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UNIVERSITY OF LOUISVILLE

THE SEVENTH-GRADE ARITHMETIC TEXTBOOK

AND

MODERN EDUCATIONAL THOUGHT

A Dissertation

Submitted to the Faculty

of the Graduate School of the University of Louisville

In Partial Fulfillment of the

Requirements for the Degree

Of Master of Arts

Department of Education

By

Adele Hunckler

Year

1937

NAME _____

TITLE THE SEVENTH-GRADE ARITHMETIC TEXTBOOK

AND MODERN EDUCATIONAL THOUGHT

DIRECTOR _____

APPROVED BY:

_____ DIRECTOR

_____)
_____)
_____) Reading
_____) Committee
_____)

Representative
of the English
Department

DATE July 22, 1937.

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CHAPTER I

INTRODUCTION

The junior high school movement in the United States has developed during the present century. During that time it has grown until such writers as Kocs now predict that it will be a near-universal institution within the next twenty-five or thirty years.¹ Leaders of present-day educational thought realize that the junior high school offers a problem in educational theory and practice that must be given major attention. This is particularly true of the curriculum of which the textbook forms an appreciable part.

The rapid growth of the junior high school, the revolutionary educational theories upon which it is founded, the lag of educational tools as against demonstrated need, and the seeming social necessity for this administrative unit, all call for searching investigations in the field. The purpose of the present study is to throw some light upon textbook

¹Williams, R. L., "The Selection of Mathematics Textbooks in Junior High School." School and Science, Volume V, Number 3, March, 1931, Pp. 284-291.

practices and needs at the seventh-grade level. An attempt is made to answer the following questions:

1. What are the characteristics of a modern seventh-grade arithmetic textbook in terms of modern educational and psychological thought?
2. How adequately do certain of the recent seventh-grade arithmetic textbooks conform to these standards?
3. How might a city such as Louisville insure that the arithmetic textbook at the seventh-grade level provides its children with study materials which conform to the standards of modern educational thought?

What the requirements of a modern textbook in seventh-grade arithmetic are is a question which cannot be answered without careful examination of an extensive body of educational and psychological literature. As is shown in Chapter III, the answer to this question, as far as can be determined, is not always given directly in the literature but must be derived from basic philosophies and researches covering a wide variety of fields that have contributed to the junior high school movement. While a certain degree of contradiction is found, the general agreement as to specific requirements for the modern junior high school arithmetic

textbook is remarkable considering the diverse fields from which these specifications come. Careful examination reveals that many of the seeming contradictions arise from failure of various writers to discuss comparable points or because they discuss the same things with reference to various applications. In general, the analysis of the literature presented in Chapter III warrants an establishing of definite standards which should be met before school men purchase arithmetic textbooks at this level and even before publishers place the books on the market. While it is not claimed that the method of analysis presented in this thesis is complete, or perfect, it is claimed to be a distinct improvement over the hap-hazard methods commonly employed in textbook analysis.

The importance of adequate textbook analysis prior to adoption is emphasized by Jensen¹ who asked 172 Superintendents of schools: "Do you build a course of study and then select a textbook, or do you select a textbook and then build your course of study?" Eighty-five percent of these superintendents replied that they built a course of study and then selected a textbook, while the remainder replied that they selected the textbook and then built the course of study.

¹Caswell, H. L. and Campbell, D. S., Curriculum Development. American Book Company, New York, 1935, Pp. 45-47.

In view of these practices it is evident that city school systems need some definite procedures to follow in determining how adequately various textbooks meet the requirements of their courses of study and of modern educational thought.

A scientific attitude toward the study of all school problems has brought about a change in many of the techniques formerly used in selecting textbooks. So far as school people are concerned, a textbook should be a good educational tool to be satisfactory. Unfortunately, they have marked difficulty in determining exactly what constitutes a good educational tool. A textbook that was satisfactory a generation ago may be totally unsuitable today due to changed social and economic conditions. A text whose mechanical features placed it in the forerank in this respect a few years ago may not be usable today because of improvements in manufacturing and materials, and because of recent researches in the field. Obviously, a text that is ideally adapted to one locality or to one level of ability may be very much unsuited to another.

In 1929 McCormick¹ made a study which compared the contents of eleven seventh-grade textbooks published since 1925 with ten published prior to 1923. The books

¹McCormick, Clarence, The Teaching of General Mathematics in the Secondary Schools of the United States. Teachers College, Columbia University, Contributions to Education, Number 386, Chapter V, P. 61.

from the two periods contained about the same amount of statistical material. In every other branch there was a very noticeable difference. Plane arithmetic dropped from an average of about eighty percent in the earlier group to about fifty-nine percent in the later one. Intuitive geometry increased from sixteen to twenty-one percent.

In a more detailed study Davis¹ presents evidence obtained through an examination of ten series of three textbooks each which were published within the last fourteen years. She shows that each of the ten authors offered materials from arithmetic, geometry, and algebra in the seventh grade. The following of Mrs. Davis' conclusions are noteworthy: (1) Much use is made of material for motivating all phases of the work; (2) A tendency is noted to present work in a psychological rather than a logical manner; (3) Mechanical problems are given much less space than verbal problems; (4) A tendency is present to develop practical rather than impractical mathematics; (5) Much effort is devoted to training the child for quantitative interpretation.

The first step in the present study was to determine current practices in textbook selection. These are presented in Chapter II. Here it is shown that textbooks are chosen, for the most part, because

¹Davis, D. R., "A Comparative Study of Textbooks in Junior High School Mathematics. High School, Volume 8, Number 2, February, 1931, Pp. 103-114.

of factors other than value as teaching devices--prestige of the author or of the publishing company, or both, etc.; that the score card alone is an inadequate tool for selecting a textbook and should be supplemented by painstaking analysis on the part of specialists in the field, preferably those who will use the text, providing their other qualifications are satisfactory.

The characteristics which the modern seventh-grade arithmetic textbook should possess, as outlined in current educational and psychological literature, are given in Chapter III. Lack of unification and cohesion in the analysis of the literature is inevitable. A large number of individuals have written more or less directly about this problem; many of them have touched the matter only incidentally while dealing with some aspect of a very different major problem. From this, seemingly, disorderly array of literature (all that was available to the writer) come the desiderata of the modern seventh-grade arithmetic textbook as given in the twenty-eight headings of Chapter III.

The next step in the study was to determine how adequately modern seventh-grade arithmetic textbooks meet the requirements of modern educational thought. Preliminary analysis was made of all the available seventh-grade arithmetic textbooks published from 1926

to 1935, inclusive, a ten year span. In the opinion of the writer, those for 1934 and 1935 seem enough alike to be considered as belonging to the same period and so different from those published prior to 1934 that those from the earlier years could not reasonably be considered modern. Since the study was begun in 1936 textbooks published later than 1935 were not available.

Careful analyses were made of the six seventh-grade arithmetic textbooks listed in the Cumulative Index of Periodic Literature for the years 1934 and 1935. While analysis of more books would have made the study more useful as regards differentiation between texts, only six were available for these years. The inclusion of books from the two-year period was considered advisable in order to secure as large a sampling as seemed consistent with modernity. The study of a greater number of books would have involved a time span which might have complicated and confused the issue, since a long-time study would have introduced the factor of evolution, shown by McCormick, as cited above, to such an extent that the books analyzed would not be contemporary. It seemed further advisable to make an attempt at analyzing only books which would be contemporary with the literature from which the methods of analysis were derived. For the most part

texts are published from two to five years after completion of the manuscripts, sometimes longer.

Periodic literature does not, generally speaking, have a comparable delay in publication. While analyzing literature and texts from a strictly comparable period was impossible in this study, the two types of literature are, for the most part, contemporary, when lag of publication is allowed for.

These six textbooks were examined, analyzed and rated as to whether they were superior, average, or inferior according to the twenty-eight criteria set down in Chapter III. These analyses are given in Chapter IV. The teachers making the analytical ratings were: Misses Miriam Heymann, Alice Bailey, Esther Barth, Mary Corcoran, and the writer, all teachers with extensive experience in seventh-grade arithmetic in the Louisville public schools.

Whether these teachers are qualified to make such evaluations may be questioned, of course, as it may be considered debatable that anyone is so qualified. These teachers are intimately in contact with arithmetic instruction at this level and have had recent contact with university courses in education, and have assisted with curriculum reconstruction in the Louisville schools.

Whether five judges are sufficient to insure a requisite degree of accuracy of judgment will depend

upon how well their ratings agree one with another. Examination of the data given in Chapter IV shows a high degree of agreement - at least as consistent as those used by Terman and Cox in estimating the intelligence quotients of three hundred geniuses.¹

Since, in the opinion of the judges, none of the six modern seventh-grade arithmetic textbooks adequately meets the requirements of modern educational thought as laid down in Chapter III, specific recommendations are made regarding the usage of arithmetic textbooks at this level in the Louisville public schools. These are given in Chapter V, together with a summary of the findings of the study.

¹Cox, C. C., The Early Mental Traits of Three Hundred Geniuses. Genetic Studies of Genius, Volume II, Stanford University Press, 1926.

CHAPTER II

HOW TEXTBOOKS ARE SELECTED

I. The value of a book as a teaching device has little to do with its selection as a textbook.

Because those responsible for the selection of textbooks have not been equipped with techniques that would insure adequate analysis, special arguments have been used by publishing companies to influence their choices. Maxwell¹ lists the following as the most common and the most effective of these: (1) The prestige of the author. It has been taken for granted that an author who has a reputation as a scholar in his field is equipped to prepare a textbook for children. Publishing companies have made much use of this argument as one of the basic considerations for the excellence of a text. (2) The prestige of the publisher. This has been used particularly by large companies and they have disparaged the books of more recent comers in the field. (3) The general appearance of the book. This has received undue emphasis. (4) The wide use of the book. This is one of the most persistent arguments and in the opinion of the publisher, author and purchaser, a good text is, quite generally, one that sells

¹Maxwell, C. R., "The Use of Score Cards in Evaluating Textbooks." National Society for the Study of Education, Thirtieth Yearbook, Part II. Public School Publishing Company, Bloomington, Illinois, 1931, Pp. 143-146.

well, regardless of all else. (5) The cost of the book. This, as an argument, has made a distinct appeal when recommendations have been made to school boards. When publishing companies bid against each other for adoptions, it naturally appears as a vital consideration.

II. A score card alone is inadequate.

Sometimes score cards are used for evaluating textbooks, but according to Buckingham,¹ a score card alone does not insure scientific methods or results. Science calls for more than an instrument. In the first place, the instrument must be a good one; secondly, the instrument must be used properly; and thirdly, the user of the instrument must have a scientific attitude. By scientific attitude is meant open-mindedness, freedom from prejudice, willingness to consider all viewpoints, a willingness to seek facts wherever they are to be found, and the drawing of only such conclusions as are warranted by the data.

Unless such criteria are set up, says Maxwell, the objectives of the school system may be lost sight of in the selection of textbooks.

It is not easy to make a good score card, and textbook committees soon discover this. The basis for

¹Buckingham, B. R., "The Scientific Development and Evaluating of Textbooks", Department of Superintendents Official Report. February 25-March 2, 1933, Pp. 159-166.

weighting and even for selecting the items is likely to be neither objective nor impartial. The textbook committee must either make its own score card or adopt one from some other source.

A good arithmetic score card contains such headings as: Problem material, processes in drill, diagnostic and remedial features, provisions for individual differences, physical features, and vocabulary and sentence structure. It is generally agreed that this last feature deserves far more detailed attention than it usually gets. A fairly typical score card is given below. The inadequacies of such a device taken alone are at once apparent:

TYPICAL SCORE CARD¹

(Books that are superior, average, or inferior in regard to the items given below are rated as 1, 2, or 3, respectively)

I. Organization:

- a. Plan of course
- b. Logic of development
- c. Manner of tying up, summarizing
- d. Concrete first, abstract later

II. STYLE OF PRESENTATION:

- a. Clear, coherent, unified, concise, adequate, appealing to both sexes
- b. Effective presentation of vocabulary

III. UNDERLYING PSYCHOLOGY:

¹Fuller, Florence, Scientific Evaluation of Textbooks. Houghton Mifflin Company, Boston, Massachusetts, 1928, P. 56.

- a. From known to unknown
- b. From simple to complex
- c. One difficulty at a time
- d. Offering motivation
- e. Stimulating thinking
- f. Stimulating initiative
- g. Observing laws of recency and frequency
- h. Utilizing that which has been developed

IV. AIDS:

- a. Table of contents
- b. Indices
- c. Appendix, tables, charts, supplementary material

V. PROVISION FOR ABILITY DIFFERENCES

VI. APPEAL TO INTEREST:

- a. Pictures
- b. Titles, headings, etc.
- c. Simplicity
- d. Devices--for fun, games, contests
- e. Explanations as to usefulness of material

III. Practices in large cities:

In Boston the mathematics council adopts a list of textbooks, any one of which the teacher may use. In the junior high school grades of Cleveland, different texts are adopted for use with X, Y, Z groups, representing the bright, medium and slow pupils. In most systems, Lide¹ found that a single textbook was adopted and that all teachers felt that they should use it.

In practically all schools visited by Lide, textbooks are selected through a committee appointed for that purpose, each member of which uses his own

¹Lide, Edwin S., "Instructor in mathematics", United States Department of the Interior, Office of Education, Monograph Number 23, 1932, Number 17, Pp. 17, 18.

methods in arriving at a conclusion. A school official in one of these cities felt that publishers of textbooks affected too much the choices made. Certainly, the selection should be made on the extent to which the books represent the ideas of the staff relative to materials and methods. It is most unfortunate that the ideas of most committees are not better crystallized and more objectively administered. The score card given above was devised to assist in such selections. It has been used in the Los Angeles junior high schools, but with what success, we are unable to determine.

IV. How publishers secure manuscripts:

In order to learn how publishers secure manuscripts for textbooks, Jensen asked this question: "What methods do you employ as a publisher in the securing of manuscripts and of authors to write manuscripts for textbooks?"¹ Typical answers were: "A great many manuscripts are offered to us. Many come to us through advisory editors. Our own editors are in evidence at educational gatherings and are often consulted by teachers with regard to books in process." "Our editors and our field representatives try to keep informed of manuscripts in preparation and of persons qualified to do special work of this sort. We find

¹Maxwell, C. R., "The Use of Score Cards in Evaluating Textbooks." National Society for the Study of Education. Thirtieth Yearbook, Part II, Public School Publishing Company, Bloomington, Illinois, 1931, P. 80.

authors by personal contact. Our editor-in-chief makes it his business to investigate prospective authors personally. Sometimes the author brings his material unsolicited to the publisher and if it is found to be sufficiently meritorious to justify preliminary examination, the material is considered in the light of meeting present-day demands as reflected in the reports of educational committees representing in a large degree the ideas of the times. The all important thing is, first, whether there is a sufficient demand for such a book to justify the expense of publication; and second, the quality and organization of the material.

"In nearly every case we decide on the subject, then seek the author. We seldom accept ready-made manuscripts."

Publishers are always on the alert to find prospective authors. Some publishers have a special department to discover authors and materials for publication. An author must have recognized standing in his field. Subject matter must conform to the educational demand. The educator who is responsible for the success of the schools must say what tools are needed. The publisher attempts to produce the type book he thinks the educator will want.

Most of the present authors are college professors who are experts in the various school subjects. These men often are assisted by public school

administrators and teachers. To quote Rugg:¹ "Since 1895 textbook companies with an eye to sales have tended more to form partnerships of professors and public school workers--superintendents, principals, or teachers. Few school books get wide adoption that are not prepared by such a partnership of subject matter, authority, and practical school administration."

Publishing companies must anticipate and measure the need for a new textbook before building one and placing it on the market. Criteria used by the publisher to determine the need for a new textbook are about as follows:² (1) Constant watchfulness of educational movements as reflected in addresses and writings. (2) The efforts by field representatives to detect educational tendencies and a real demand for textbooks. (3) The knowledge that there is a dissatisfaction with existing texts. (4) Reports of committees on curricula, new courses of study, articles in educational periodicals, discussions in educational meetings, and the reports of field men.

V. Summary:

The value of a book as a teaching device has

¹Rugg, Harold., "Curriculum-making via National Committees." National Society for the Study of Education, Twenty-sixth Yearbook, Public School Publishing Company, Bloomington, Illinois, 1927, P. 65.

²Jensen, Frank, "The Selection of Manuscripts by Publishers." National Society for the Study of Education, Thirtieth Yearbook. Public School Publishing Company, Bloomington, Illinois, 1931, Pp. 80-91.

little to do with its selection as a textbook. Textbooks are chosen subjectively and usually without adequate evaluation. Even where a score card is employed, it furnishes, generally, a superficial judgment.

Where teachers are left to choose their own texts, as is common in many school systems, or where they have several acceptable ones to choose from, they still are likely to make inadequate analyses of the books considered. Their choices are influenced very much by publishers, presumably because the teacher has no adequate method of textbook analysis.

It is agreed among educators that effective textbooks cannot be secured unless the publisher and the schoolman work together with the interests of the child in mind. In this joint effort, the evaluating of textbooks assumes major importance and the development of the text of the future will be the task of both author and publisher. Unfortunately, the modern text, speaking generally, is primarily the concern of the publisher who selects authors, manuscripts, and ideas out of which textbooks arise, and no satisfactory criteria are applied to the text as a teaching tool, either before or after publication.

CHAPTER III
STANDARDS FOR THE MODERN SEVENTH-GRADE
ARITHMETIC TEXTBOOK

An analysis of the current educational and psychological literature, as outlined in Chapter III, warrants an establishing of definite standards which should be met before educators select arithmetic textbooks at the seventh grade level. These standards are as follows:

- I. The modern seventh-grade arithmetic textbook should have a sound philosophical background relative to the functions of arithmetic.¹

In deciding what to put into a textbook, authors should be guided primarily by educational theory as well as by considerations of practice and social utility. Since it is the aim of education to fit the child for life, i. e., for growth that draws upon the present environment, the present capacities, and the present interests of the child, education and the textbook must be flexible. The child must be trained to make his own adjustments and to meet unforeseen circumstances.

