

Utah State University

DigitalCommons@USU

All Graduate Plan B and other Reports

Graduate Studies

5-1966

A Comparison of the Fifth Grade Arithmetic Content as Prescribed in the Basal Arithmetic Textbooks Adopted in the State of Utah for 1954-1964

Blanche Thaxton Le Baron
Utah State University

Follow this and additional works at: <https://digitalcommons.usu.edu/gradreports>



Part of the [Education Commons](#)

Recommended Citation

Le Baron, Blanche Thaxton, "A Comparison of the Fifth Grade Arithmetic Content as Prescribed in the Basal Arithmetic Textbooks Adopted in the State of Utah for 1954-1964" (1966). *All Graduate Plan B and other Reports*. 1047.

<https://digitalcommons.usu.edu/gradreports/1047>

This Report is brought to you for free and open access by the Graduate Studies at DigitalCommons@USU. It has been accepted for inclusion in All Graduate Plan B and other Reports by an authorized administrator of DigitalCommons@USU. For more information, please contact digitalcommons@usu.edu.



A COMPARISON OF THE FIFTH GRADE ARITHMETIC CONTENT
AS PRESCRIBED IN THE BASAL ARITHMETIC TEXTBOOKS
ADOPTED IN THE STATE OF UTAH FOR 1954-1964

by

Blanche Thaxton Le Baron

A seminar report submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF EDUCATION

in

Elementary School Teaching

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1966

ACKNOWLEDGEMENT

I wish to express my sincere thanks and appreciation to my committee members, Dr. Bryce Adkins, Chairman; Arthur Jackson and Joan Bowden for their suggestions, advice, and encouragement.

I am also indebted to Claudia Forsythe, Iron County Supervisor, Clamont Adams, and Dixie Homer for their helpful assistance.

A special appreciation goes to my husband for his patience, helpfulness, and special encouragement when I became discouraged. Without his help this seminar paper might never have been written.

Blanche T. Le Baron

TABLE OF CONTENTS

INTRODUCTION	1
Statement of the problem	1
Significance of the problem	1
Purpose of the study	2
Limitations of the study	3
REVIEW OF LITERATURE	4
Changes in arithmetic according to literature	4
DESCRIPTION OF TEXTS	8
American Book Company, <u>American Arithmetic</u>	9
Row, Peterson Company, <u>Arithmetic Book</u>	9
Silver Burdett Company, <u>Making Sure of Arithmetic</u>	10
John C. Winston, <u>The Exploring of Numbers</u>	10
The World Book Company, <u>Growth in Arithmetic</u>	10
Addison-Wesley Book Company, <u>Elementary School</u> <u>Mathematics 1964</u>	11
American Book Company, <u>Learning Mathematics</u>	16
Encyclopedia Britannica, <u>Math Workshop for Children E 1962</u>	17
Laidlaw Brothers, <u>Arithmetic 1964</u>	18
Silver Burdett, <u>Modern Mathematics Through Discovery 1965</u>	19
Science Research Association, <u>Greater Cleveland</u> <u>Mathematics Program 1962</u>	20
Comparison of textbooks	21
CONCLUSION	27
Summary of findings	27
BIBLIOGRAPHY	29

LIST OF TABLES

Table		Page
1.	A listing of mathematical language as used in the 1964 textbooks	13-15
2.	A comparison of the number of pages used to develop several concepts in American arithmetic textbooks for 1954 and 1964	23-25
3.	A comparison of the number of pages used to develop several concepts in Silver Burdett textbook for 1954 to 1964	26

INTRODUCTION

Statement of Problem

The area of investigation selected for this report is "A Comparison of the Fifth Grade Arithmetic Content as Prescribed in the Basal Arithmetic Textbooks Adopted in the State of Utah for 1954 and 1964."

Significance of the Problem

Education has been under severe criticism for the past ten to twenty years by the populace and newspaper and magazine editors. Arithmetic has received its share of criticism since the first Sputnik was placed in orbit. The criticism focused on education implied that our children today were not taught as well as those a generation or more ago.