Arithmetic should make a vital contribution

¹Schorling, R., "The High School Teacher in the Making", The High School Teacher and the Textbook, Edwards Bros., Ann Arbor, Michigan, 1931, P. 1.

to the intelligent consideration of various aspects of business, consumption, production, government, and social relationships which lend themselves to quantitative study and analysis. The real meaning and significance of profit and loss, the responsibilities and difficulties of the home and business establishments are part of the field of arithmetic. Arithmetic offers an opportunity for the individual to become more intelligent in his selection of food, clothing and shelter; that is a more intelligent consumer.

Certain topics in arithmetic may be well used as a means of showing how complex international problems have been settled by common agreement. The metric system represents an interesting illustration of an attempt to solve by common acceptance of a simple decimal system the vexing problems due to a lack of uniformity in measurement units among different countries.

Textbooks have wider use now than ever before. Arithmetic is taught primarily as presented in these texts. If the child is to develop a basis for expressing his concepts quantitatively and in orderly manner, he must learn to express relationships clearly. If he is to learn these things, he must learn the techniques that have been invented for stating these relationships, such as ratio, average, median, per cent, mode, and other such devices. Such terms occur in books other

than texts, in newspapers, and magazines. To read intelligently he must have a true appreciation of their functions. This can be accomplished only through the arithmetic textbook whose writer has been guided by sound educational and psychological principles.

The modern arithmetic textbook must recognize that habits are essential for economy of action and must make provision for their establishment. The number facts should be reduced to a habit basis. But confronted by unfamiliar situations habits no longer meet the need and number facts become insufficient. The educated person is a thinking person, and a fundamental problem of the modern course in arithmetic is to teach children to think. This cannot be done unless the children are placed in situations requiring thought. In the social environment these situations are called problems, and arithmetic offers experiences which likewise are called problems.

The importance of a proper philosophical approach to the teaching of arithmetic is indicated by Schorling and Bagley who say: "In our secondary schools the most important factor next to the teacher is the textbook. For most teachers the curriculum and the textbook are identical. The inadequately trained teacher and, in most cases, the beginning teacher need to follow a textbook in systematic fashion. It is a

very poor textbook indeed that is not better than no textbook."¹ "Whatever the evils of the textbook system may be, it is fairly clear that it is about the only force in American education that reflects a systematic and orderly procedure."²

While the exact nature of the seventh-grade textbook in arithmetic is not specifically outlined in modern courses of study, there is absolute agreement that careful consideration should be given to basic educational philosophies. According to the Course of Study of the State of New York,³ mathematics at the junior high school level should depend upon a broad philosophy of education rather than following the momentary interests of childhood or unduly stressing alleged life needs discovered by inventories of adult literature and vocational practices."

A fairly comprehensive idea of the nature of this general educational philosophy is given in the Foreword of the Indianapolis Course of Study for 1934:⁴

¹Schorling, R., "The High School Teacher in the Making. The High School Teacher and the Textbook, Edwards Bros., Ann Arbor, Michigan, 1931, P. 1.

²Bagley, Wm. C., "The Textbook in American Education". School and Society, Volume XXXIII, March 14, 1931, P. 358

³University of the State of New York, A Syllabus in Junior High School Mathematics, Albany, New York, 1938, P.2.

⁴Indianapolis Public Schools: Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934.

"The general aim of the course (Junior High School Mathematics) is to provide experiences and suggest activities which will help the pupil:

1. To develop speed and accuracy in the fundamental operations through their more difficult applications; to develop an understanding of their use through a wider relation to home, school, community, and business life.
2. To gain such a knowledge of geometric form and dimension as is useful in the ordinary activities of life.
3. To acquire the algebraic knowledge which is useful in simple mensuration and common business practices and to have an opportunity to master the fundamentals essential for advanced work.
4. To discover mathematical ability and particular interests and capacities so that intelligent choice of senior high school subjects may be made.
5. To gain some appreciation of the value of mathematics in every-day life, in related fields of knowledge, and in advanced work in the subject.
6. To develop a clear notion of the relationship between the various fields of mathematics and the inter-dependence of the various mathematical operations.

7. To develop: greater power in problem solving, responsibility and need for accuracy, satisfaction in thorough and precise work, and ability to estimate approximate results."

In emphasizing what constitutes an adequate educational philosophy the New York Course of Study says:¹

- "1. No idea should be emphasized which does not have inherent mathematical or practical value.
2. New ideas should not be introduced unless their actual use will be relatively immediate.
3. New ideas should not be introduced until the child has the proper background for them.
4. Only one topic should be studied intensively at one time.
5. All processes should be given enough attention that they will be learned. Certain ones should be made automatic.
6. Reviews and summaries must be provided.
7. Individual differences must be provided for, especially as vocational aids.
8. The study must not be complicated.
9. Intuitive geometry should have more attention than is customary.

¹University of the State of New York, A Tentative Syllabus in Junior High School Mathematics. The University of the State of New York Press, Albany, 1928.

10. Algebra should be recognized."

Clearly then, the task of the author of a modern seventh-grade arithmetic textbook is a difficult one as respects philosophy. He must know what philosophy is. He must apply it in such a manner that it will function with the pupil through the textbook and through the teacher. He must at the same time conform to current usage through careful analysis of courses of study and competing textbooks. He must consider the criterion of social utility with reference to the needs of both children and adults. One of his major problems will be to consider the functions of arithmetic other than the computational. He must consider not only what numbers people do use, but also the numbers that they need to use and for what purposes other than for mere computation.

11. The modern seventh-grade arithmetic textbook should provide a sound system of character and citizenship training.¹

Few fields offer more definite opportunities for specific training in character and citizenship than does mathematics. All modern educational philosophies emphasize the crying need for such training; many of the writings relative to junior high school mathematics

¹Indianapolis Public Schools: Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934.

mention the possibilities offered for such training in this field. Unfortunately, specific directions as to how this training is to be given are usually lacking. Perhaps the most specific thought on this type of training through junior high school mathematics is given in the Indianapolis Course of Study. They say:¹

"While the purpose of teaching mathematics is not essentially character and citizenship training, many situations arise in connection with this work which offer distinct opportunities for the development of desirable character and civic traits. Since there is much individual activity, few other subjects afford as much practice in development of habits of industry and perseverance, and reliance upon one's own efforts. Mathematics problems challenge the pupil's resourcefulness and originality, and achievement based on faithful honest effort brings a feeling of satisfaction. which stimulates further effort. Teachers should plan the classroom procedures so carefully that temptations for dishonesty and carelessness on the part of pupils are removed as far as possible. Every pupil's work should be carefully checked before credit is given in order that only careful, accurate, honest effort is properly rewarded. The teaching of mathematics should

¹Indianapolis Public Schools: Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934.

establish an appreciation of the necessity of exactness, a love of accuracy, and an understanding of the contribution of mathematics to our social life in science and invention. Since some of the units in mathematics--banking, insurance, taxes, household practices--relate very definitely to social activities, the pupils should gain a deeper appreciation of the duties of an upright citizen in the community, especially in relation to financial obligations."

III. The modern seventh-grade arithmetic textbook should have a vocabulary of suitable difficulty for seventh-grade children.¹

It goes without saying that problems must be expressed in the vocabulary which children can understand. new terms should be introduced when needed, and the sentences must be simple enough that the pupil can read and understand them. Maxwell points out that many textbooks have been found practically worthless owing to the character of the vocabulary used. This is amply supported by the findings of Patty.¹

For many years it has been recognized that the difficulty of the vocabulary in which a book is

¹Patty, W. W., "The Textbook and Its Vocabulary", Journal of Educational Research, Volume 34, Number 24, June, 1931, P. 145.

²Patty, W. W., "The Textbook and Its Vocabulary", Journal of Educational Research, Volume 34, Number 24, June, 1931, P. 145.

written limits the group with which it can be used and plays a large part in determining its usefulness as a text. Professor Thorndike of Columbia University was one of the first, if not the first, to make practical application of this finding. In 1921 he published The Teacher's Word Book,² a compilation of the 10,000 most frequently used words in the English language. While Professor Thorndike did not claim that the frequency with which a word is used is an exact measure of its difficulty--the extent to which it is understood by children of a given age--it has been found that the relationship between frequency of usage and understanding of vocabulary terms is so close that those who write textbooks for children must consider whether or not those for whom the writings are intended will be reasonably well acquainted with the terms used.

It should be the business of the author to know the technical and literary words with which he is loading his text as well as to know the facts of subject matter.

So far, we have no adequate measure of exactly what percent of the words a child meets in a textbook he should be familiar with or understand. If he knows all of them there will be no growth in

²Thorndike, E. L., The Teacher's Word Book, Teachers' College, Columbia University, New York City, 1921.

language mastery; if he knows too few of them he will become discouraged and will have to spend an unreasonable amount of time with the dictionary.

Jensen and Schrodtt,¹ working with sixth-grade children, found some relation between the frequency of usage of words in compositions and how much was learned from them in a limited period of time. They found, however, that factors other than frequency of usage had more to do with learning where the differences in frequency of usage were no greater than are ordinarily found in textbooks intended for the same grade. They say: "... what a child learns from a five-minute study period is not wholly dependent upon the above named factors--comprehension, vocabulary difficulty, phrase and sentence length. In our opinion, style of presentation, key sentences, etc., are vital factors. It seems to us that too much 'story' may actually detract from learning and that study materials may be too 'entertaining' to be good teaching devices where time is limited."¹ They did find, however, in a preliminary (unpublished) study and in the published study reported, that in the textbooks compared and the study sheets of graded difficulty from which the children learned most rapidly contained, on the whole,

¹Jensen, M. B. and Schrodtt, M., "Language Difficulty and Learning: The Relative Effectiveness of a Series of Study Sheets of Graded Difficulty as Teaching Devices with Children in the 6A Grade." Jr. Genetic Psychology, Volume XLIX, number 2, December, 1936, P. 451.

much more frequently used words than did those from which the children learned more slowly. If we may accept their findings, judgments of competent "rators" must be used to supplement vocabulary counts, measures of sentence structure, etc. in arriving at proper analyses of textbook difficulty.

A study made by Kramer¹ showed that the unfamiliarity of terms made a difference in the accomplishment of pupils in solving verbal problems. Kramer further showed that the group which solved problems containing only familiar vocabulary gained 6.5 per cent more than the group which solved problems containing unfamiliar terminology.

Brueckner² found that the correlation between computational ability and understanding of quantitative relationships was .417. He concluded, "... a pupil's rating on a computational test is not a reliable index of his ability as measured by the vocabulary or quantitative relationship test." He found a high correlation between problem solving ability and vocabulary.

Grossnickle³ made a study which is concerned

¹Kramer, G. A., The Effect of Certain Factors in the Verbal Arithmetic Problems upon Children's Success in Their Solution. The John Hopkins University Press, Baltimore, Maryland, 1933, Pp. 58-61.

²Brueckner, L. J., "Diagnosis in Arithmetic". National Society for the Study of Education, Thirty-fourth Yearbook, Public School Publishing Company, Bloomington, Illinois, 1935, P. 273.

³Grossnickle, F. E., "Concepts in Social Arithmetic for the Eighth Grade Level." Jr. Educational Research, Volume XXX, Number 3, March, 1937, Pp. 475-488.

with the informational phase of arithmetic as it relates to an understanding of certain concepts found in the social usages of business arithmetic.

The purpose of the study was to find the degree of accomplishment attained in mastery of certain concepts by the pupils when they had completed the eighth grade.

A list of sixty-eight mathematical concepts in the business usages of arithmetic was found by analyzing thirteen different textbook series for the seventh and eighth grades. These concepts were grouped as follows: banking, stocks and bonds, taxation, insurance, merchandising, building and loan associations, and installment buying.

The study showed that the level of attainment in mastery of concepts in most of the schools was about the same. Yet in only one of the schools was the average attainment more than two-thirds of the total possible. If the judgment of the textbook writers is a valid criterion for the worth of concepts, then a class which has a working knowledge of only two-thirds of the mathematical terms from an assigned list, has not made a record of achievement that merits such praise. However, the major part of the criticism for the low level of achievement of most classes should be placed upon the textbooks since the concepts which the

classes meet in daily arithmetic are determined by the text it uses.

Burch¹ found about as much difference in difficulty between the literature books ordinarily used in one grade of the junior or senior high school as there was between the average reading ability of the various grades. In other words, some of the books were much easier to understand than were others used at the same grade level. She concluded that the literature intended for the twelfth grade could be used as satisfactorily with students of the ninth grade as many of the books they were using. The fault, undoubtedly, does not lie with the children, with the schools, or with the teachers, but with the books which, from the standpoint of difficulty, are not adapted to the children with whom they are used.

IV. Sentences and paragraphs should be brief, simple, and unified in the modern seventh-grade arithmetic textbook.²

Jensen and Schrod² rewrote a section about Arabia from Gibbon's History of the Decline and Fall of the Roman Empire to form a "series of five selections

¹Burch, M. C., "Determination of a Content of the Course in Literature of a Suitable Difficulty for Junior and Senior High School Students." Genetic Psychology monographs, Volume IV, Numbers 2, 3, February and March, 1928.

²Jensen, M. B. and Schrod², M., "Language Difficulty and Learning." Jr. of Genetic Psychology, Volume XLIX, number 2, December, 1936, Pp. 451-467.

(including the original), uniform in content, but differing markedly in difficulty". In the opinion of thirteen experienced teachers these selections were of difficulties suitable for the 11.6, 9.2, 7.5, 5.5 and 3.7 grades. The average number of words per sentence was: 27.1, 23.4, 11.9, 7.9, and 10.4. The mean lengths of phrases were: 12.1, 10.3, 9.9, 6.9 and 8.6. The five selections were given to five carefully equated groups of sixth grade children to study for ten minutes after which they were all given the same examination to find out how much they had learned. Those that studied the easiest selection scored almost twice as high on the test as did those who studied the hardest selection. The mean scores for the five groups on a test containing fifty-one items were 15.8, 17.0, 20.5, 25.2, and 30.4. They found that about two grades difference in suitability, as judged by their thirteen "rators", produced a significant difference in the amount that the children learned in a ten-minute study period. While it is not claimed that there is a direct relationship between the length of sentences and phrases and the coherence of the paragraph and how well a child learns from what he studies, it is evident that these three factors should have vital consideration by the makers and purchasers of textbooks.

An examination of current textbooks in almost

any field shows that the vocabulary has been greatly simplified, many technical details have been omitted, and the entire presentation has been made more elementary. There is still much room for improvement, however.

- V. The modern seventh-grade arithmetic textbook should define new terms in context as they are introduced.¹

While little is made of this in most of the educational literature, it is mentioned occasionally. Wherever teachers get together to discuss textbooks there is a general disappointment relative to the student's inability to use the dictionary well and, frequently, as regards the necessity for such a task. The introduction of new terms gradually and their defining as they are introduced would save the student's time and free him from the discouragement of meeting many terms with which he is unfamiliar.

- VI. The modern seventh-grade arithmetic textbook should provide proper motivation through data related to the child's experience.²

A real task of the author of an arithmetic

¹Breslich, E. R., Reconstruction in Secondary School Mathematics, Ph. D. Thesis (Unpublished), University of Chicago, 1926.

²Buckingham, B. R., "The Social Value of Arithmetic". National Society for the Study of Education, Twenty-ninth Yearbook, Public School Publishing Company, Bloomington, Illinois, Part II, 1930, Pp. 95-96.

textbook is the utilization of the possibilities of normal activities that give the pupil practice in a normal way, and to apply number as it is applied in life. This procedure is made imperative by modern educational thought which says that the textbook must be interesting to the child. To them, interest means effort, and a fundamental principle of interest is understanding; hence the great effort must be made to draw problems from the experiences of child life.

Benthack¹ and Buckingham² agree that utility is a major concern of any textbook. It must have meaning in the life of the child and it must give the child training for useful living. This, they feel, can be accomplished only by means of materials suited to the interests, needs, and capacities of the child. Problems must be derived from natural situations arising in the school, the home, and the community, and they must be applicable to modern business.

This implies the elimination of the following traditional materials from the textbook: (1) least common multiple (2) greatest common denominator (3) complex and compound fractions (4) long confusing problems in common fractions (5) Apothecaries weight

¹Benthack, Emil. "Standards for the Selection of Arithmetic Textbooks." Educational Research Record, University of Nebraska, February, 1929, Pp. 85-90.

²Buckingham, B. R., "The Social Value of Arithmetic." National Society for the Study of Education, Twenty-ninth Yearbook, Public School Publishing Company, Bloomington, Illinois, Part II, 1930.

(6) Troy weight (7) tables of foreign money, eases of percentage, cube root, and tables for surveyors and of compound annual interest.

Benthack further states that a good textbook should include: (1) fundamental processes in arithmetic--integers, common fractions and decimal fractions, denominate numbers, addition, and one-place reduction (2) tables of length, surface, cubic, liquid and dry measures, avoirdupois, and United States money (3) the use of aliquot parts, simple percentage with simple interest and bank discount (4) mensuration--perimeter, surface, content of common plane and solid figures (5) square root (6) business practices (7) taxes and public expenditures (8) the keeping of simple accounts.

Burch¹ is in full agreement with this but goes even further and says that how much a child learns depends to a tremendous extent upon the amount of enjoyment he receives through doing the work prescribed. Unless the work gives pleasure, she says, there can be little hope of influencing the child permanently.

Schaaf² says that the distinction between verbal problems and real life problems is significant.

¹Burch, M. C., "Determination of a Content of the Course in Literature of a Suitable Difficulty for Junior and Senior High School Students." Genetic Psychology Monographs. Volume IV, Numbers 2 and 3, August-September 1928.

²Schaaf, W. L., Mathematics for Junior High School Teachers. Johnson Publishing Company, New York, 1931, Pp. 417, 420.

Fundamentally, the life problem is the actual situation itself, while the verbal problem is only a description of that situation by means of language. This is a source of confusion and difficulty for the pupil. It is quite conceivable that a pupil who is able to cope successfully with problem situations of a certain difficulty in real life may be a dismal failure when it comes to solving verbal problems.

It is well known that there are two types of arithmetic, namely, informational and computational. Judd, Buckingham, and Butler¹ have shown the desirability for greater emphasis on the informational type, that is, those aspects of arithmetic dealing with life situations.

VII. Explanations in the modern seventh-grade arithmetic textbook should be addressed to the pupil rather than to the teacher.²

It is an all too common practice for explanations to be given in language understandable only to the teacher. If the purposes of progressive educational thought are to be attained, the pupil must realize that the learning of the subject matter

¹Butler, C. H., "Mastery of Certain Mathematical Concepts by Pupils at the Junior High School Level." The Mathematics Teacher, Volume XXV, Number 3, March, 1932, Pp. 117-172.

²Breslich, E. R., Reconstruction in Secondary School Mathematics, Ph. D. Thesis (Unpublished) University of Chicago, 1926.

presented is his problem rather than the task of the teacher to teach him. In almost all modern educational literature there is emphasis upon the necessity of making the child aware of his responsibility in the learning situation. If this is to be accomplished the modern textbook must talk to him rather than about him or to the teacher.

- VIII. The modern seventh-grade arithmetic textbook should provide illustrations that visualize life situations for the child.¹

While the field of visual education is relatively new and few definite data are available, most modern educational literature emphasizes the importance of adequate illustration. In arithmetic this should be done through charts, graphs, diagrams, etc. of actual situations and data. The importance of such procedures are implied through most of the writings reviewed in the present study, though specific statements are seldom given.

- IX. The modern seventh-grade arithmetic textbook should provide games and contests to break the monotony.²

That much of the work of arithmetic may

¹Breslich, E. R., Reconstruction in Secondary School Mathematics, Ph. D. Thesis (Unpublished) University of Chicago, 1926.

²West, R. L., Greene, C. W., and Brownell, W. A., "The Arithmetic Curriculum", National Society for the Study of Education, Twenty-ninth Yearbook, Public School Publishing Company, Bloomington, Illinois, Part II, 1930, Pp. 95-96.

readily become tiresome is emphasized repeatedly throughout the literature. This is particularly true with the phases which should be habituated as will be shown under the discussion on drills. Since modern educational philosophy emphasizes the advisability of utilizing the child's natural tendencies, one of which is to play in competitive situations, it is obvious that provision should be made for such activities in the modern arithmetic class.

- X. The modern seventh-grade arithmetic textbook should provide adequate opportunity for practice in solving problems.¹

Verbal problems form the most significant part of arithmetic. In solving problems the pupil gets the benefits of abstract examples plus training in thinking through problems as he will meet them in life experiences outside of school.

According to Thorndike,¹ "good" problems will have the following desirable qualities: (1) the situations dealt with will be such as are likely to occur in real life, (2) the situations will be dealt with in a manner as nearly as possible analogous to that in which they are dealt with in life, (3) the situation presented will be approximately the same

¹Schaaf, W. L., Mathematics for Junior High School Teachers, Johnson Publishing Company, New York, 1931, Pp. 418-422.

difficulty as a similar life situation, and (4) the problem will be accompanied by substantially the same degree of motivation and interest as accompanies it in real life. Furthermore, two other aspects must be kept in mind: the aim of the problem, and the wording of the problem. The chief aims of the problem are to cultivate the habit of looking for quantitative relationships, the ability to apply these relationships to life situations, and the ability to arrive at proper solutions.

- XI. The modern seventh-grade arithmetic textbook should give adequate attention to the mathematics of thrift and investment for everyday use--banking, interest, savings, discount, budgets, etc.¹

The importance of this characteristic of the modern seventh-grade arithmetic textbook is emphasized by nearly all writers in the field, almost irrespective of what they are writing about. It is listed, as previously stated, by the Indianapolis Course of Study as one of the chief objectives of citizenship training. All the discussions of arithmetic in relation to life situations stress these important phases of modern arithmetic. Without question, the adapting of arithmetic subject matter is an important task of the modern

¹Schaaf, W. L., "Mathematics for Junior High School Teachers", Johnson Publishing Company, New York, 1931, Pp. 125-130.

textbook author.

- XII. The modern seventh-grade arithmetic textbook should provide concrete problems such as those which require actual measurements to be made, estimates given, etc.¹

While the making of arithmetic concrete in the life experiences of the child by actual measurements and other performances is emphasized in the literature, references as to how it is to be accomplished are almost as vague as are the attempts of textbook authors to accomplish it. That it should be done is a matter of common agreement. As to just how it is to be accomplished and how much time might be devoted to it is still a matter of subjective judgment.

- XIII. The modern seventh-grade arithmetic textbook should instruct the pupil for immediate and future use of graphs and formulas, enable him to interpret them intelligently in his reading of newspapers, magazines, and other current literature.²

This is a generally accepted requirement of the modern arithmetic text. All courses of study provide for such goals though the exact nature of the instruction is left pretty much to the teacher.

¹Schaaf, W. L., "Mathematics for Junior High School Teachers", Johnson Publishing Company, New York, 1931, Pp. 125-130.

²Betz, William, "Mathematics in Modern Education", National Council of Teachers of Mathematics, Eleventh Yearbook, Bureau of Publications, Teachers' College, Columbia University, New York, 1936, Pp. 106-121.

Educational writers mention such objectives as important at this level of instruction in arithmetic. Mention, as a rule, is incidental, however, rather than definite.

- XIV. The modern arithmetic textbook for the seventh-grade provide a sufficient number of reasoning problems involving life situations.¹

To be of most value, problems should involve those things which make up the child's daily interests and activities. Writers in the field are emphatic in that there should be a large number of such problems as well as that they should center about life situations as shown above.

- XV. The modern seventh-grade arithmetic textbook should have enough drills to iron out the difficulties and make the correct methods mechanical.²

How much drill is necessary for these purposes is not given in the literature. Until experimental investigations indicate the approximate amounts of drill needed, the judgments of experienced teachers must be relied on in deciding if the drill provisions are adequate.

- XVI. The modern seventh-grade arithmetic textbook should

¹Betz, William, "Mathematics in Modern Education", National Council of Teachers of Mathematics, Eleventh Yearbook, Bureau of Publications, Teachers' College Columbia University, New York, 1936, Pp. 106-121.

²Brueckner, L. J., "The Critique of the Yearbook", National Society for the Study of Education, Twenty-ninth Yearbook, Public School Publishing Company, Bloomington, Illinois, 1930, Pp. 687-692.

have drills distributed in diminishing amounts and at more frequent intervals.¹

As the child progresses through the course, or through the unit, in case the unit plan is followed, fewer examples should be included in the drills and the drills should occur at more frequent intervals.

XVII. The amount of drill provided in the modern seventh-grade arithmetic should be proportionate to difficulty.¹

more drill space should be allotted to those examples which involve a frequent difficulty rather than those of the same type but of lesser difficulty. For example, $604/2$ is much more difficult than $624/2$, because of the zero in the number. It should, of course, receive more drill.

XVIII. The modern seventh-grade arithmetic textbook should have "mixed" rather than "isolated" drills.²

Luse² found from a twenty-six week experiment in isolated versus mixed drill that all pupils profited from drills, but that those using mixed drills showed twenty-three percent greater gain than did those using

¹Brueckner, L. J., "The Critique of the Yearbook", National Society for the Study of Education, Twenty-ninth Yearbook, Public School Publishing Company, Bloomington, Illinois, 1930, Pp. 687-692.

²Kepp, A. C., "Mixed Versus Isolated Drill Organization", National Society for the Study of Education, Twenty-ninth Yearbook, Part II, Public School Publishing Company, Bloomington, Illinois, 1930, P. 535.

isolated drills. They also learned to work more accurately and more rapidly and their teachers reported that they sustained interest at a higher level of efficiency than did those using isolated drills.

According to Knight¹ there are two major purposes of drill: (1) drill to build a skill and (2) drill to maintain skill. Sheer drill work, either to learn or to maintain knowledge, has little social value in itself, though the solution of the problem requires accurate computation.

As early as 1910, Dewey² stated that drill material is worthwhile only if children understand what they learn.

Schorling and Edmonson³ point out that the more desirable of the newer textbooks differ from those of a generation ago in that they include certain features which rest partly on evidence secured through investigation. Among these features are: (1) A program of drill constructed according to specifications based on experiments in learning; (2) Provisions designed to meet

¹Knight, B. F., "Some Considerations of Method." National Society for the Study of Education, Twenty-ninth Yearbook, Part II, Public School Publishing Company, Bloomington, Illinois, 1930, P. 224.

²Dewey, John, How we Think, D. C. Heath and Company, New York, 1910, P. 224.

³Schorling, Ralph and Edmonson, J. B., "The Techniques of Textbook Authors." National Society for the Study of Education, Thirtieth Yearbook, Part II, Public School Publishing Company, Bloomington, Illinois, 1931, Pp. 44-45.

the problem of individual differences; (3) New-type tests--inventory, diagnostic, and remedial; (4) Certain exercises specially designed to increase the pupil's ability in problem solving; and (5) Efforts to carry out a definite program of motivation.

According to Lide¹ the problem in seventh-grade mathematics over which teachers seemed most concerned was how to interest the children in the practical aspects of mathematics without sacrificing such drill as is necessary for accuracy and facility in the fundamental processes. Lide says that it is necessary to give a considerable number of seventh-grade pupils more than a brief review of the fundamental processes, but he also recognizes that the attainment of practical results that cannot be secured from routinized drill alone is also desirable.

In several of the centers where Lide visited he made an effort to conduct drill in such a way that the course of study did not become too mechanical or tiresome for the pupil. In three of these centers the schedules provided that ten minutes of each period be devoted to drill.

In Boston, drill was connected in many ways with an aim at developing what the junior high school

¹Lide, E. S., "Instructor in Mathematics." United States Department of the Interior, Office of Education, Bulletin number 17, Monograph number 23, 1932, Pp. 30-32.

teachers called "mathematical sense". Where possible, they attempted to have the pupils take a common-sense view of the application of mathematics to practical situations--a need emphasized by many writers as outlined above.

In constructing the course for junior high school mathematics at the University of Chicago High School, Breslich¹ found that pupil efficiency could be secured best through seemingly incidental reviews in practical situations. In consequence, much that had been done in the arithmetic classes previously was omitted.

According to the Louisville Course of Study,² drill is tremendously important, though "a good drill-master is not necessarily a good teacher".

In terms of the Indianapolis Course of study³, "An important feature of the course is provision for frequent reviews and systematic drill in the fundamental operations at regular intervals throughout the course. By centering attention upon relatively few out-

¹Breslich, E. R., "Reconstruction in Secondary School Mathematics", Ph. D. Thesis (Unpublished), University of Chicago, 1926.

²Louisville Public Schools. Mathematics--Tentative Course of Study for Junior High Schools, Grades VII and VIII, Louisville, Kentucky, 1933.

³Indianapolis Public Schools. Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934.

comes, and making adequate provision for effective motivated drill, a high degree of mastery should be achieved.

- XIX. The modern seventh-grade arithmetic textbook should have inventory tests to determine what the child knows about the subject to be studied.¹

All the courses of study examined and the articles dealing with testing emphasize the need for inventory tests.

- XX. The modern seventh-grade arithmetic textbook should provide inventory testing as a means of determining the child's difficulties.¹

Practically all the literature examined stressed the importance of diagnostic testing in arithmetic. If an arithmetic textbook is to be in step with modern educational thought it must provide a diagnostic testing program that will be readily available to the teacher and that will impress the child with his difficulties.

- XXI. The modern seventh-grade arithmetic textbook should provide remedial tests for particular drill on the difficulties discovered by the diagnostic tests.¹

Since remedial work is so potently important

¹Greene, C. E. and Buswell, G. T., "Testing, Diagnosis and Remedial Work in Arithmetic", National Society for the Study of Education, Twenty-ninth Yearbook, Public School Publishing Company, Bloomington, Illinois, Part II, 1930, Pp. 269-276.

and since teachers cannot be expected to be acquainted with remedial procedures not supplied in textbooks, it is evident that the textbooks themselves should provide the tests for this purpose. If remedial testing is left for the teacher to outline or if remedial tests must be purchased separately from the textbook, it is quite certain that the needed remedial work will not be done.

XXII. Tests provided by the modern seventh-grade arithmetic textbook should be of both types:¹ "The short-answer objective test which covers a larger range, and the type of question calling for sustained application."

While it is apparent that the short-answer objective examination is here to stay, there is an increasing dissatisfaction with it as the sole measuring device. This is most apparent in the writings of teachers and in the courses of study examined. Evidently, the modern true-false, multiple-choice, and completion tests do not test all that teaching experience indicates is accomplished in the learning process. Modern thought requires that the text provide adequately for testing by both methods.

¹University of the State of New York. A Tentative Syllabus in Junior High School Mathematics. The University of the State of New York Press, Albany, New York, 1928 (Foreword).

XXIII. The modern seventh-grade arithmetic textbook should provide for individual differences.¹

The recognition of individual differences is one of the outstanding achievements of modern times. It is now clearly understood that children differ in ability and that equal amounts of instruction cannot result in identical products. Through a combination of several criteria--achievement tests, previous school records, teacher's opinions, and such, it is possible to classify children according to their various abilities in a way that is distinctly modern. To cite the literature in this field would be impossible in a limited space; to cite that reviewed in this study would almost mean giving the entire list of references contained in the bibliography.

To determine how children should be taught after they have been classified is one of the major problems of textbook writers. Some writers have adopted various plans by which they hope to increase the teacher's skill with children who differ markedly in ability. Practically all writers have provided some practice tests of graded difficulty. These tests aim at giving each child an opportunity to make his best individual progress.

¹Betz, William, "Mathematics in Modern Education", The National Council of Teachers of Mathematics, Eleventh Yearbook, Bureau of Publications, Teachers' College, New York, 1936, Pp. 93.

Some authors provide several lists of miscellaneous review problems at the end of a topic whose difficulties have been determined experimentally. There may be a list of problems designated as "Easy", another list for the average pupils and a third list for the superior students.

The San Francisco Course of Study¹ makes detailed provisions for slow-moving groups, marking those portions of the work which may be omitted by these groups. They place major emphasis on the, necessarily, ever-changing nature of the curriculum.

The provisions made for individual differences reflect, perhaps, more than any other provision, the carefulness given to course-of-study construction. There should be specific material included for the purpose of the laboratory-plan of instruction. The ultimate aim should be for a variety of activities, many of which have been tested carefully, and which will aid in the attainments of specific learning such as factual knowledge, habits and attitudes. Relative to this subject, the Indianapolis Course of Study² says:

¹San Francisco Public Schools. Mathematics, Junior High School, Grades VII, VIII, and IX, Curriculum Bulletin number 108, Board of Education, San Francisco, 1927.

²Indianapolis Public Schools: Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934. (Foreword).

"Since the lengthened class period is used in the seventh and eighth grades, practically all of the work is done under the immediate supervision of the teacher. This enables the teacher to spend at least half of the class period in supervised study and affords an opportunity for her to help those pupils who encounter difficulties. Since the emphasis is largely upon the application of fundamental skills to new situations, it is relatively easy to adapt the work to the ability and experience of the individual pupil. The slower pupil can be given problems involving the more elementary applications, while the stronger pupil can be assigned more difficult exercises. The work in the classroom involves both group and individual activity. In developing an understanding of the social background for the mathematical operations, for example, the class should work largely as a group. In acquiring mathematical skills the work should be individualized to a large extent.

- XXIV. The modern seventh grade arithmetic textbook should be organized on a "Unit plan."¹

The courses of study available and most of the educational literature reviewed mention or emphasize the desirability of the unit plan of organization.

¹Indianapolis Public Schools: Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934. (Foreword).

The courses of study outline their work in "Units". According to the Indianapolis Course of Study there are several advantages to such organization. They say:¹

"The materials in the seventh and eighth grades have been organized around such topics as taxes, selling, lines and angles, and plane and solid figures. Simple application of the formula and simple algebraic equations are introduced in appropriate connections.

"The materials in the seventh and eighth grades have been divided into fall and spring semesters in order that "A" and "B" pupils in each grade may be combined when necessary for instructional purposes. In order that this arrangement will not handicap the pupils who take the spring semester prior to the fall semester the materials have been organized so that the work in one semester is not essentially a foundation for the work of the other semester in the same grade. Since the "A" and "B" pupils will not have the same background it is vital that the drill materials which are introduced to maintain the skills acquired in the previous semesters be planned separately for the two groups, - each according to the background of the particular group."

That the unit plan of organization is a product of modern educational thought is further indicated by

¹Indianapolis Public Schools: Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934. (Foreword)

the emphasis given it in educational courses in the universities. The writer of textbooks of today should take these ideas into consideration in preparing a textbook for today.

- XXV. The modern seventh-grade arithmetic textbook should have its subject matter integrated with other subject-matter and with vocational fields.¹

According to the Oakland Course of Study the major objective of mathematics is integration with life activities. They say that the course, and of course the textbook, should: "(1) Have immediate value rather than aim at preparation for more advanced courses; (2) Be logical mathematically and at the same time consider the social needs of the child; (3) Include: The elements of simple arithmetic, intuitive geometry, algebra, statistics, and numerical trigonometry; (4) Be unified; (5) Result in accuracy; (6) Have social utility." The detail in which they outline the content of the seventh-grade arithmetic course should be a marked help to the teacher, should aid materially in selecting textbooks for this course in the Oakland schools and should be of distinct aid to an author writing a book he hoped to sell to the Oakland system.

¹Oakland Public Schools. Mathematics for Junior High Schools. Superintendent's Bulletin, Course of Study Series number 103. Board of Education, Oakland, California, March, 1927. (Foreword)

According to the Louisville Course of Study,¹ integration must be satisfactory. Unfortunately, there is little of a definite nature to show how this is to be accomplished. They quote from the national Committee of Mathematics Requirements (Reorganization of mathematics in Secondary Education, Chapter II, P. 13) that, "The primary purpose of the teaching of mathematics should be to develop those powers of understanding and of analyzing relations of quantity and space which are necessary to an insight into the control over our environment---."