According to the literature, from 1954 to 1964, there is an indication that today children are taught better than those in the previous generations. Tiegs (1949, p. 50-51) investigated these charges by giving achievement tests to 230,000 children in sixty communities in seven states. These tests were given at intervals from two to nine years. He found the measures of the growth of children after 1945 indicated an overall gain in both the fundamentals of arithmetic and in the arithmetical reasoning. Alberty (1951), Lanton (1954) and others also found similar favorable comparisons in their research.

Although there have been indications through literature that our children are

learning arithmetic better today, there is always room for improvement. This improvement has been witnessed by the amount of literature that has been published to help teachers become aware of the changes in teaching arithmetic. Special workshops have been held in various sections of the state of Utah. For example, one was held two years ago in Davis County School District. This past year another workshop, similar to the one held in Davis County, was held in Salt Lake City. Invitations were sent out to all of the school districts in the state of Utah urging teachers to attend these workshops.

In some of the school districts, such as Iron County, teachers have been urged to attend night classes in order to become better acquainted with the newer approach to mathematics. Classes have been offered to teachers attending summer school so they, too, might become acquainted with the newer concepts of mathematics. The United States government appropriated money under the National Defense Education Act for elementary school teachers to attend special math workshops to enrich their background of mathematics. Some of the districts in Utah are incorporating in their winter programs, in-service training for their teachers.

Purpose of the Study

Book companies are aware of the change in mathematics and are therefore updating their textbooks by changing the content to meet the challenge of the newer approach to mathematics. For this purpose the author desired to compare the arithmetic textbooks of 1964 with those of 1954 to determine the changes, if any, that have taken place in the basal arithmetic textbooks on the adopted list for the state of Utah.

Limitation of the Study

Arithmetic textbook series have been published by numerous book companies. To make a comparison of all the arithmetic textbooks on the fifth grade level would be too great an undertaking for a paper of this type. This study has been limited to a comparison of the basal arithmetic textbooks adopted by the state of Utah as prepared by the arithmetic committee for the state of Utah. The content of the fifth grade arithmetic textbooks for the years of 1954 and 1964 will be compared.

REVIEW OF THE LITERATURE

Changes in Arithmetic According to Literature

Investigation of the literature shows that arithmetic has undergone several changes since its introduction into the school curriculum in the Colonial period of the United States. Arithmetic was taught as a separate subject during the Colonial period. At first it was taught just to the boys who were going into commerce or trade (Flournoy, 1964). According to Overman (1964, p. 1-14) the books first used made no attempt to show the principles underlying the operations.

The theory of the Swiss educator, John Heinrich Pestalozzi, influenced the teaching of arithmetic during the period of 1821-1857. Pestalozzi believed:

. . . that a child is endowed by nature with certain instincts or capacities and it was the purpose of education to develop these faculties (Overman, 1964 p. 3-7).

Biber described Pestalozzi's work as "entirely mental exercises to develop the acuteness and strengthen the mind." (Overman, 1964)

Warren Colburn introduced Pestalozzi's method to America. This method had a profound influence on the teaching of arithmetic during the middle of the eighteenth century. The importance of arithmetic in the schools was increasing and a change in the teaching method was sweeping the schools. Colburn's text, First Lessons, gave no rules to the children of ages five or six; they were to think their way through this "first lesson".

Overman (1964, p. 7-8) stated the effect of Pestalozzi and Colburn's development of arithmetic goals in the American curriculum:

. . . added a new goal to the two that had dominated the teaching of arithmetic in America. Before 1821 arithmetic was taught as a tool for practical use (social goal) and, in the higher schools and colleges, as an organized body of knowledge (scientific goal). To these is now added a third, the teaching of arithmetic as a means of training and developing the mind.

This addition of a third goal for the teaching of arithmetic is important even though the methods used to attain this goal were relatively ineffective . . . The psychology of Pestalozzi and Colburn is outdated today, but we see in their work the first attempt to teach arithmetic according to the way in which the mind develops and an aid to that development. This is still an important objective, although our methods of accomplishing this aim are quite different as a result of our more detailed and more accurate knowledge of psychology.

Teaching of arithmetic went through a period of stagnation. Mental discipline continued to be the major aim. The beginning of the twentieth century brought a new emphasis on the social value of arithmetic.

Mc Murray (1905, p. 16) writes:

The chief aim of arithmetic is the mastery of the world on the quantitative side through number concepts : . . . to gain this mastery a child must have a varied number of experiences . . . (with) the things of the objective world.

The think we aim at is a completely practical and accurate mastery of our material surroundings from the narrow point of view of numbers. It is not mathematical processes and discipline for their own sake.

Wilson (1926, p. 1-2) writes:

While not denying the cultural and disciplinary values of arithmetic, it is assumed that arithmetic in the grades is justified only on the basis of its utility

in the common affairs of life. We learn the multiplication tables not to sharpen the wits nor to comprehend a beautiful system but to figure out bills, our taxes, or the interest on a note.

Flournoy (1964, p. 3-7) has the following to say about the change that arithmetic has undergone!

The meaning approach was introduced in the middle 1930's. Arithmetic was described as a 'system of related principles and processes.' By the 1940's the need for teaching arithmetic for understanding began receiving some attention at the elementary school level. During the 1950's the inclusion of content to give meaning and to enrich the learning of arithmetic was increasingly evidenced. Recent scientific and technological development have put even greater emphasis on the importance of developing understanding of basic mathematical ideas in the elementary school to provide a sound foundation for continued study in the field of mathematics. Thus, the mathematics curriculum is undergoing changes for improvement and modernization at all levels of instruction, from elementary school to college.

From the review of literature Glennon, (1958), Tieg (1949), Brownell (1945), Davis (1959), Dean (1964) all gave evidence that children were taught better today than a generation ago. Even though children were being taught better there was room for improvement.

Studies by Buckingham (1951), Swenson, (1964), Overman (1964) and Marks (1958) to name a few indicated in their writings that the purpose of arithmetic, in the early period of America, was to train young men for commerce and later was used as a method to train the mind.

The modern day principle for mastering arithmetic was geared more toward helping children become acquainted with the quantitative side of the world through understanding or the discovery of numbers.

Seeing definite patterns and relationships of numerals; becoming acquainted with a more precise language; developing a geometric awareness earlier in a child's experiences with numerals was the consensus of such authors as Dutton (1962), Eicholz (1964), Flourney (1964), Mueller (1956), Fisher (1961), Lay (1961) and others.

DESCRIPTION OF TEXTS

Following are the basal arithmetic textbooks for the fifth grade that were included on the adopted book list for the state of Utah for the year 1954:

1. Upton, Clifford B., and Kenneth G. Fuller.
American Arithmetic, American Book Company, 1951.
2. Wheat, Harry G., and Ida Mae Heard.
Row-Peterson Arithmetic Book Five, Second edition,
Row, Peterson and Company, 1953.
3. Morton, Robert Lee., Merle Gray, Elizabeth Springstun, and
William L. Schaaf. Making Sure of Arithmetic. Silver-Burdett
Company, 1951.
4. Buechner, Leo J., Elda L. Meton, and Foster E. Grossnickle.
Growth in Arithmetic. World Book Company, 1952.
5. Clark, John R., Charlotte W. Junge, and Harold Moser.
Growth in Arithmetic. World Book Company, 1952.

The following basal arithmetic textbooks were adopted by the state of Utah in the fall of 1964 as a tentative list. These will be the books used for a comparison:

1. Eicholz, Robert E., Phares G. O'Daffer, Charles F. Brumfield, and
Merrill E. Shanks. Elementary School Mathematics. Addison,
Wesley Book Company, 1964.
2. Deans, Edwina., Robert B. Kane, George H. McMeen, Robert A.
Oesterle. Learning Mathematics. American Book Company, 1963.
3. Wirtz, Robert W., Morton Botel and W. W. Sawyer.
Math Workshop for Children E. Encyclopaedia Britannica Press, Inc.,
1962.