Even a cursory examination of modern educational literature shows that a great deal of importance is attached to the integrating of subject matter of one course with that of others and of relating the whole to the vocational aspects of adult life. That this is very inadequately done in the modern seventh-grade arithmetic textbook will be shown in Chapter IV.

XXVI. The modern seventh-grade arithmetic textbook should have proper balance between adult- and child interests.²

While there is no specific reference in the literature as to just what percent of the work in the

¹Louisville Public Schools. Mathematics--tentative Course of study for Junior High Schools, Grades VII and VIII. Board of Education, Louisville, Kentucky, 1933.

²Buckingham, B. R., "The Social Value of Arithmetic", National Society for the Study of Education, Twenty-ninth Yearbook, Public School Publishing Company, Bloomington, Illinois, Part II, 1930, Pp. 95-96.

course should center about child interests as opposed to adult interests, it is mentioned, rather incidentally, that neither must be emphasized to the exclusion of the other. At the same time that the author motivates pupils through appeals to the activities with which they are intimately acquainted as children, he should acquaint them with and prepare them for adult activities. It might be reasonable to place a good portion of the responsibility of acquainting the child with vocations which he might consider following upon the writers of the textbooks he studies. Some of the confusion in choosing vocations and the lack of information about vocations of today results from failure of textbooks to meet this requirement.

XXVII. The modern seventh-grade arithmetic textbook should:

(1) Review the Fundamentals; (2) Introduce the Algebraic Formula; and (3) Give more attention to Intuitive Geometry Than is Customary.¹

The courses of study examined are in complete agreement on these points though they do not agree in total as to how much review should be given, when algebra should be introduced, or how much time should be devoted to intuitive geometry. A somewhat typical time allotment is given in the Indianapolis

¹Indianapolis Public Schools: Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934. (Foreword)

Course of Study.¹ It follows:

SEVENTH GRADE - FALL SEMESTER

Unit I-----Literal Numbers, The Formula,
and the Equation.....4 Weeks

Unit II----Buying and Selling

Subunit A-----Percentage.....4 Weeks

Subunit B-----Trade Discount.....2 Weeks

Subunit C-----Commission.....4 Weeks

Subunit D-----Gain and Loss.....2 Weeks

Review.....2 Weeks

SEVENTH GRADE - SPRING SEMESTER

Unit I-----Lines and Angles.....5 Weeks

Unit II----Plane Figures

Subunit A-----Quadrilaterals.....2 Weeks

Subunit B-----Triangles.....2 Weeks

Unit III---Statistics and Graphs.....3 Weeks

Unit IV----Household Practices

Subunit A-----Budgets.....2 Weeks

Subunit B-----Arithmetic of the Home.....2 Weeks

Review.....2 Weeks

XXVIII. Mechanically, the modern seventh-grade arithmetic textbook should:

1. Have an attractive and durable binding.
2. Have paper of appropriate quality and weight.²
3. Have ten or eleven point type.²
4. Have lines about 80 millimeters in length.²

¹Indianapolis Public Schools: Course of Study in Mathematics for the Junior High School Division of the Secondary Schools, Grades 7-8-9. Board of School Commissioners, Indianapolis, Indiana, 1934. (Foreword)

²Linker, M. A. and Paterson, D. G., "Studies in Typographical Factors Influencing Speed of Reading." Jr. of Applied Psychology. Volume XIII, Number 3, June, 1929, P. 212.

5. Have pages that are now crowded.
6. Have attractive illustrations.
7. Have illustrations that help pupils visualize life interest of problems.
8. Provide a protractor with the book.

Generally speaking, the mechanical features of modern textbooks are superior to their educational and psychological aspects. Textbook publishers have been more alert regarding mechanical aspects than any other feature of their books. Then, the criteria of sound mechanical construction are fairly definite while educational and psychological criteria, even though available, are hard to apply. For the most part, the educational literature merely mentions the aspects of satisfactory mechanical construction. It is almost taken without proof that the size of type should be about ten point (two millimeters high), that there should be a good deal of space between letters, words, and lines, that the lines should be in the neighborhood of eighty millimeters in length, that the paper should have a dull finish.¹

While it costs less to stitch a book than to sew it,² and the stitched book is more durable, many

¹Luckiesh, M. and Moss, F. K., Seeing, A Partnership of Lighting and Vision. Williams and Wilkins Company, Baltimore, 1931, Chapter XII.

²Fuller, Florence, Scientific Evaluation of Textbooks. Houghton Mifflin Company, Boston, 1928, P. 49.

books are sewed because they present a slightly better appearance and open more easily. The stitched book is recommended, however, because of its greater durability.

It is generally agreed that the color of a textbook should be dark, though this is not as important now as formerly due to the development of washable covers.

According to Lide¹ there is an increasing carefulness in the mechanical make-up of course outlines as a means of making them more attractive and usable. He says that outlines should be made attractive as well as forceful through the use of mechanical aids, and should provide space in which the teacher's criticisms may be recorded. The modern seventh-grade arithmetic textbook should observe the same principles.

XXIX. Summary:

Draper and Roberts² say, in substance, relative to the selection of textbooks:

By whom was the book written? What is his philosophy and experimental work done in preparation for writing such a book?

By whom has the book been published? Many of our book companies have become specialists in certain

¹Lide, E. S., "Instructor in Mathematics." United States Department of the Interior, Office of Education, Bulletin number 17, Monograph number 23, 1932, Pp. 17-18.

²Draper, E. M. and Roberts, J. L., Principles of American Secondary Education. Appleton-Century Company, New York, 1932, p. 387.

fields or at least have made outstanding contributions in publishing textbooks for these fields. They have secured men of national reputation to edit for them in these fields, and for these reasons should receive more than usual consideration.

How nearly does the content of a particular book make possible the realization of the objectives of the course of study which has been worked out in the school? The number of pages devoted to each topic should be listed as the basis for comparison. The number, distribution, and desirability of illustrations should be checked. In similar manner, the drills, tests, and problems should be given careful attention.

Is the general organization of the book such that it will meet the needs of the children of the particular grade, age, and level of ability for which it is being considered? In this connection, the size of type used, the quality of paper, the quality and number of illustrations, the durability of the binding, and the size of the book should be considered.

If the book should be selected, would it be adaptable to all the children of a particular age and grade, or suited only to the needs of certain ability levels?

¹
 Jacobs lists features outlined by Draper and Roberts and supplements them somewhat as follows:

(1) Does the author's point of view best serve the present needs? (2) Does the subject matter of the textbook conform with both progressive educational theory and local educational aims? (3) Does the textbook appeal to the interests of children? Is it interesting, engaging, appealing, and does it make provision for individual differences while building good study habits? (4) Does it save the teacher's time by careful planning, abundance of material, simple but effective tools for learning and convenient "units"?

The organization of subject matter should be considered carefully. The author may have approached the material from the standpoint of logical development of subject matter but with little thought about the learner. The only way to determine the suitability of a textbook from the standpoint of organization is to make a careful and complete analysis of the content in the light of the students who will study the text.

Analytical summary of the literature shows that the modern seventh-grade arithmetic textbook should:

1. Have a sound philosophical background relative to the functions of arithmetic.

¹Jacobs, L. B., "Eighteen Criteria for Choosing New textbooks." The Clearing House, Volume 11, Number 8, April 1937, Pp. 485-486.

2. Provide a sound system of character and citizenship training.
3. Be understandable to seventh-grade children--have a vocabulary of suitable difficulty.
4. Have brief, simple, and unified sentences and paragraphs.
5. Define new terms in context as they are introduced.
6. Provide motivation through data related to the child's experience.
7. Address explanations to the child rather than to the teacher.
8. Provide illustrations that visualize life situations for the child.
9. Provide games and contests to break the monotony.
10. Provide adequate opportunity for practice in problem solving.
11. Give a good deal of attention to the mathematics of thrift and investment for every day use--banking, interest, savings, discount, budgets, etc.
12. Provide concrete problems which require actual measurements to be made, estimates given, etc.
13. Instruct the pupil for immediate and future use of graphs and formulas, enable him to interpret them intelligently in his reading of newspapers, magazines, and other current literature.

14. Provide a great number of reasoning problems involving life situations.
15. Have drills that will iron out difficulties and make correct methods mechanical.
16. Have drills distributed in diminishing amounts and at more frequent intervals.
17. Provide for drill, in amount, proportionate to the difficulty of operation.
18. Use "mixed" rather than "isolated" drills.
19. Have inventory tests to determine what the child knows about the subject to be studied.
20. Provide diagnostic tests as a means of determining the child's difficulties.
21. Provide remedial tests for particular drill on the difficulties discovered by diagnostic testing.
22. Provide tests of both the short-answer objective type which cover a larger range, and the type calling for sustained application.
23. Provide for individual differences.
24. Be organized on a "Unit" plan.
25. Integrate its subject matter with that of other courses and with vocational fields.
26. Have a proper balance between adult- and child-interests.
27. (a) Review the fundamentals; (b) Introduce the algebraic formula; and (c) Give more attention

to intuitive geometry than is customary.

28. (a) Have an attractive and durable binding;
- (b) Have paper of appropriate quality and weight;
- (c) Have ten or eleven point type;
- (d) Have lines about eighty millimeters in length;
- (e) Have uncrowded pages;
- (f) Have attractive illustrations;
- (g) Have illustrations that visualize the life-interest of problems; and
- (h) Provide a protractor with the book.

That these features should characterize the modern seventh-grade arithmetic textbook is adequately shown by modern educational and psychological literature; the extent to which these requirements are met by modern textbooks of arithmetic at this level is shown in Chapter IV.

CHAPTER IV

ANALYSES OF SIX MODERN SEVENTH-GRADE ARITHMETIC TEXTBOOKS

Introduction:

In order to determine how adequately the modern seventh-grade arithmetic textbook meets the requirements of modern educational thought as to what a seventh-grade arithmetic textbook should be like, detailed analyses were made of the six such books listed in the Cumulative Index of Periodic Literature for the years 1934 and 1935. The textbooks, listed in the order in which they are discussed throughout the study, are:

1. Edgerton, E. I. and Carpenter, P. A., The New Mathematics. Benjamin H. Sanborn and Co., Chicago, 1935.
2. Brueckner, L. J., Anderson, C. J., Banting, G. O., and Merton, E. L., The New Triangle Arithmetics. John C. Winston Co., Chicago, 1935.
3. Stone, J. C., Mills, C. N., and Mallory, V. S., Unit Mastery Mathematics. Benjamin H. Sanborn and Co., Chicago, 1935.
4. Thompson, C. O., Elements of Practical Arithmetic. Prentice-Hall, Inc., New York, 1935.
5. Schorling, R., Clark, J. R., and Smith, R. R., Modern School Mathematics. World Book Co., Yonkers-on Hudson, New York, 1935.

6. Strayer, G. D. and Upton G. B., Practical Arithmetic.
American Book Co., Chicago, 1934.

Reasons for limiting the books analyzed to those listed above are given in Chapter I of this study.

The six textbooks were given critical examination by the writer individually on each of the features listed in Chapter III as requisite to the modern seventh-grade arithmetic textbook. On all of the criteria which seemed to admit of such procedures, or where the judgments of more than one person would improve the value of ratings, the six textbooks were rated in order of merit by five teachers of seventh-grade arithmetic in the Louisville Public Schools. The "rators" worked independently, using the detailed instructions given in Appendix C. A three-point scale of merit (Above Average, Average, Below Average) was used because the consensus of opinion of the five judges and of several other experienced teachers was that three degrees of merit were about all that could be kept in mind and that three orders of merit constituted as fine distinctions as could be made with adequate accuracy. The validity of these ratings is discussed in Chapter I; that they are reliable is evidenced by the very close agreement between the ratings of the five judges as given in Table 29.

Analyses are given under the headings, I to

XXVIII, inclusive, given in Chapter III. Data are presented in tables and summaries, and specific indication is given as to whether the judgments are opinions of the writer, individual judgments of the five "rators", or combined judgments of the five "rators".

I. Philosophical background of six modern seventh-grade arithmetic textbooks:

In the opinion of the writer, an adequate analysis of the general philosophical backgrounds of these six textbooks is impossible. While the Preface or Introduction of each gives a short treatise on the place of arithmetic in the curriculum, what it is hoped the child will learn in the course, etc., these discussions are addressed to the teacher rather than to the pupil, perhaps justifiably so, and are too incomplete for analysis.

Some indication of the philosophical background of the books may be had from a knowledge of the backgrounds of their respective authors. Unfortunately, the training, experience, and educational philosophies of the authors are not available in connection with the textbooks in such a manner as to make proper examination of these possible. On the basis of academic position, the authors of Book II should form a better balance of educational philosophy and actual contact with practical school situations. The authors are, respectively:

Professor of Elementary Education, Dean of a School of Education, Superintendent of Schools, and Elementary Supervisor. The positions held by the authors of the six books are given below. If the academic position of an author is representative of more than one field he is tabulated under each. The total number of authors and of fields represented is also given.

<u>Fields of Authors</u>	<u>Books</u>					
	I	II	III	IV	V	VI
Dean of Education		1				
Professor of Education		1			1	1
Professor of Mathematics		1	3			1
Superintendent of Schools						
High School Principal				1		
Supervisor		1		1		
High School Mathematics					1	
High School, Unclassified	2					
Public School Mathematics					1	
Public School, Unclassified					1	
Number of Authors	2	4	3	1	3	2
Number of Fields	1	4	1	2	4	2

That the authors of several of the textbooks examined are eminently qualified, from the standpoint of educational training may be implied from their reputations in the field of modern education. That other authors, not so eminent in modern education are any less

qualified in this respect, is not demonstratable, however. There is, of course, some justification for giving the eminence of textbook authors weight in evaluating their products. It is not to be supposed, however, that an eminently qualified author will invariably produce an excellent textbook. A more adequate method is to examine the textbook itself to determine whether the principles of modern educational philosophy have been followed. This is done in succeeding sections of this chapter.

II. Provisions for character and citizenship training in the six modern seventh-grade arithmetic textbooks.

So far as the writer is able to determine from careful examination of the six textbooks there is no conscious effort to develop the characteristics of good character and citizenship--Industry, Cooperative-ness, Courtesy, Honesty, Dependability, Initiative, Self-Control, Moral Courage, Loyalty, Reverence, Tolerance, Aesthetic Appreciation, Optimism. If these are to result from the teaching of arithmetic where these textbooks are used, they must come from the teacher and not from the textbook. In view of the crying need for training in character and citizenship this is most unfortunate. Considering the findings of Hartshorne and May¹

¹Hartshorne, Hugh and May, M. A., "Studies in Deceit", Studies in the Nature of Character, Book I. The Macmillan Company, New York, 1931.

that character traits are pretty much specific to situations, efforts should be made for training in honest calculations and to provide methods for determining whether the child was honest in those situations.

III. The vocabulary of six modern seventh-grade arithmetic textbooks.

In analyzing the vocabularies of the six arithmetic textbooks the writer chose selections from each totalling about 300 words in length. (Appendix A) A term was counted as a word whether it had one, two or ten letters in it, the length of the word not being taken into consideration.

The selections included materials on percentage, interest, bank discount, budgets, and banking. These topics were used in order to secure selections which would be free from problems and computations and which would be about the same subjects for all the textbooks. These discussions, of necessity, were widely scattered throughout the book and, in the opinion of the writer and four other seventh-grade teachers of arithmetic, constitute representative samples of the vocabularies of the books.

The selections were limited to 300 words in length in order to avoid the use of numbers as far as possible and to secure comparable materials from the various books. The judges were the same teachers as

those who made the other ratings used in the study. They were in complete agreement as to the representativeness of the selections used, since all items on which they were not completely agreed as to representativity were excluded from the study.

Classification of the words according to Professor Thorndike's¹ ratings as to frequency of usage is given in Table I. The frequency-of-usage groupings are given in the stub. The books (I to VI, inclusive) are given in the caption. The number of words falling in each grouping is given, together with the percentage that these are of the total number of words in the selection. The line between the 7001-8000 and 8001-9000 groups is drawn to emphasize the total number of words in the vocabulary of the average seventh-grade child at age thirteen years--about 8000 words according to Terman². This is an approximation of the difficulty beyond which much of the vocabulary of seventh-grade textbooks should not go, considering the relationship between language mastery and frequency of usage.

¹Thorndike, E. L., The Teacher's Word Book. Teachers College, Columbia University, New York, 1923.

²Terman, L. M., The Measurement of Intelligence. Houghton Mifflin Company, Boston, 1916, P. 226.

TABLE I

WORDS FROM REPRESENTATIVE SELECTIONS OF SIX
SEVENTH-GRADE ARITHMETIC TEXTBOOKS CLASSIFIED
ACCORDING TO FREQUENCY OF USAGE

(numbers of words and percents that these are
of total words in selections, Thorndike's
Classification)

[illegible]

Whether the vocabularies of the six textbooks were "readable and comprehensible by seventh-grade children", the three judges rated them as follows:

RATINGS AS TO SUITABILITY OF VOCABULARY OF SIX
SEVENTH-GRADE ARITHMETIC TEXTBOOKS

(1 = Superior, 2 = Average, 3 = Inferior)

	Books					
	I	II	III	IV	V	VI
Judge A	3	1	3	3	2	2
Judge B	2	2	2	3	2	1
Judge C	2	1	1	3	3	1
Judge D	2	1	2	3	2	1
Judge E	2	1	2	3	2	2
Average	2.2	1.2	2.0	3.0	2.2	1.4
Rank	4½	1	3	6	4½	2

It should be noted that the ratings of the judges as to suitability of vocabulary agree very well with the vocabulary classifications in terms of frequency of usage (Table I) and with the average lengths of sentences in representative selections from the books. (Table II) In the opinion of the "rators", those of the six books which have shorter sentences and are more heavily loaded with frequently used words are more suitable to the needs of seventh-grade children. It should be noted further that there is a close relation between implied philosophical background of the

author (Section I of this chapter) and the measures of vocabulary and sentence suitability.