4. Mc Swain, E. T., Kenneth Brown, Bernard H. Gunlach and Ralph J. Cooke. Arithmetic. Laidlaw Brothers, 1965.
5. Science Research Association, Inc., Greater Cleveland Mathematics Program (GCMP). Science Research Association Inc., 1964.
6. Morton, Robert Lee., Myron F. Rosskoph, H. Stewart Moredock, Merle Gray, Edward E. Sage, and Wagner G. Collins. Modern Arithmetic Through Discovery. Silver-Burdett Company, 1965.

American Book Company, American Arithmetic 1951

The organization of the American Arithmetic textbook was: (1) a review of the previously learned skills; (2) an enlargement of skill practice of the basic concepts; (3) verbal problems for problem solving; (4) introduction of fractions; (5) solving for areas, perimeters, dry and liquid measurements; (6) the continual use of the typical vocabulary; (7) and the weekly timed tests with the suggestion if pupils did not pass the test a review of the skills should be entertained and the test be retaken.

Row-Peterson Company, Arithmetic Book 1953

The Row-Peterson Arithmetic Book Five was structured similar to the American Arithmetic book. The book was divided into nineteen chapters. The first four chapters were a review of the basic skills previously learned. The thirty pages of story problems referred to real-life situations. The following chapters consist of problems designed to enlarge the pupils ability to utilize the basic skills. New topics such as fractions, measurement and decimals were included in the later part of the textbook. A diagnostic test was included in each chapter of the book.

The Silver-Burdett Company, Making Sure of Arithmetic 1951

The Silver-Burdett Arithmetic book was similar to the two books previously described. The three hundred and forty-eight pages were divided into eight chapters of the basic skills.

The first chapter was a review of the previously learned concepts while the following chapters were concerned with enlarging the concepts of the basic skills through practice with larger numbers, fractions, decimals and measurements.

The book contained twenty-one pages of explanations, forty-seven pages of illustration, one hundred and thirty-six pages of verbal problems, computational exercises, tests and review.

John C. Winston Company, The Exploring of Numbers 1952

The similarities of this book to the ones previously described indicate the trend of teaching arithmetic a decade ago. Like the other textbooks, this text was divided into sections providing a review of the number system and the four basic skills with one and two place numbers. The basic skills were enlarged by using two or three digit numbers while helping pupils to memorize the skills. Fractions, measurement, decimals were included in the latter part of the book. Included in each chapter was a diagnostic test. At the conclusion of the book a section was included for those children needing more practice in a specific skill.

The World Book Company, Growth in Arithmetic 1952

The textbook Growth in Arithmetic was divided into chapters concerning the

content areas of review, addition, subtraction, multiplication, division, fractions and measuring. Within each chapter were story problems pertaining to the development of all of the skills. Two or three place numbers were included in teaching the basic skills, starting with the easier numbers then increasing in difficulty. Measurement, fractions and decimals were included in the textbook. Of the sixty-five pages that treated the division concept, twenty-five pages had verbal problems and twenty-one pages had drill type problems. Of the ninety-three pages of fractions, most of them considered verbal problems.

Addison-Wesley Book Company, Elementary School Mathematics 1964

The authors, Robert E. Eicholz and his associates, of the Addison-Wesley Mathematics textbook, organized their textbook in such a manner that more than one skill would be taught at the same time. An example of this was noted in addition which was taught in various ways: (1) addition was an inverse to subtraction; (2) it was taught in vertical or horizontal columns; (3) the commutative and associative laws were used; (4) addition was taught with sets; (5) cross number puzzles were used; (6) the number line was used to teach addition with the principle of subtraction; (7) multiplication is repeated addition; and (8) the algebraic unknown was another aid to help students understand addition.

The place value system was presented by a historical background and development of our number system. The inclusion of the study of Babylonian, Egyptian and Roman numerals along with a demonstration of the base four system strengthened the understanding of the place value of the base ten system.

Some of today's mathematicians, Wirtz, Spitzer, and Eicholz, suggested that part of the difficulty children encountered in working in arithmetic, with understanding

was due to their inability to comprehend the structure of the base ten number system.

The colorful illustrations, that were in evidence throughout the textbook, were used to clarify the new steps and concepts of each content area.

The mathematical language was used extensively. Table 1 shows the extent of the precise language found within the 1964 editions of the mathematical books. This language was gathered from the publications of the Science Research Association written by Loretta B. Fisher.

Accompanying the textbook was a "Getting Ready Book" which reviewed concepts previously taught. The teacher's edition had many suggestions and directions that appeared to be helpful to teachers teaching the "newer" approach to mathematics.

Table 1. A listing of mathematical language as used in the 1964 fifth grade textbooks.

Vocabulary	Textbook Using Vocabulary					
	Addison	American	Encyclopaedia Britannica	Laidlaw	S.R.A.	Silver-Burdett
additive identity					X	
algorism	X					
array		X				
associative property	X	X	X	X	X	
Babylonian						
bases 4, 5	X	X		X		
base 10	X	X		X		
binary operation				X	X	
bisect	X			X		
cardinal		X				
centimeter	X					
circumference	X					
closed figure	X	X	X	X		
closure	X			X		
commutative property	X	X	X	X	X	
composite number					X	
congruent	X	X				
curve	X		X	X		
decimals, exponents	X	X	X	X	X	
digits	X	X	X	X	X	X
disjoint sets				X	X	
distributive property	X	X			X	
Egyptian	X	X		X		
elements	X	X	X	X	X	
empty set					X	
equal to	X	X	X	X		X

Table 1. Continued.

Vocabulary	Textbook Using Vocabulary					
	Addison	American	Encyclopedia Britannica	Laidlaw	S.R.A.	Silver-Burdett
equations	X	X		X	X	
equivalent fraction	X			X	X	
equivalent sets				X	X	
expanded notation				X	X	
factors	X	X	X	X	X	X
finite set					X	
fractional number	X		X	X	X	
greatest common multiple	X				X	
Greek	X					
grouping			X			
Hindu-Arabic		X		X		
identity element					X	
inequality	X				X	
infinite set					X	
intersection of sets	X				X	
inverse			X		X	
is greater than	X	X	X	X		X
is less than	X	X	X	X		X
is not equal to	X	X	X	X		X
is not greater than	X	X	X	X		X
least common multiple	X	X			X	
line	X	X	X	X	X	
line segment	X	X	X	X	X	
math sentence	X	X				
number	X	X	X	X	X	
number line	X	X	X	X	X	
numeral	X	X	X	X		

Table 1. Continued

Vocabulary	Textbook Using Vocabulary					
	Addison	American	Encyclopedia Britannica	Laidlaw	S.R.A.	Silver-Burdett
one to one correspondence				X	X	
one to many correspondence						
ordinal		X				
paint	X	X	X	X		
pentagon						
perpendicular				X		
place value	X	X				
plane	X		X	X	X	
prime number	X				X	
quadrilateral	X	X	X	X		X
ray	X		X		X	
reciprocal		X			X	
regions	X				X	
re-naming					X	
Roman	X			X		
sets	X	X			X	
subsets				X	X	
triangle	X	X	X	X		
union	X				X	
universal sets						
unknown number			X		X	
venn diagram						
vertical notation					X	
whole number			X		X	
zero					X	X

American Book Company, Learning Mathematics 1963

Edwina Deans and her associates had the subject of geometry as the introduction to their 1964 arithmetic textbook. The first chapter presented the ideas of lines, line rays, line segments, rectangles, squares, triangles, and other geometric figures.

Both the authors of the Addison-Wesley mathematics textbook and the authors of the American mathematics textbook related the history and development of our present numeral system with a short sketch of the Roman numeral system and an introduction of another base system in an attempt to help children in the understanding of the uniqueness in the construction of our base ten system.

Colors were used to emphasize various concepts. The red was used in the explanation of the place value, geometry and sets. The blue color was used in the explanation of fractions and subtraction. The grey was the unknown quantity in geometry.

The authors, Deans et al., (1963 Teachers Guide iii) stated their purpose in the overview of the program as:

The modern mathematics series is based upon a psychological foundation which emphasizes the perceiving of relationships, the awareness of the relationship of the part to the whole. In so far as possible, discovery is emphasized and insight was sought. Problems are to be solved on the basis of reasoning, rather than on the basis of blind repetition.