IV. The sentence and phrase construction of six modern seventh-grade arithmetic textbooks.

As far as the writer could determine, the sentences and paragraphs of the six books are equally unified. There are marked differences between them as regards average length of sentences and of phrases, however. While length of sentence has certain weaknesses as a measure of difficulty, it is generally agreed and has been shown in Chapter III that children learn more readily from compositions made up of short sentences and phrases. This is, of course, in keeping with findings in the field of child development, that the length of idea that a child can retain is determined, very largely, by his mental development.

In determining the lengths of sentences for the selections from the six books five letters counted as one word. The averages of sentence-length for the six books are given in Table II, together with the standard deviations, standard deviations of the means, and probable errors of the means.

TABLE II

COMPARISON OF SENTENCE LENGTH IN REPRESENTATIVE
SELECTIONS FROM SIX SEVENTH-GRADE ARITHMETIC
TEXTBOOKS

Book	Mean	S. D.	S. D. _M	P. E. _M
I	15.9	6.7	1.5	1.0
II	14.8	6.6	1.4	.9
III	15.6	6.4	1.4	.9
IV	24.3	9.4	2.5	1.7
V	16.3	8.8	2.0	1.4
VI	18.4	7.9	1.8	1.2

The question naturally arises as to the significance of these differences in average sentence length. That they may be accepted, along with other factors, as evidences of differences in difficulty has already been shown in Chapter III. The statistical significance of the differences between means is shown in Table III. The differences between successive mean sentence lengths are given at the left of the table. The means themselves are given in parentheses to make clear how the differences are obtained. The probable errors of the differences between means were calculated from the regular formula:¹

$$PE_{A-B} = \sqrt{PE_A^2 + PE_B^2 - 2PE_A PE_B r_{AB}}$$

where PE refers to probable error of the mean, A and B to successive means and r_{AB} to the correlation between

¹Dunlap, J. W. and Kurtz, A. L., Handbook of Statistical Nomographs, Tables and Formulas. World Book Company, Yonkers-on-Hudson, 1932, Formulas 154 and 5B.

means. Since the means are uncorrelated, the third term under the radical is, of course, zero. The probable errors of the means were calculated from the regular formula:¹

$$PE_M = PE_X / \sqrt{N}$$

where PE_X refers to the probable error of the distribution and N to the number of cases, in this instance the number of sentences in a selection. Probable errors of means were used since the differences to be interpreted are between means.

TABLE III

STATISTICAL SIGNIFICANCE OF DIFFERENCES BETWEEN
MEAN SENTENCE LENGTHS OF REPRESENTATIVE SELECTIONS
FROM SIX SEVENTH-GRADE ARITHMETIC TEXTBOOKS

(The successive subtractions of means are given in the stub, the means themselves being given in parentheses. The differences between means are given in the second column, the probable errors of these differences in the third column and the resulting quotients in the fourth column. Whether the difference is significant is indicated by "Yes" or "No" in the last column.)

Subtractions	d	PE_d	d/PE_d	Significant
$M_1 - M_2$ (15.9-14.8)	1.1	1.4	.78	No
$M_1 - M_3$ (15.9-15.6)	.3	1.4	.21	No
$M_1 - M_4$ (15.9-24.3)	-8.4	2.0	-4.20	Yes
$M_1 - M_5$ (15.9-16.3)	-.4	1.7	-.23	No
$M_1 - M_6$ (15.9-18.4)	-2.5	1.6	-1.56	No
$M_2 - M_3$ (14.8-15.6)	-.8	1.3	-.61	No
$M_2 - M_4$ (14.8-24.3)	-9.5	1.9	-5.00	Yes

Subtractions	d	PE _d	d/PE _d	Significant
M ₂ - M ₅ (14.8-16.3)	-1.5	1.6	-.94	No
M ₂ - M ₆ (14.8-18.4)	-3.6	1.5	-2.40	No
M ₃ - M ₄ (15.6-24.3)	-8.7	1.9	-4.58	Yes
M ₃ - M ₅ (15.6-16.3)	-.8	1.6	-.50	No
M ₃ - M ₆ (15.6-18.4)	-2.8	1.5	-1.86	No
M ₄ - M ₅ (24.3-16.3)	8.0	2.2	3.63	No
M ₄ - M ₆ (24.3-18.4)	5.9	2.1	2.80	No
M ₅ - M ₆ (16.3-18.4)	-2.1	1.8	-1.16	No

In reading Table III note that the mean sentence lengths for the selections from the six books are: 15.9, 14.8, 15.6, 24.3, 16.3, and 18.4. The data for Book I may be read and interpreted as follows:

In length of sentences it averages 1.1 words longer than Book II, .3 words longer than book III, 8.4 words shorter than Book IV, .4 words shorter than Book V, and 2.5 words shorter than Book VI. The probable errors of these mean differences as shown by Table III are 1.4, 1.4, 2.0, 1.7, and 1.6. Division of the differences by their respective probable errors are as shown in the third row: .78, .21, -4.20, -.23, -1.56. Since it is generally agreed that a difference must be at least four times as large as its probable error to be significant, we may say that Book IV is the only one having sentences of significantly different length from those of Book I.

V. How adequately the six seventh-grade arithmetic text-books define new words in context as they are introduced.

The opinions of the three judges on this point are shown by their ratings given below:

RATINGS OF SIX SEVENTH-GRADE ARITHMETIC TEXT-BOOKS ON DEFINING OF NEW TERMS IN CONTEXT

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	3	1	3	3	2	2
Judge B	2	2	1	3	1	1
Judge C	1	1	2	3	1	1
Judge D	2	2	3	2	2	2
Judge E	2	1	2	2	2	2
Average	2.0	1.4	2.2	2.6	1.6	1.6
Rank	4	1	5	6	2½	2½

In the opinion of the writer, none of the books is satisfactory in this respect. They do not adhere strictly to modern educational opinion that new words should be defined as introduced, saving the child a great deal of effort and discouragement and obviating, very largely, the use of the dictionary. It will be noted, of course, that Book IV is definitely inferior.

VI. Motivation through relating data to the child's experience.

In examining for motivating provisions through appeal to interest, Child Interest Problems were defined as those dealing with objects or information of primary interest to children as:

"With a yardstick, measure the length and width of your mathematics room. Find the number of square feet to which each member of your class is entitled."

Adult Interest Problems were defined as those of primary interest to adults, as:

"Mrs. Hill bought a vacuum cleaner having a 250 watt motor. She used it on an average of ten hours a month. If she paid 8¢ per K.W.H. for electricity, how much did it cost her to run it for a month?"

Borderline Interest Problems were defined as those holding interest for both adults and children, as:

"Lindbergh made the first record solo flight across the Atlantic. He flew 3600 miles in 33½ hours. He averaged how many miles per hour?"

The judges rated the six books relative to provision for motivation through appeal to child interests. Their ratings are given below. Undoubtedly they considered factors other than the number or percent of problems devoted primarily to child interests since their ratings are not in complete agreement with the tabulations made by the writer as to what percent of the reasoning problems of the six books were devoted to adult interests, child interests, and borderline interests.

**RATINGS OF SIX SEVENTH-GRADE ARITHMETIC TEXT-
BOOKS ON PROVISIONS FOR MOTIVATION THROUGH
APPEAL TO INTERESTS**

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	3	1	2	3	2	2
Judge B	2	1	2	3	1	2
Judge C	2	1	1	2	2	1
Judge D	2	1	3	3	2	1
Judge E	2	1	3	3	2	1
Average	2.2	1.0	2.2	2.8	1.8	1.4
Rank	5	1	4	6	3	2

**PERCENT OF REASONING PROBLEMS IN SIX SEVENTH-
GRADE ARITHMETIC TEXTBOOKS APPEALING TO CHILD-
ADULT-, AND BORDERLINE-INTERESTS**

(Judgments of the writer)

Book	I	II	III	IV	V	VI
No. Verbal Problems	1514	1272	945	1049	1643	932
% Child-Interest	26.6	51.3	38.7	29.1	38.2	39.4
% Adult-Interest	23.2	13.8	23.2	12.2	20.7	31.2
% Borderline-Interests	50.2	34.9	38.1	58.7	41.1	29.4
Rank	5	1	3	6	4	2

It will be noted that the rankings of the texts from the two sets of data above are very close. As in most of the measures employed in this chapter, Book II is rated best and Book IV poorest of the six examined.

VII. How satisfactorily the six seventh-grade arithmetic textbooks address explanations to pupils instead of teachers.

As regards this particular feature, the judges rated the books as follows:

RATINGS ON ADDRESSING EXPLANATIONS TO PUPILS
RATHER THAN TO THE TEACHERS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	3	2	2	3	2	1
Judge B	2	1	1	3	2	1
Judge C	1	1	2	3	1	1
Judge D	2	1	3	3	1	1
Judge E	2	2	3	3	2	1
Average	2.0	1.4	2.2	3.0	1.6	1.0
Rank	4	2	5	6	3	1

VIII. Adequacy with which illustrations visualize life situations for the child.

The ratings of the judges follow:

RATINGS ON ADEQUACY WITH WHICH ILLUSTRATIONS
VISUALIZE LIFE SITUATIONS FOR THE CHILD

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	3	2	2	3	2	1
Judge B	3	1	1	2	1	2
Judge C	3	2	1	2	1	3
Judge D	2	1	2	3	1	1
Judge E	1	1	2	3	2	1
Average	2.4	1.4	1.6	2.6	1.4	1.6
Rank	5	1½	3½	6	1½	3½

Book I has forty-one pictures and illustrations, not one of which, in the opinion of the writer, would help a child to visualize a life situation. Book II, on the other hand has thirty-two pictures and illustrations, many of which are pertinent to situations the child encounters in daily life. Among the best of these are:

1. An inspector testing the accuracy of a grocer's scales.
2. A picture illustrating the annual fire loss in various communities.
3. An excellent diagram of a plumb-line.
4. A chart showing how we dispose of our corn crop.

IX. Adequacy with which six seventh-grade arithmetic textbooks provide games and contests.

The ratings of the judges on this point follow:

RATINGS ON ADEQUACY WITH WHICH SIX SEVENTH-GRADE ARITHMETIC TEXTBOOKS PROVIDE GAMES AND CONTESTS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	2	3	3	3	2	3
Judge B	1	3	3	3	2	3
Judge C	2	3	3	3	2	3
Judge D	3	2	3	3	3	2
Judge E	2	2	3	3	3	2
Average	2.0	2.6	3.0	3.0	2.2	2.6
Rank	1	3½	5½	5½	2	3½

None of the books is satisfactory in this respect. They overlook almost entirely the possibilities of stimulating the child through competitive games and contests. While there are some provisions for interest through puzzles in Books I and V, these, at best, are weak attempts at conformity with modern educational thought.

X. Provisions for problem solving in the six seventh-grade arithmetic textbooks.

In the opinion of the judges, all the textbooks were satisfactory and superior in their provisions for problem solving. The judges are in total agreement that the books provide adequate opportunity, and they were unable to differentiate between the books in this respect. There was not this agreement or satisfaction relative to the nature of the problems, however, as is shown in the next section.

XI. Extent to which the six seventh-grade arithmetic textbooks give attention to the mathematics of thrift and investment for every day use.

The ratings of the judges on this point follow:

RATINGS AS TO PROVISION FOR MATHEMATICS OF THRIFT
AND INVESTMENT

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	3	1	3	3	2	2
Judge B	2	1	2	2	1	1
Judge C	2	1	2	1	1	1
Judge D	3	1	2	3	2	1

Judge E	2	1	2	2	2	1
Average	2.4	1.0	2.2	2.2	1.6	1.2
Rank	6	1	4½	4½	3	2

Since a large portion of all the textbooks examined is made up of problems, it is interesting here to note the percentage of each devoted to various topics. The writer went through each book carefully marking each problem, discussion, and example as to the field of arithmetic it dealt with. These were tabulated and are presented below.

PERCENT OF SPACE DEVOTED TO VARIOUS SUBJECTS
BY THE SIX SEVENTH-GRADE ARITHMETIC TEXTBOOKS

Book	I	II	III	IV	V	VI
Total No. Pages in Book	448	280	314	382	364	258
	%	%	%	%	%	%
Banking and Investments	6.8	7.7	9.6	9.5	6.9	15.6
Percentage	9.2	3.2	9.4	5.4	5.0	21.1
Stocks and Bonds				4.8		
Insurance		.4		3.0		
Mensuration and Construction	3.8	10.9	13.6	5.5	2.3	9.1
Graphs	16.9	6.4	8.4	2.7	6.7	6.6
Budgets	.5	1.3	.6	.7	1.2	2.7
Gas and Electricity	1.2	1.8	3.2	1.9	1.2	3.5
Govt. Land Surveys				.3		
Metric System	1.6					
Taxes				4.3		
Geometry	3.6	4.7	13.6		7.3	7.4
Transportation and Communication						3.9

It is significant that so little space is devoted to such subjects as banking and investments, stocks and bonds, and budgets, considering the importance of these fields of thrift and investment in the lives of American citizens. In consequence we find that the judges consider only one of the books (VI) superior in its treatment of these topics. There is indeed room for improvement in the modern seventh-grade arithmetic in its provisions for thrift and investments.

XII. How the six modern seventh-grade arithmetic textbooks provide concrete problems requiring actual measurements, estimates, etc.

In the opinion of the judges, the books are about average in their providing of concrete problems. It is quite clear that the modern textbooks are not meeting the requirements of modern educational thought in this respect. The ratings follow:

**RATINGS AS TO PROVISION OF CONCRETE PROBLEMS
BY SIX MODERN SEVENTH-GRADE ARITHMETIC TEXTS
(1 = Superior, 2 = Average, 3 = Inferior)**

Book	I	II	III	IV	V	VI
Judge A	3	2	3	3	2	1
Judge B	2	1	2	3	2	1
Judge C	2	1	2	1	2	1
Judge D	2	1	3	3	2	1
Judge E	1	1	3	3	2	1
Average	2.0	1.2	2.6	2.6	2.0	1.0
Rank	3½	2	5½	3½		1

It will be noted that Book VI is rated as superior by all five of the judges. It is outstanding in the procedures by which the child is led to do actual work, measuring, estimating, etc., in solving his problems.

XIII. Provisions for immediate and future use of graphs and formulas in the six modern seventh-grade arithmetic textbooks.

The ratings of the judges on this point follow. It will be noted that Book II is agreed upon as being superior. Books I and IV are rated as definitely inferior.

RATINGS ON PROVISIONS FOR IMMEDIATE AND FUTURE
USE OF GRAPHS AND FORMULAS IN THE SIX TEXTBOOKS
(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	3	1	2	3	3	2
Judge B	2	1	1	2	2	1
Judge C	2	1	1	2	1	1
Judge D	2	1	2	2	2	1
Judge E	2	1	3	3	3	1
Average	2.4	1.0	1.8	2.4	2.2	1.2
Rank	5 $\frac{1}{2}$	1	3	5 $\frac{1}{2}$	4	2

XIV. Provisions of the six seventh-grade arithmetic textbooks for reasoning problems involving life situations.

While there seems to be some overlapping between this desired feature of the modern seventh-grade arithmetic textbook and Number VI above, the literature reviewed in Chapter III, separates the two to the extent that separate analyses seemed advisable. The ratings of the judges on this point follow:

RATINGS AS TO PROVISION OF REASONING PROBLEMS
INVOLVING LIFE SITUATIONS IN THE SIX SEVENTH-
GRADE ARITHMETIC TEXTBOOKS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	3	2	3	3	1	2
Judge B	3	1	3	3	2	1
Judge C	3	1	3	3	1	1
Judge D	2	1	3	3	2	1
Judge E	2	1	3	3	2	1
Average	2.6	1.2	3.0	3.0	1.6	1.2
Rank	4	1 $\frac{1}{2}$	5 $\frac{1}{2}$	5 $\frac{1}{2}$	3	1 $\frac{1}{2}$

The ratings of the judges leave much to be done before textbooks in this field are abreast of modern educational thought regarding problems related to the lives of the children who study the books.

XV. Adequacy of drills as regards amount in the six seventh-grade arithmetic textbooks.

The importance of repetition, or drill, in learning, relearning, and retention, as emphasized in modern educational and psychological literature was

discussed in Chapter III. In order to determine how adequately the six seventh-grade arithmetic textbooks provide drills the writer examined each, tabulating the number of pages devoted to drill under the various subjects. These data are given below:

PAGES DEVOTED TO DRILLS IN THE SIX SEVENTH-GRADE
ARITHMETIC TEXTBOOKS

	I	II	III	IV	V	VI
Total No. Pages in Book	448	280	314	382	364	258
Accounts				3		8
Addition	4	7	18		5	11
Aliquot Parts	3		2		1	
Angles	8	15	7		4	7
Areas	5		12		5	9
Averages					3	6
Banking					2	
Bills		3				
Circles				5		
Construction	5		6		3	11
Decimals	7	28	5	5	12	4
Diameters			3			1
Discounts	5	4	3	9	5	9
Division	5	4		3	5	
Estimating		3			2	
Fractions	14	23	8	7	15	6
Fundamentals		3		4		
Graphs	12	20	6	3	14	14
Interest	3	3	3	5	6	6

Lines					7	1
Metric System					3	
Multiplication	5	5		6		19
Numbers				1	8	7
Percent	7	21	10	3	19	15
Proceeds						2
Ratio					9	
Rectangles						3
Scale Drawings	3					
Subtraction		5	13	5		12
Triangles		5			5	6
Zero Difficulty		2	1			
Total Pages of Drill	86	138	97	59	133	157
Percent of Book Devoted to Drill	19	49	31	15	37	61

The adequacy of these drills is, of course, a matter of opinion until such times as experimental evidence is available covering each of the situations.

The ratings of the judges as to their adequacy follow:

RATINGS AS TO ADEQUACY OF DRILL IN SIX SEVENTH-
GRADE ARITHMETIC TEXTBOOKS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	2	1	3	3	2	1
Judge B	2	1	1	2	2	1
Judge C	2	2	1	1	2	1

Judge D	2	1	3	3	2	1
Judge E	2	1	3	3	2	1
Average	2.0	1.2	2.2	2.4	2.0	1.0
Rank	3½	2	5	6	3½	1

XVI. Distribution of drills in diminishing amounts and at more frequent intervals in the six seventh-grade arithmetic textbooks.