Suggestions were included for several methods of teaching the basic processes in an attempt to help the children understand the "how" and "why" aspects of the process. A premium was placed on understanding and the use of precise mathematical language.

The study of the number system was developed gradually, systematically and sequentially. The "modern" terms of commutative, associative and distributive properties over addition were developed within this textbook. The language of geometry, the numeration system, number sentences, sets, the fundamental idea of inverse operations, the identity element of (0) for addition, the identity element of (1) for multiplication and the study of measurements were all explained and demonstrated within this textbook.

Encyclopedia Britannica, Math Work Shop for Children E 1962

The mathematics program written by the authors, Robert Wirtz, Morton Botel and W. W. Sawyer, was organized with an unusual creative style in order to help children discover and understand the basic concepts and skills in a delightful and significant way.

The textbook is oriented around the story of a computer which wrote a set of numerals establishing a pattern different from that "fed into" the computer by the people in the story. The pattern established by the machine was to be discovered by the children. Sometimes more than one pattern could be found. This type of problem was called, "What's my rule?" All the principles, concepts and skills were found within the various patterns set up by the machine.

Wirtz, et al., (1962 preface iii) had this to say as to their purpose:

The story line that unfolds in many ramifications throughout level E has novelty in it, a strong flavor of puzzle and humorous development. It also requires much computation and successful pattern-hunting to keep up with the story.

It is not the purpose to sugar coat drill. Instead, our rationale is that the story line parallels very closely mankind's efforts to understand nature; mankind's research for knowledge about the world he lives in. Nature's secrets are locked in just as the mechanisms of Alec's machines are locked in. All we can ever know about nature is that a certain input leads to a certain output, a certain stimulus produces a certain response, a certain cause is followed by a certain effect. When we see a relationship between cause and effect, we spin a theory, make an educative guess, then we predict, and test our prediction. We keep on searching for a pattern that seems reliable. Our predictions are proved correct, but we are never sure that we have unlocked nature's secret.

The method used in Alec's machine is worked similar to a scientist at work. Scientists observe events, searching for a cause, effect relationship, then they try to find a pattern that will lead to formulation of a rule that can be used to predict what will happen in a given set of circumstances. They test the rule . . . predict.

Wirtz (1962) indicated, as scientists probed deeper into nature, the once reliable rules failed as reliable bases for prediction. Old rules have to be amended and new laws of mechanics have to be formulated. Mathematics was a study of patterns. Patterns were a mechanism that made memory possible.

Laidlaw Brothers, Arithmetic 1964

E. T. Mc Swain, et al., introduced their textbook with a historical background of the base ten numeral system. Examples with Roman numerals were also included in the development of the base ten system. The textbook was divided into chapters which had the usual headings of addition, subtraction, multiplication, division, measurement, fractions and decimals.

Addition and subtraction were developed together. The new terminology was used with the newer methods of instruction such as; (1) number line; (2) the associative

law; (3) the commutative law for addition; (4) subtraction as the undoing of addition; and (5) the algebraic unknowns.

The content within the third chapter appeared more as the 1954 edition. The book had in its content twenty-two pages of explanation, one hundred and forty-five pages of computational problems. Occasionally the authors introduced "newer" concepts with minimum illustration of the concept. There was a section included in the last part of the book which contained the meanings of the newer terms and rules pertaining to the concepts.

At the conclusion of each chapter there were pages of problem solving, a review of the chapter and a self-evaluation test. Included in the book was a "mid" and final test. Accompanying the textbook was a workbook and an achievement test.

A comparison of the vocabulary can be noted in Table 1, pages 13-15.

Silver-Burdett, Modern Mathematics Through Discovery 1965

The Silver-Burdett arithmetic textbook showed some difference in the 1965 edition in the content area. The book had more illustrations to facilitate the explanation of new topics. It also contained a more precise language which is shown in Table 1.

The authors tried to create a greater understanding for mathematics by including in their textbook, more than one method of addition, subtraction, multiplication and division. For example, this textbook included expanded notation, regrouping, factoring of numerals in multiplication; and subtraction was the inverse of addition while division was the inverse of multiplication.