As to how adequately this is done, the judges rated the books as follows:

RATINGS ON DISTRIBUTION OF DRILLS IN THE SIX SEVENTH-GRADE ARITHMETIC TEXTBOOKS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	2	1	3	3	2	1
Judge B	2	2	2	3	2	2
Judge C	2	2	2	3	2	2
Judge D	3	2	3	3	2	2
Judge E	3	2	3	3	2	2
Average	2.4	1.8	2.6	3.0	2.0	1.8
Rank	4	1½	5	6	3	1½

The interesting thing is how little attention is given to drill distribution in most of the textbooks. Book IV is particularly poor in this respect: the drills appear to be put in at intervals and in amounts convenient in the arrangement of the book rather than as related to the learning process.

XVII. Extent to which the amount of drill is proportionate to difficulty of operation in the six textbooks.

The ratings of the judges on this point follow:

**RATINGS ON THE EXTENT TO WHICH DRILL IS PRO-
PORTIONATE TO DIFFICULTY OF OPERATION IN THE
SIX TEXTBOOKS**

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	3	1	3	3	2	1
Judge B	2	2	2	2	2	2
Judge C	2	2	2	3	2	2
Judge D	3	1	3	3	2	1
Judge E	3	1	3	3	2	1
Average	2.6	1.4	2.6	2.8	2.0	1.4
Rank	4½	1½	4½	6	3	1½

XVIII. Use of "mixed" rather than "isolated" drills in the six seventh-grade arithmetic textbooks.

Upon careful analysis the writer concluded that Book VI is the only one making even average use of mixed drills. The percentage of drill materials that were "mixed" as opposed to "isolated" in the six books were: Book I, 25%; Book II, 30.1%; Book III, 0.0%; Book IV, 3.5%; Book V, 0.0%; and Book VI, 38.8%. That the procedures followed in these books is not in keeping with the experimental data in the field has been shown in Chapter III.

The ratings of the judges follow:

RATINGS ON THE USE OF "MIXED" RATHER THAN
"ISOLATED" DRILLS IN SIX ARITHMETIC TEXTBOOKS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	2	2	3	3	3	1
Judge B	3	2	3	3	3	2
Judge C	2	2	3	3	3	2
Judge D	2	2	2	3	3	2
Judge E	2	2	3	3	2	2
Average	2.2	2.0	2.8	3.0	2.8	1.8
Rank	3	2	4½	6	4½	1

XIX. Inventory tests in the six seventh-grade arithmetic textbooks.

The writer examined each of the textbooks to find out how many test situations were devoted to determining what the child knew as an inventory of what he should be taught. While it would have been desirable to know how carefully these tests had been validated, how reliable they were, and exactly what the authors wished to find out, most of these data were not available. A rough classification of the fields covered by the inventory tests and the number of test situations provided in each of the six books is given below:

NUMBERS OF INVENTORY TEST SITUATIONS PROVIDED
IN SIX ARITHMETIC TEXTBOOKS

Book	I	II	III	IV	V	VI
Decimals	4					1
Fractions	2					1
Fundamentals	8					1
Percentage	1					1
No. Survey Tests	15	0	0	0	0	4

That adequacy of survey testing is not determined by number of test situations alone is shown by the ratings of the judges. They rate Books I and VI as superior, Book I having 15 survey tests and Book VI having only 4. The equality with which the survey tests of the two books are rated is due to the fact that the tests are massed in Book VI while they are widely distributed in Book I.

RATINGS ON ADEQUACY OF INVENTORY TESTS IN THE
SIX ARITHMETIC TEXTBOOKS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	1	3	3	3	3	1
Judge B	1	3	3	3	3	1
Judge C	1	3	3	3	3	1
Judge D	3	2	3	3	2	2
Judge E	3	2	3	3	2	2
Average	1.8	2.6	3.0	3.0	2.6	1.6
Rank	2	3½	5½	5½	3½	1

XX. Provisions for diagnostic testing in the six seventh-grade arithmetic textbooks.

In the opinion of the judges, Book V is the only one of the six texts that is superior in its provisions for diagnostic testing. Their ratings follow:

RATINGS ON PROVISIONS FOR DIAGNOSTIC TESTING
IN SIX SEVENTH-GRADE ARITHMETIC TEXTBOOKS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Judge A	2	2	3	3	1	2
Judge B	2	2	3	3	1	2
Judge C	2	2	3	3	1	2
Judge D	3	1	2	3	1	1
Judge E	3	1	3	3	1	1
Average	2.4	1.6	2.8	3.0	1.0	1.6
Rank	4	2½	5	6	1	2½

The ratings do not reveal the entire situation with respect to diagnostic testing since two of the books, Numbers III and IV, make no provision whatsoever for diagnosing the student's difficulties. The number of sets of diagnostic tests in each of the six books is shown below:

NUMBERS OF SETS, OR GROUPS, OF DIAGNOSTIC TEST
ITEMS IN THE SIX SEVENTH-GRADE ARITHMETIC
TEXTBOOKS

Book	I	II	III	IV	V	VI
Areas					1	
Decimals	1				1	1
Fractions	1	2			2	1
Fundamentals	1				4	

Interest					1	
Percentage	1	2			1	4
Total No. Tests	4	4	0	0	10	6

XXI. Provisions for remedial testing in the six seventh-grade arithmetic textbooks.

Analyses of the books showed that they supplied sets or groups of remedial test items on various subjects as follows:

NUMBERS OF REMEDIAL TESTS IN THE SIX SEVENTH-GRADE ARITHMETIC TEXTBOOKS

	Book	I	II	III	IV	V	VI
Decimals		6		4		2	3
Fractions		5	7	4		6	3
Fundamentals		6	2	9		7	8
Percentage			6			7	5
Vocabulary						1	
No. Remedial Tests		17	15	17	0	23	19

The ratings of the judges on provisions for remedial testing follow:

RATINGS ON PROVISIONS FOR REMEDIAL TESTING IN THE SIX SEVENTH-GRADE ARITHMETIC TEXTS
(1 = Superior, 2 = Average, 3 = Inferior)

	Book	I	II	III	IV	V	VI
Judge A		3	3	3	3	3	3
Judge B		3	3	3	3	3	3
Judge C		3	3	3	3	3	3
Judge D		2	3	3	3	1	3
Judge E		3	3	3	3	2	3
Average		2.8	3.0	3.0	3.0	2.4	3.0
Rank		2	4½	4½	4½	1	4½

It is highly significant that, in the opinion of the judges, all the textbooks are definitely inferior in their provisions for remedial testing. Even a casual examination of the books reveals these inadequacies.

XXIII. Use of both "short-answer" objective tests and tests calling for sustained application in the six seventh-grade arithmetic textbooks.

Since the testing program of the textbooks, speaking generally, are so inferior, ratings on this point would have little value. The writer would rate them all as inferior with nothing to choose between the six, giving them all the rank of $3\frac{1}{2}$. As pointed out in Chapter III, modern educational thought stipulates that testing procedures must be integral parts of the textbooks, either incorporated in the same covers or supplied separately. It is disconcerting to note that of these six, supposedly modern textbooks, not one has an adequate testing program. Book I has a few good vocabulary tests; the tests in Book II, are generally poor; Book III makes some good use of practice tests; Book IV makes use of scarcely any testing procedures at all; Book V, while testing better than any of the others, is still far from satisfactory; and Book VI is certainly far from superior in its use of testing techniques. The writers of these textbooks are far from attainment of modern educational principles in their handling of testing procedures.

XXIII. Provisions for individual differences in the six seventh-grade arithmetic textbooks.

Book I makes little or no provision for various levels of ability. Book II has carefully provided for individual differences through sets of special exercises and reports for the faster pupils. Book III has given fairly adequate attention to the problem of individual differences through grading the work in order of difficulty and varying the amounts for three levels of ability. Book IV makes no apparent provision for individual differences. Book V stars extra problems and exercises for the faster pupils. An outstanding feature of Book VI is its provision for individual differences. Many examples and problems are given for the faster pupils. Difficulties are pointed out and along with these are given "help-hints" with number of pages suggested where help may be secured for particular types of difficulty. In the opinion of the writer, Book VI is superior in its provisions for individual differences, though there is still room for improvement. Book IV and Book I are definitely inferior and Books II and III are about average in their provisions for individual differences. The rankings of the books with respect to this feature would be, in the opinion of the writer: Book VI, Book II, Book III, Book V, Book I and Book IV. There is still much to be done before any of these books meets the standards of modern educational and psychological thought.

XXIV. "Unit" type of organization in the six seventh-grade arithmetic textbooks.

Unfortunately, units of work, such as those recommended by outstanding curriculum workers such as Draper, Caswell, and Campbell, are not found in the six books.

In all, there are seventy-five so-called units in the six books. Of these, only one ("Transportation and Communication", Book VI) approaches closely to the requirements of a good unit. Its good features are:

1. Excellent illustrative material and pictures to help the child visualize actual life situations in the fields of transportation and communication.
2. Each problem is concerned with data that are recent, rich, and varied in scope.
3. The problems are technical, yet understandable to seventh-grade children.
4. It is organized so that the pupil acquaints himself with these major fields of human achievement.
5. It has general social value in familiarizing the child with the social necessity of travel by land, sea, and air, and with the still closer social contacts of the radio, telegraph, telephone, and mails.
6. In the opinion of the writer it leads to other worthwhile activities as well as to mastery of arithmetic.

7. It contains a wealth of accurate information.

Its undesirable features are:

1. A lack of integration with other school subjects.

With the exception of an historical reference to Morse's first telephone message in 1884 (P. 9), the unit is void of integration.

2. Very little bodily activity is provided for.

3. Individual differences receive no consideration.

4. It does not supply references for finding the needed materials and information.

5. It is not sufficiently comprehensive for a seventh-grade group.

In the opinion of the writer, Book VI would rank first of the six in type of organization, being about average as regards what a modern seventh-grade arithmetic textbook should be like. The others are quite definitely inferior in organization, judging from the standards of modern educational thought as outlined in Chapter III.

XXV. Integration of arithmetic with other school subjects and with vocational fields in the six textbooks.

In examining for integration, as defined in Chapter III, each problem in each of the books was examined to determine the field or fields from which illustrative materials were drawn. These were checked and tabulated. Illustrations of the methods by which

integration is secured in the six textbooks are given in Appendix B.

Needless to say, integration in all the books centers about the grocery store--how much will so many things cost? How much change will one get back?, etc.

Throughout, there is apparent disregard for the activities of the student, either as a child or as an adult. One is led to wonder how the authors and publishers can justify the treatment of arithmetic as an end in itself when it offers such excellent opportunities for acquainting the child with vocational- and adult- activities. Examination of the books shows that most vocational fields are neglected completely in the six books.

The inadequacies of integrative work in the textbooks are almost too obvious from the data to need elaboration. The writer rates all the texts as inferior in integration with little or nothing to choose between the six.

XXVI. Balance between adult- and child interests in the six seventh-grade arithmetic textbooks.

Considerable information on the above point is found under number VI, above. It was found that only Book II had used child interests to the exclusion of others in its verbal problems. In the opinion of the writer, the books rank, with respect to balance of

interest, exactly as they are ranked in Number VI, above: Book II, Book VI, Book III, Book V, Book I, and Book IV. These ranking are, of course, highly subjective and not overly valuable, considering that the five judges rated only one of the books (Number II) as being superior in its provision for motivation through appeal to childhood interests.

XXVII. Review of fundamentals, introduction of the algebraic formula, and attention to intuitive geometry in the six seventh-grade arithmetic textbooks.

How adequately the six books treated the three points given above was difficult to determine. The judges were agreed in classing Book IV as definitely inferior but did not agree that any of the books was superior. In fact, they refused to give ratings on the above point beyond the generalizations given. In the opinion of the writer, Book IV should be rated as inferior with the others receiving average ratings. It is quite obvious that the books as a whole do not conform to modern educational thought as given in Chapter III.

XXVIII. Suitability of the mechanical features of the six seventh-grade arithmetic textbooks.

In checking the mechanical features of the books the writer used the specifications given under No. XXVIII in Chapter III. Data on the mechanical

features of the books are given below:

MECHANICAL FEATURES OF THE SIX SEVENTH-GRADE
ARITHMETIC TEXTBOOKS

Book	I	II	III	IV	V	VI
Length of page*	185	188	184	200	185	179
Width of page*	125	126	126	133	126	125
No. of pages	448	280	314	382	364	258
Sewed binding	Yes		Yes			
Staple bound		Yes		Yes	Yes	Yes
Length of line*	88	86	86	85	88	89
Lines fine print	165	0	0	534	33	53
Protractors	Yes	No	Yes	No	Yes	No

*Millimeters

The writer's ratings on mechanical features follow, using the standards previously cited:

RATINGS ON MECHANICAL FEATURES OF SIX SEVENTH-
GRADE ARITHMETIC TEXTBOOKS

(1 = Superior, 2 = Average, 3 = Inferior)

Book	I	II	III	IV	V	VI
Binding	1	2	1	2	2	2
Paper	1	1	1	1	1	1
Size type	2	1	1	3	2	2
Length of line	1	1	1	1	1	1
Pages uncrowded	1	1	2	3	2	2
Illustrations	1	1	1	3	2	2
Life int. of Ills.	3	2	1	2	1	3
Protractor	1	3	1	3	1	3
Average	1.3	1.3	1.1	2.3	1.5	2.0
Rank	2½	2½	1	6	4	5

XXIX. Summary:

A summary of the ratings of the six books analyzed in Chapter IV follows:

TABLE 29

SUMMARY OF THE RATINGS OF THE SIX SEVENTH-GRADE ARITHMETIC TEXTBOOKS ANALYZED IN CHAPTER IV ACCORDING TO THE CRITERIA ESTABLISHED IN CHAPTER III AS THE DESIRED CHARACTERISTICS OF MODERN TEXTBOOKS AT THIS LEVEL

(1 = Superior, 2 = Average, 3 = Inferior. The ratings based on the individual judgment of the writer are marked with an asterick. Those not so marked are averages of the ratings of the three judges.)

Book	I	II	III	IV	V	VI
I. General Philosophical Background*	3.0	1.0	3.0	3.0	1.0	2.0
II. Character and Citizenship Training*	3.0	3.0	3.0	3.0	3.0	3.0
III. Vocabulary	2.3	1.3	2.0	3.0	2.3	1.3
IV. Sentence Structure	2.0	1.3	2.0	3.0	1.3	1.3
V. Defining New Terms in Context	2.0	1.3	2.0	3.0	1.3	1.3
VI. Child Interest	2.3	1.0	1.7	2.7	1.7	1.7
VII. Explanations Addressed to Child	2.0	1.3	1.7	3.0	1.7	1.0
VIII. Illustrations Visualize Life	3.0	1.7	1.3	2.3	1.3	2.0
IX. Games and Contests	1.7	3.0	3.0	3.0	2.0	3.0
X. Problem Solving*	1.0	1.0	1.0	1.0	1.0	1.0
XI. Thrift and Investments	2.3	1.0	2.3	2.0	1.3	1.3
XII. Concreteness	2.3	1.3	2.3	2.3	2.0	1.0
XIII. Graphs and Formulas	2.3	1.0	1.3	2.3	2.0	1.3
XIV. Reasoning Problems and Life	3.0	1.3	3.0	3.0	1.3	1.3

	I	II	III	IV	V	VI
XV. Amount of Drill	2.0	1.3	1.7	2.0	2.0	1.0
XVI. Drill Distribution	2.0	1.7	2.3	3.0	2.0	1.7
XVII. Drill Proportion- ate to Difficulty	2.3	1.7	2.3	2.7	2.0	1.7
XVIII. Mixed Drills	2.3	2.0	3.0	3.0	3.0	1.7
XIX. Inventory Tests	1.0	3.0	3.0	3.0	3.0	1.0
XX. Diagnostic Tests	2.0	2.0	3.0	3.0	1.0	2.0
XXI. Remedial Tests	3.0	3.0	3.0	3.0	3.0	3.0
XXII. Types of Tests*	3.0	3.0	3.0	3.0	3.0	3.0
XXIII. Individual Differences*	3.0	2.0	2.0	3.0	2.5	1.0
XXIV. Organization*	3.0	3.0	3.0	3.0	3.0	2.0
XXV. Integration*	3.0	3.0	3.0	3.0	3.0	3.0
XXVI. Balance of Child- and Adult Interests*	2.3	1.0	1.7	2.7	1.7	1.7
XXVII. Fundamentals, Alg- ebra and Geometry*	2.0	2.0	2.0	3.0	2.0	2.0
XXVIII. Mechanics	1.3	1.3	1.1	2.3	1.5	2.0
Average Rating	2.5	1.8	2.3	2.7	2.0	1.8
Rank	5	1½	4	6	3	1½

The averages of the ratings as shown above are in strict harmony with the opinions of the judges as to the order or merit of the books, taken as a whole, with the possible exception of some slight preference shown for Book II as against Book VI. There was no disagreement as to the ranking of the other books. They were almost vehement in saying that Book IV was very definitely

inferior to the others.

While the averages of the ratings leave much to be desired in the books, greater weaknesses are shown by examination of the ratings on individual characteristics shown as desirable in terms of modern educational and psychological thought. The books are weakest in: Provisions for character and citizenship training, Tests, Organization, Integration, and Motivation. In these respects it might be said with complete justification that the texts are modern only in date of publication.

The textbooks are best in: Provisions for problem solving, Mechanics, Amount of drill, Use of graphs and formulas, Addressing explanations to the child rather than to the teacher, Sentence structure, and Defining new terms in context as they are introduced.

In substance, it may be said that there is an unfortunate lag between the modern seventh-grade arithmetic textbook and what modern educational literature says it should be. Recommendations as to how much of this may be obviated are given in Chapter V.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

It was pointed out in Chapter I that the rapid growth of the junior high school movement has brought to the fore the problem of curriculum reorganization and construction to meet the demands of changes in educational thought regarding education at this level. It was shown that there have been marked changes in curricula and textbooks and that the textbook is, not only an integral part of the curriculum, but, next to the teacher, the most important part.

In Chapter II it was shown: (1) That the value of a textbook as a teaching device has little to do with its adoption; (2) That the score-card method must be supplemented by more painstaking analyses than are customary in most school systems; and (3) That the production of a modern textbook is so important and complicated a task that it cannot be entrusted to publishers alone, or to authors alone: It should be the cooperative undertaking of authors, school men, and publishers. If this cooperation is to be secured school men must set up more definite and more searching requirements for textbooks and must apply them to the textbooks they select. The major portion of the present study is

devoted to determining what those standards should be, in terms of modern educational thought, and in measuring how adequately six seventh-grade arithmetic textbooks published in 1934 and 1935 meet those requirements.

Chapter III is an attempt to bring order out of a mass of educational and psychological literature as to what the modern seventh-grade arithmetic textbook should be like. These desired characteristics are presented under twenty-eight headings in Chapter III, citation being made to the literature wherever possible. The desiderata may be grouped, roughly, as follows:

General philosophical background, No. I

Character and citizenship training, No. II

Difficulty, Nos. III, IV and V

Motivation, Nos. VI, VII, VIII and IX

Subject matter, Nos. X, XI, XIII, XIV, XXVI, and XXVII

Method, No. XII

Drill, Nos. XV, XVI, XVII and XVIII

Tests, Nos. XIX, XX, XXI and XXII

Individual differences, No. XXIII

Organization, No. XXIV

Integration, No. XXV

Mechanics, No. XXVIII, a to h, inclusive

While exact specifications for certain of the points discussed under these headings in Chapter III are

vague and must be inferred rather than taken directly from the literature, it is surprising, in the opinion of the writer, that there is such a close agreement considering the diverse fields from which much of the literature comes and the fact that many of the writers discussed these problems rather incidentally while dealing with considerably different major problems. That they do not form a perfect or complete outline of what the modern seventh-grade arithmetic textbook should be like, but one that is markedly superior to the rather haphazard methods employed by most school systems in analyzing and selecting textbooks is the contention of the writer. That such criteria can be used by carefully trained and experienced teachers in evaluating textbooks for use in their classes is demonstrated in Chapter IV.

The twenty-eight points set down in Chapter III as desiderata of the modern seventh-grade arithmetic textbook were formulated as instructions to five teachers of seventh-grade arithmetic in the Louisville public schools (Appendix C). With these instructions before them they rated the six textbooks published in the years 1934 and 1935 as superior, average or inferior on each point. These ratings, together with more detailed analyses of Difficulty, Integration, Organization, Subject Matter, Drills, and Mechanics by the

writer individually form the basis of Chapter IV.

How adequately the six books meet the specifications for the modern seventh-grade arithmetic textbook laid down in Chapter III may be seen from the table given below. The ratings of the individual judges, and in some instances the opinions of the writer alone, or the ratings of the judges plus additional analysis by the writer, are combined to give average evaluations on the twelve major points given below. These are taken from the more detailed evaluations given in the Summary of Chapter IV:

EVALUATIONS OF SIX SEVENTH-GRADE ARITHMETIC
TEXTBOOKS IN TERMS OF CRITERIA SET DOWN IN
MODERN EDUCATIONAL AND PSYCHOLOGICAL LITERATURE

(1 = Superior, 2 = Average, 3 = Inferior)

	I	II	III	IV	V	VI
I. General Philosophical Background	3.0	1.0	3.0	3.0	1.0	2.0
II. Provisions for Training in Character and Citizenship	3.0	3.0	3.0	3.0	3.0	3.0
III. Difficulty	2.1	1.3	2.0	3.0	1.6	1.3
IV. Motivation	2.3	1.8	1.9	2.8	1.4	1.9
V. Subject Matter	2.3	1.2	1.9	2.3	1.5	1.7
VI. Method	2.3	1.3	2.3	2.3	2.0	1.0
VII. Drill	2.3	1.7	2.3	2.7	2.3	1.8
VIII. Testing	2.3	2.8	3.0	3.0	2.5	2.3
IX. Provisions for Individual Differences	3.0	2.0	2.0	3.0	2.5	1.0

	I	II	III	IV	V	VI
X. Organization; "Units"	3.0	3.0	3.0	3.0	3.0	2.0
XI. Integration with other Subjects and with Vocations	3.0	3.0	3.0	3.0	3.0	3.0
XII. Mechanics	1.3	1.3	1.1	2.3	1.5	2.0
Average Rating	2.5	1.8	2.3	2.7	2.0	1.8
Rank	5	1½	4	6	3	1½

In general, it may be said that none of the books is sufficiently modern in terms of present-day educational thought to serve the children in seventh-grade arithmetic adequately. Furthermore, using all of the textbooks examined, or using parts from several of them, would not provide a satisfactory textbook in seventh-grade arithmetic.

Specifically, it may be said that:

1. Only two of the textbooks are by authors who are judged to have the desired philosophical backgrounds for writing seventh-grade arithmetic textbooks. Modern educational thought is that at least three fields should be represented in preparing a textbook for the seventh grade: (1) Academic education; (2) The classroom; and (3) The specific field (Mathematics, History, etc.) for which the book is intended. Only Books II and V are rated by the judges as meeting these requirements.
2. None of the books is at all modern with respect to training in citizenship and character. They seem to have overlooked these all-important fields entirely.

3. Books II and VI are reasonably modern in their usage of terms within the range of comprehension of the children for whom they were intended. They use reasonably easy sentences and paragraphs and define most new terms in context as they introduce them. They are not entirely satisfactory, however, and leave a considerable amount to the teacher that an inexperienced teacher could not do.
4. None of the books pays adequate attention to the task of motivating the child. There is considerable room for improvement in relating arithmetic to the child's interests and activities, providing games and contests, etc. Book V is best in this respect.
5. Only one of the books, No. II, is reasonably modern in its selection of subject matter. Even this would have to be supplemented by the teacher to meet the requirements of modern educational thought.
6. Books II and VI are reasonably modern in their methods of instruction. They provide opportunities for actual physical activity--measurements, for instance--and for practice in estimating, etc.
7. None of the books is satisfactory regarding provisions for drill. Books II and VI have about enough drill, none of the books distributes drills properly, and none of them takes adequate account of the fact that "mixed" drill is much more effective than "isolated" drill.

8. None of the books tests adequately. Books I and VI are satisfactory in their provisions for inventory testing. Book V has good diagnostic tests. None of the books makes adequate usage of remedial testing techniques, and none of the books gives due attention to various types of tests. They seem to regard the "short-answer" test as the only type worthwhile, overlooking the advantages of providing test situations in which the child has to sustain attention at a task over a protracted period of time.
9. Book VI provides satisfactorily for individual differences. The others are either average or inferior. Book VI is the only one that could be used satisfactorily with the varying degrees of ability in the average seventh grade.
10. None of the books is organized around the "Unit" plan. The advantages outlined in Chapter III as incident to "Unit" organization would have to be supplied by the teacher using any of the books--a highly improbable thing.
11. The books are all inferior in the manner in which they integrate the work of arithmetic with that of other subjects and with vocational fields. So far as these books are concerned, arithmetic is still an isolated body of subject matter and the child is supposed to fill some compartment of his mind with isolated facts and techniques.

12. None of the books is strictly satisfactory in mechanical features. Type of binding is satisfactory in only two of them (Nos. I and III). Size of type is satisfactory in only Books II and III--The others use entirely too much fine print. The pages are unduly crowded in all but Books I and II. Illustrations are satisfactory in only Book III. Books II, IV and VI do not provide the student with a protractor, a seeming necessity to the student of seventh-grade arithmetic.

Recommendations:

At the completion of a study such as this it is quite reasonable to try to answer some of the questions which naturally arise as to what can or should be done about the textbook situation in seventh-grade arithmetic in a city school system. Since the textbooks now available do not measure up to modern educational thought one of two courses is indicated: (1) Discard the textbook entirely and provide the child with study sheets worked out by local committees; or (2) Supplement the best, or several of the best textbooks with materials designed to overcome the weakness and shortcomings shown by analyses such as the present one. Neither of these would be new to the Louisville schools since a committee has already written a course of study, almost a text, for the

underprivileged child and another for the ninth-grade general mathematics course.

Specifically it is recommended that:

1. Before a seventh-grade arithmetic textbook is adopted for any school system there should be a thorough analysis of educational and psychological literature to determine what leaders in the field think an arithmetic textbook for this level should be like. Such an analysis should be kept up to date by reference to literature of later date than that available for examination at the time this study was made. With increased information from the wide variety of fields bearing directly upon seventh-grade arithmetic, there will be important changes in educational concepts from time to time, though it is scarcely probable that these will be as revolutionary during the next twenty years as they have been during the past.
2. Analyses of several textbooks thought to best meet the requirements of educational thought should follow examination of the literature in a most rigorous manner before any textbook is adopted. Those responsible for the selection of the text should guard against the dangers of "high-pressure" salesmanship frequently employed by textbook distributors. Painstaking analysis is the only way of avoiding such dangers as it can scarcely be

expected that textbook publishers will provide such analyses when submitting a textbook for consideration. As shown by the present study, this analysis should consist of careful ratings plus more detailed analysis of features such as sentence length, vocabulary difficulty, and mechanical features, etc.

3. Assuming that an adoption was to be made at the close of the 1935-36 school term for the following year, and with the data from this study available, the following would be a desirable course of action:

- a. Adopt either Book II or Book VI, depending upon the preferences of the individuals making the adoption: The difference between them is too slight to warrant a choice on other than prejudicial grounds.
- b. Supply the teacher with specific directions on how to secure definite ends in the development of character and citizenship--Industry, Cooperation, Courtesy, Honest, Dependability, Initiative, Self-Control, Moral Courage, Loyalty, Reverence for established institutions, Tolerance, Aesthetic Appreciation and Optimism. As pointed out in this study, results in this field are to be expected from definite training with respect to specific situations, and not by moralistic lecturing. The answers should be taken out of both Books II and VI in order that

the child's work may be checked with a minimum of effort.

- c. Supply the child with definitions of difficult words that he will meet in the text and with simple explanations of certain portions of the texts which are too difficult for seventh-grade children. Since this is the task of very skilled workers in the field it cannot be left safely to the individual teacher in the school system.
- d. Supplement the text with a wide variety of problems of strictly "child" interest. Provide the child with more detailed and simpler explanations addressed expressly to him and not to the teacher. Prepare illustrations of life activities in relation to arithmetic as supplements to the textbook. Supply each class with a careful system of games and contests to be used for motivating activity in the various topics as they are studied.
- e. Provide supplementary materials calling for a wide variety of actual activity on the part of the child--actual measurements such as surveying on an elementary scale, solving problems connected with the school grounds, estimating and checking of estimates, etc.
- f. Supplement the drills, using only those that meet the requirements of what good drills should be. Developments in this field will have to be followed

through investigations as they appear in current literature.

- g. The entire matter of testing should be gone into carefully and the textbook supplemented. In view of the advances made in this field during the past ten years or so, there is no excuse for the inadequacies found in the books examined. The teacher should be provided with adequate testing materials, particularly of a diagnostic and remedial nature and directions for their use should be so complete that the teacher cannot make mistakes.
- h. More attention should be given to provisions for individual differences. These are not satisfactory in the textbooks examined. In terms of modern educational thought, the school is confronted, not only with the problem of varying the amount of work to suit the speed of learning of individual children, but of adapting the type of arithmetic to be learned to what the child is able to learn, and how he will be able to use what he does learn.
- i. Experienced teachers in this field could organize the materials of the textbook on a "Unit" basis. The advantages of this type of organization justify such a procedure.
- j. Teachers and pupils should be provided with detailed information as to how arithmetic is used in other

school subjects and in various vocational fields. Until such time as textbooks in this field make such provisions it is the task of the local school system to provide them.

- k. The child should be provided with a protractor whether either Books II or VI is adopted. These are not expensive and the amount of time they save is ample justification for their inclusion with the seventh-grade arithmetic textbook.

APPENDIX A

EXCERPTS FROM THE SIX BOOKS
CHOSEN FOR VOCABULARY ANALYSIS

Book I

Per Cent

The expression per cent is an abbreviation for per centum. We usually call per cent rate per cent or simply rate or fractional part. The number of which we find the per cent is called the base or whole. We must get clearly in mind the difference between per cent and percentage. Per cent is the rate; percentage is the result. P. 266

Budget

John and Mabel wished to go to housekeeping. They had to solve many problems which may come to each of you some day.

John's salary was \$300.00 a month; he had trouble to make it last. The first year they had to give up some things they really needed because of unwise buying. The second year they planned each month's salary. Such a plan for one's income is called a budget. P. 376

Banking

Banks are the most important institutions in the business world. Without them modern business could not exist. Savings and investments are helped by banks.

Many towns have school banks where the pupils may deposit their savings, but whether banks are large or small they all have certain things in common. P. 348

Discount

One of the commonest practices in business is called discount. This is a percentage of the regular or list price that is taken off because the customer pays cash, or buys a quantity, or for some other reason. Trade discount is the allowance to the wholesaler or retailer to pay him for handling and selling the goods. P. 296

Commission

Many people make their living by selling goods for some other person. Often they are paid a certain per cent of the selling price of the goods that they sell. The money which they receive for selling the goods is called commission.

Many people who sell butter, eggs, and produce of various kinds do business on commission. So do traveling salesmen, such as book agents. P. 321

Book II

Per Cent

Helen showed that the phrase per cent is usually expressed by a symbol. Some business houses often give a small per cent of discount for cash payment. Per cent is used by business men instead of the word hundredths. Per cent means by the hundred. Any fraction or decimal

that is expressed as hundredths may be written as per cent. Per cent means hundredths. P. 70

Budget

A budget for the family expenses is planned in much the same way as the one on the next page. Before a family can make a plan for its expense it must know the approximate amount of income it will have. Jack's father and mother made a list of their probable income which appears below, such as--Fees, Salary, Dividends, Interest, Profits, and Gifts. P. 209

Banking

Banks lend a large part of the money deposited with them to business people of good standing who promise to repay the loan with interest. The interest on these loans provides a large share of the earnings of the bank, out of which salaries and other expenses are paid. P. 215

Discount

Mr. Brown allows all of his employees a special ten per cent discount on all articles they purchase at his store. Since Mary works there on Saturdays she is entitled to this special discount. During a dress sale Mary bought a dress which she liked. By buying this dress at the sale she received both the sale discount of ten per cent and the employee's discount. P. 258

Commission

Some people buy goods for other persons or firms on a commission basis. Their commission is calculated on the

amount they pay for goods. An automobile salesman bought a used car for his friend. If the salesman charged three per cent for buying, how much was his commission if the car cost \$800.00? P. 269

Book III

Per Cent

You have learned that hundredths and per cent mean the same thing.

To change a decimal to per cent, move the decimal point two places to the right and annex the percent sign (%).

To find what per cent one number is of another, divide the number being compared by the number with which it is compared, carrying the division to hundredths, then write as per cent. P. 73

Budgets

Remember that a budget cannot be followed exactly, but it will help very much to determine how much money is to be spent. This chart shows the budget for two persons for one month based upon an income of \$100 per month.

There are many factors that enter into the making of budgets. No single budget can be planned to meet the requirements of all families. P. 110

Commission

Fred has a paper route. He is an agent for the publishers. The publishers send Fred fifty copies

every Tuesday. He sells all he can at five cents each and returns the rest to a local news dealer. He sends four cents to the publisher. He keeps one cent, which is his commission for selling the paper. P. 136

Banking

A bank is a business institution in which money may be deposited for safe-keeping.

When making your first deposit at a bank, you are given a pass book. You will be required to write your name on a signature card. In the pass book will be written the amount of the deposit.

A deposit may be in currency, silver, or gold, or it may be a check calling for money or some other person's deposit. P. 145

Discount

A merchant often finds that certain lines of goods have not sold so well as he had expected. The unsold goods will be out of fashion if kept over to another season. He needs the space for new goods and he needs the money that is tied up in his stock; so he offers the remaining articles at a lower price. These reductions in price are called discounts. P. 133

Book IV

Percentage

Percentage problems occur frequently in business transactions, particularly in those which require the computing of discounts, commissions, interest, and

so on. It is also a common practice to express the relation between two numbers in per cent; for example, the relation of operating costs to sales, of advertising cost to sales, and so on. P. 121

Budgets

Every person who has any financial matters to handle should prepare a budget of expenses based on a definite or probable income. The person who works on a specified salary, or the person who owns income-producing securities on which the income is definite, can plan his budget by month or by the year. P. 352

Commission

A commission merchant is one who transacts business for another party. The charge for this service is called commission. This commission is usually a certain percentage of the cost or selling price. A collection fee is a service charge made by the commission merchant when he makes the collections for goods sold on account. Pp. 146, 147

Banking

The banker accepts money on deposits from people who wish to avail themselves of banking facilities, either for checking purposes or for safe-keeping and interest income.

The banker, in turn, lends or invests certain portions of the deposits in his bank, and for these loans and investments he receives a higher rate of interest

than he pays to depositors. P. 329

Discount

Trade discounts are deductions, according to the terms of the sale, from the list price of the goods sold. Discounts serve principally as a means of regulating prices. The list price is the price at which the goods are listed before the discounts are deducted. Net cost is the cost of the goods after the trade discounts are deducted. Pp. 129, 130

Book V

Percentage

In all parts of the world people now use per cents for many different purposes. You will find the language of percentage in newspapers and magazines, in almanacs, in reference books, in advertisements, and on posters. This fact will convince you that per cents are very helpful in describing and explaining the world's work.

Percent means hundredths. P. 136

Budgets

One of the best ways to make sure that you are spending your money wisely is to plan your expenditures ahead of time. Such a plan is known as a budget. This will vary according to the amount of your income, size of family, and the community in which you live. There are many good ways of organizing a family budget. One of the most common is to list under five main headings

all money spent. P. 318

Commission

Farmers and fruit growers often ship their goods to the city, where they are sold by agents. Manufacturers send out traveling salesmen to take orders for their goods, and property owners employ real-estate agents to sell their property. Payments for such sales are usually made in terms of an agreed per cent of the money for which the goods are sold. This amount so paid is called a commission. P. 146

Banking

Mr. Arnold, the cashier of a savings-bank gave a talk on thrift to the seventh and eighth grade pupils of the Lincoln School. He emphasized the great importance of saving regularly, either from money received from parents or from money earned by the pupils.

He further explained that when a bank lends money it deducts the interest in advance. This interest is known as bank discounts. P. 217

Discount

During a dull business season merchants frequently reduce prices to attract more trade. During a January sale a merchant advertised overcoats for sale at a reduction of 20% of the marked price. Such a reduction is called a discount. You will find discounts advertised in most newspapers. Make a collection of advertisements and bring them to class with you. P. 144

Book VI

Percentage

In percentage you need not learn any new rules for addition, subtraction, multiplication, or division. Since per cent means hundredths, you may solve any problem in percentage by using decimals. Percentage is like a new language in which the words "per cent" show the old idea of hundredths. You should be thoroughly familiar with this new language. P. 54

Budgets

It is not a safe thing for a family to spend its income without some definite plan. Hence intelligent and forward-looking people try to make a budget and to follow it as closely as possible. A family budget is a definite plan for using the family income. It may cover a period of a week, or a month, or a year. P. 148

Commission

You have perhaps sold Christmas cards or magazines and received as your pay a definite part of the amount of your sales. Agents have called at your home selling brushes, books, vacuum cleaners, or other goods. Manufacturers, merchants, and farmers often depend on such agents to do business for them. These agents receive a certain per cent of their sales as their commission. P. 113

Banking

Savings banks are used chiefly by people of

small means who wish to place their money safely at interest instead of using it in active business.

Banks keep money at work. They take the money which the depositor leaves with them and lend it to the merchant, farmer, or other borrower who needs it for use and can give security for its repayment. The borrower pays the bank for the use of the money. P. 172

Discount

Wholesalers usually publish a catalogue which gives the list price for each article listed. This price is usually made great enough so that it is the maximum price that must be charged even if the price of material and labor should increase. In order to inform their customers about the actual prices at any time, wholesalers issue from time to time a list of discounts from these published list prices. P. 120

APPENDIX B

ILLUSTRATIONS OF HOW INTEGRATION IS ATTEMPTED IN
THE SIX BOOKS ANALYZED

I. EXAMPLES OF INTEGRATION IN BOOK I

a. Astronomy
p. 246

Example. The visible stars have been arranged into six groups according to their apparent brightness. These groups are called "stars of the first magnitude", "stars of the second magnitude", etc. The following table shows the number of stars in each group:

First magnitude....	20	Fourth magnitude...	425
Second magnitude...	65	Fifth magnitude....	1100
Third magnitude....	190	Sixth magnitude....	3200

Find the total number of stars visible to the unaided eye in all parts of the world. (P. 246)

b. Athletics
pp. 56, 57, 133

Example. A famous girl athlete made a world's record high jump of 5 feet, $3\frac{3}{16}$ inches. If a junior high school girl could make a high jump of 3 feet, how much higher was the former girl's jump? (P. 56)

c. Aviation
pp. 103, 104, 235

Example. Captain James Mollison flew from Ireland to New Brunswick, a distance of 2400 miles in $30\frac{1}{4}$ hours. What was his speed per hour? (P. 104)

d. Health
p. 81

Example. The graph below from a junior high school in Los Angeles shows how corrective health work will remedy underweight. See if you can explain it. (P. 81)

e. Home Economics
pp. 50, 51

Example. A recipe required $4\frac{1}{2}$ quarts of flour to make 6 loaves of bread. How much flour will be needed to make 18 loaves of bread? (P. 50)

f. Physics
pp. 28, 388

Example. The speed of the earth is such that if a man, moving at the speed of the earth, started to tip his hat to a lady in New York he would be putting it on in Trenton, some 60 miles away, 4 seconds later. The speed of the earth is about (1.5, 150, 15) miles per second. (P. 28)

g. Science
pp. 83-85, 87

Example. On a Fahrenheit thermometer the freezing point of water is marked 32° , and the boiling point of water is marked 212° . How many degrees are there between the freezing point and the boiling point? (P. 83)

h. Spelling
p. 88

Example. Ten members of a seventh-grade class had the following number of words right in a spelling

test of 25 words: 20, 18, 24, 17, 25, 19, 20, 18, 24, 25. Find the average number of words right.
(P. 88)

i. Social Studies
pp. 130, 131

Example. On a certain map of Rhode Island the map-maker used a scale of 10 miles to the inch. If the greatest length of the state is 48 miles and the greatest width is 37 miles, how many large squares and how many small squares would you use on squared paper to represent each of the above distances? (P. 131)

j. Statistics
p. 80

Example. The approximate death rate per 1000 persons in an Atlantic seaboard city is given below:

1925.....11.1	1929.....11.3
1926.....11.7	1930.....10.8
1927.....11.5	1931.....10.9
1928.....11.5	1932.....10.3

When was the rate highest? Lowest? (P. 80)

II. EXAMPLES OF INTEGRATION IN BOOK II.

a. Economics
pp. 64, 65, 225

Example. In 1930 the average price of milk was 14.0 cents a quart. Compare this price with the present price in your locality. What is the difference in price? (P. 64)

b. Forestry
pp. 197-200

Example. According to a recent report, the forest regions of the United States are divided into five

districts as shown in the following table. What was the total original area of our forests?

What per cent of the original area (823 million acres) is the remaining area? (444 million acres) (P. 197)

c. Health
pp. 52, 236

Example. Milk is one of the most valuable foods we have. Can you tell why?

In the United States each person consumes on the average 1.3 pints of milk per day. How many pints does he consume in a week? (P. 52)

d. Science
pp. 63, 168, 237

Example. The normal rainfall in Mobile, Alabama, is 62.04 inches a year. What is the average monthly rainfall? (P. 63)

e. Physics
p. 182

Example. Jack told Arthur that the pressure exerted on the sail by the wind was at that time about 3.5 pounds to each square foot of sail. What was the total pressure of the wind on the sail before the reef was taken in it? (P. 182)

f. Transportation
pp. 3, 9, 13

Example. One of the largest and fastest ocean liners of the present time is 880 feet long. How many ships of the same length placed end to end would extend a mile? (P. 9)

III. EXAMPLES OF INTEGRATION IN BOOK III.

a. Anthropology
p. 5, 6

Example. The greatest dinosaur was called the "Thunder Lizard". It attained a length of 60 feet. The distance from home base to second base (126 feet) is how much more than the length of this dinosaur? (P. 6)

b. Astronomy
pp. 7-9

Example. The distance from the sun to the earth is about 93,000,000 miles. Light travels about 186,000 miles per second. Find the time required for light to travel from the sun to the earth. (P. 9)

c. Athletics
pp. 57, 58, 74, 75

Example. In 1929, G. S. Simpson ran 100 yards in $9 \frac{3}{5}$ seconds. Find the average speed in feet per second. (P. 57)

d. Aviation
pp. 23-25

Example. On Easter Sunday 1930, Mr. and Mrs. Charles Lindbergh flew 2500 miles in about 14 hours. Find the average speed per hour. (P. 23)

e. Home Economics
pp. 51-53, 109

Example. Old-fashioned Taffy

$1\frac{1}{2}$ cups sugar
 $\frac{1}{8}$ cup molasses

$1\frac{1}{4}$ tablespoons vinegar
 $\frac{3}{4}$ cup butter

To make 3 times as much taffy, how much of each should be used? (P. 51)

f. Science
pp. 54, 57, 63

Example. Find the cost of using an electric toaster for 15 minutes at the rate of $3\frac{1}{2}$ ¢ per hour. (P. 54)

IV. EXAMPLES OF INTEGRATION IN BOOK IV.

a. Agriculture
pp. 342, 345

Example. In 1930, according to the Federal census, the total number of persons engaged in agricultural work was 10,482,323. The total population of the United States in 1930 was 122,775,046. What percent of the total population was engaged in agriculture? (P. 342)

b. Communication
pp. 310, 315

Example. There are now 17,857,000 telephones in the United States. If there are 125,000,000 people living in this country, there is one telephone for about how many persons? (P. 315)

c. Dairying
pp. 349-352

Example. The price paid for milk varies in proportion to the amount of butterfat in the milk content. The butterfat content of milk varies from 3% up to 5%. In most localities 3.6% is considered standard. This is how much below the average? (P. 349)

d. Health
pp. 27, 31, 67

Example. A certain European city has kept vital statistics since about the year 1500. These statistics

show the following facts: In the 1500's the average length of life was 21 years; in the 1600's, 26 years; in the 1700's, 34 years; and in the 1800's, 40 years. The average length of life in the 1800's was an increase of ____ percent over the average length in the 1500's. (P. 31)

e. Home Economics
pp. 7, 19, 23

Example. A punch recipe calls for 2 cups of water for each cup of fruit juice. How many cups of water are needed for 2 cups of fruit juice? 3 cups? (P. 23)

f. Science
pp. 12, 31, 48

Example. Rosebushes are sometimes dusted with a preparation consisting of 9 parts of dusting sulphur and 1 part of arsenate of lead.

What is the ratio of the dusting sulphur to the arsenate of lead? (P. 31)

V. EXAMPLES OF INTEGRATION IN BOOK V.

a. Agriculture
pp. 42, 43

Example. Marie attended the Young People's Agricultural Institute and became interested in poultry raising. After a careful study of the possibilities of making some money by keeping poultry, she decided to enter the poultry business on April 1. During the first six months Marie's hens laid 954 eggs. At 25 cents a dozen, she figured that they were worth ____ dollars. (P. 42)

b. Athletics
pp. 111, 117

Example. In 1933 the metric system was substituted for the yardage system in most college athletics. Now one hears: "All out for the 200-meter dash", rather than, "All out for the 220-yard dash". What is the difference in distance between 200 meters and 220 yards. (P. 111)

c. Civics
p. 322

Example. John received 18 votes for class president, Harry received 14, and Ellen 12. John was elected by a plurality of 4 votes. A plurality means the number of votes more than the next highest candidate received. How do you find John's plurality? (P. 322)

d. Communication
pp. 48-51

Example. During a recent year there were 6,741,788 pounds of mail carried by airplane. A pound of mail averages 40 letters. About how many letters were carried by air mail that year, assuming that all the air mail was letters? (P. 48)

e. Dairying
p. 269

Example. Above is a photograph of April Pogus recently judged the prize Jersey milk cow in the United States. She was bred in Vermont. During the official test of a year's duration April Pogus produced 17,880 pounds of milk. Allowing 3

pounds to a quart, how many quarts was that? how many gallons? (P. 269)

f. Forestry
pp. 52, 53

Example. Thirty-seven states in the United States appropriate money annually to protect their forest against fire. Is this about $1/2$, $2/3$, or $3/4$ of the total number of states? (P. 53)

g. Health
pp. 309, 310, 312, 313

Example. In the United States there are approximately 3,000,000 persons sick each day, on the average. If each day's illness represents a loss of \$1.00, what is the annual loss from illness? (P. 310)

h. Home Economics
pp. 7, 60, 61, 73, 152, 314, 315

Example. Helen is making a dress. The buttonholes on the dress are to be formed by loops of silk braid. Each loop requires $1\frac{5}{4}$ inches of braid. There are 24 loops. She has a yard of braid. Will that be enough? (P. 73)

i. Science
pp. 8, 35, 132

Example. John wishes to use a mixture of water and alcohol in the radiator of his father's car. His science teacher advised him to mix alcohol and water so that the ratio of alcohol to water would be 3 to 5. Does that mean to use 3 parts of alcohol to 5 parts of water.

How many quarts of water must John use if he used

3 quarts of alcohol? (P. 8)

j. Social Studies
p. 6

Example. From a geography textbook find the five longest rivers of the world and represent their lengths by a bar graph. (P. 6)

k. Surveying
p. 106

Example. Surveyors in the United States Geological Survey are not satisfied with their work if the error in the measurement is more than 1 part in 1,000,000.

Complete: The error in a measurement may be decreased by using more finely graduated instruments, but it can never be wholly _____? (P. 106)

VI. EXAMPLES OF INTEGRATION IN BOOK VI.

a. Communication
pp. 9, 10

Example. There were 612 radio broadcasting stations in the United States in a recent year. These were so located geographically that .94 of the 125,000,000 people of the United States could have heard daytime programs if they had listened over radio sets. How many persons could have listened to the daytime radio programs? (P. 10)

b. Home Economics
pp. 41, 94

Example. Mary's recipe for mint lemonade calls for the following:

juice of 8 lemons	12 mint sprigs
4 cups water	1 cup strawberry juice
1½ cups sugar	1 cup raspberry juice
2 cups boiling water	

This recipe is sufficient for 10 persons. Change the recipe to serve 5 persons; to serve 15 persons. (P. 41)

c. Science
pp. 84-86

Example. Arthur has a 75-watt lamp in his room. How much per month will it cost for current if the lamp is lighted 60 hours a month and if electricity cost 7¢ per K. W. H.? (P. 84)

d. Transportation
pp. 1-4

Example. The latest air liners have a cruising of 3 miles a minute. At this rate how long will it take one of these airplanes to fly from Pittsburgh to Indianapolis, a distance of 342 miles? (P. 4)

APPENDIX C

INSTRUCTIONS USED BY THE JUDGES IN RATING SIX
SEVENTH-GRADE ARITHMETIC TEXTBOOKS AS TO ADE-
QUACY WITH WHICH THEY CONFORM TO REQUIREMENTS
OF MODERN EDUCATIONAL THOUGHT

(Those marked with an asterick were employed by the
writer individually and not by the other two judges.)

Directions:

Rate each of the six textbooks on each of the
criteria given below as to whether it is (1) Superior,
(2) Average, or (3) Inferior. Use the numbers 1, 2, and
3 to express your opinions. Your judgments will be more
accurate if you will rank the books in order of merit
before giving the ratings on each point. After you have
rated the books, rank them in order of general merit as
you see it. You may add other criteria, criticisms or
suggestions in case you feel that the outline followed
is not adequate.

- *1. General philosophical background. What are the
qualifications of the author or authors for the
production of a textbook at this level and how
well do they incorporate this philosophy into their
texts.
- *11. Provisions for character and citizenship training.
How adequately do the textbooks provide a sound
system of training in citizenship and character?
How well does the text provide for training the
child to be: Industrious, Cooperative, Courteous,

Honest, Dependable, Resourceful, Even tempered, Courageous, Loyal, Reverent, Tolerant, Aesthetically appreciative, and Optimistic.

- III. Vocabulary. Is the vocabulary of suitable difficulty for seventh-grade children?
- IV. Sentences and Paragraphs. Are the sentences and paragraphs brief, simple and unified to the extent required by seventh-grade children?
- V. Definitions of new terms. How satisfactorily are new terms defined in context as they are introduced?
- VI. Motivation Through Child Interests. Problems should involve data which is interesting to and a part of the child's experience. Problems about games, the store, school, home, and the like, are all a part of the child's daily experience.
- VII. Explanations. Should be addressed to the pupil rather than to the teacher.
- VIII. Illustrative Material. Should visualize life situations for the child.
- IX. Games and Contests. Should be provided to help break the monotony of continuous arithmetical problems. They give the child a chance to display his ability to think quickly.
- X. Adequacy of Opportunity for Solving Problems.
- XI. Thrift and Investment. How satisfactory are the provisions for teaching thrift and investment for

everyday use--banking, interest, savings, discount, budgets, etc.

- XIII. Concreteness of Problems. Problems should require actual measurements to be made, estimates given, etc.
- XIII. Graphs and Formulas. The pupil should be trained for immediate and future use of graphs and formulas. He should learn to use them intelligently in his reading of newspapers, magazines and other current literature.
- XIV. Reasoning Problems and Life Situations. To be of most value, problems should involve those things which make up the child's daily interests and activities.
- XV. Amount of Drill. There should be enough drill to iron out difficulties and make correct methods mechanical.
- XVI. Distribution of Drills. Drills should be distributed in diminishing amounts and at more frequent intervals as the child progresses through the book. As the number of examples in the drills diminish, they should occur at more frequent intervals.
- XVII. Drills Proportionate to Difficulty. More drill space should be allotted to those examples which involve a frequent difficulty rather than those of the same type but of lesser difficulty.
- XVIII. Mixed rather than Isolated Drills. Drills should

be "mixed" in type rather than "isolated".

- XIX. Inventory Tests. How adequately do the books test what the child knows in order that he may be taught what he does not know?
- XX. Diagnostic Tests. How well are special difficulties tested for?
- XXI. Remedial Tests. How adequately do the books provide special drill on the processes with which the child has particular difficulty?
- *XXII. Types of Tests. Tests should be of the short-answer type covering a wider range and of the type calling for sustained application.
- *XXIII. Provisions for Individual Differences. How well do the books provide for differences in ability?
- *XXIV. "Unit" Type of Organization. How adequately are the books organized into "units"?
- *XXV. Integration. How adequately is arithmetic integrated with other school subjects and with vocational fields?
- *XXVI. Balance between Child- and Adult-Interests.
- XXVII. Review of Fundamentals, Introduction of the Algebraic Formula, Attention to Intuitive Geometry.
How adequately are these handled?
- *XXVIII. Mechanics:
- A. Binding. Should be attractive and durable.
 - B. Paper. Should be of good quality and weight.
 - C. Size Type. Ten or eleven point.

- D. Length of Line. About eighty millimeters.
- E. Pages. Should not be crowded.
- F. Illustrations. Should be attractive.
- G. Illustrations. Should help pupils visualize life situations.
- H. Protractor. Should be provided.

XXIX. Rank the books in order of general merit keeping in mind all the factors you think should be considered in selecting a textbook for the seventh grade in Louisville.

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