The authors, Morton, et al., (1965 preface vi) state:

In science, in industry and in commerce mathematics plays an important role. . . . To provide our children with the necessary foundation for their future, leaders in the field of mathematics have long seen the need to revitalize the elementary school arithmetic curriculum, they have sought a new program to clarify mathematical ideas, offer stimulating content and help pupils prepare for intelligent participation in society that will be more technological than our own.

Modern mathematics through discovery is such a program. Modern in viewpoint, in content, and in spirit. It is a sequential learning program in which new approaches and new content are always utilized for a valid mathematical and pedagogical purpose.

The authors had one goal in mind. That goal was the development of a program that would help establish new standards for teaching arithmetic, at the same time that it provided pupils with a series of challenging, meaningful and . . . appropriate learning experiences.

Science Research Association, Greater Cleveland Mathematics Program 1962

The 1962 SRA, Greater Cleveland Mathematics Program was somewhat different from the previously described textbooks. The books were transitional booklets which came in four sets titled booklet a, b, c, and d. With each booklet there was an accompanying teacher's edition. These booklets were constructed like workbooks, with perforated pages.

The content of these booklets started with a gradual introduction of the new mathematical concept and the problems at first were very simple but as ideas were developed, the material within the booklets was more difficult. Various ways, ideas, and symbols were introduced to develop the basic concepts. The authors stated that:

. . . As the pupils become more familiar with the mathematical ideas involved computation becomes increasingly more difficult. When the pupils understand a new mathematical idea and are reasonably competent in performing the computations necessary in using the idea, applications to the physical world are presented.

Transitional booklet (a) was divided into seven chapters. The set theory and whole number concept was developed. The addition and subtraction principles were presented in chapter two with a review of the previous learnings. The third chapter developed the new mathematical language (See Table 1). The following chapters presented multiplication and division with the newer approaches of modern mathematics. The newer terms were used in describing and explaining the computation of the basic concepts.

Fractions were treated in booklet (b) using sets and regions to further the understanding of fractions and decimals. Each succeeding booklet developed computational skills with more difficult problems.

Comparison of Textbooks

Several distinctive differences within the 1954 textbooks as compared with the 1964 textbooks were noted by the author. The differences found were few in some of the textbooks whereas in other there were significant differences. Some of the changes were as follows:

1. The format, of the 1954 textbooks, was in a division of chapters which were titled as to the one concept to be developed within them. The 1964 textbooks' chapters presented many principles and methods for understanding the concept that was being stressed within the chapter.

In some of the 1964 editions, the division of chapters were titled according to the methods described for presenting the basic skill. For example, to develop addition Addison-Wesley used sets, number lines, regions, the algebraic unknown, extended notation, and re-naming or regrouping of numbers. Some of the titles used were: Place Value, Inequality and Equality, Sets, and Number Sentences.

2. A greater number of ways to solve problems was included in the 1964 editions with colorful explanations and illustrations of the method used.
3. Some of the 1964 books included either diagnostic or evaluation tests. An example of this was the Laidlaw book.
4. The greatest differences were in the use of the more precise language to help children understand the actual process of the "how" and the "why" of mathematics.
5. The inclusion of geometry, decimals and more emphasis on place value with an introduction of another base and a historical development of the number system we use, was more evident in the 1964 textbooks as shown in Table 2, pages 23-25.
6. The illustrations in the 1954 textbooks were limited in number and were not so colorful nor so attractive. The explanations were limited.
7. More verbal or story problems and more pages of practice were in evidence in the 1954 books as shown in Table 2 and Table 3, pages 23-26.

Table 2. Continued

	Geometry			Review	
	1954	1964		1954	1964
angles		2	addition subtraction	7	7
area	3	2	cumulative test		2
closed figures	4	4	fraction	5	4
comparing lines		2	geometry		9
compass		4	graphs		1
congruent figures		1	multiplication	13	
lines, rays, segments		6	multiplication division		11
parallel lines		1	oral review	11	
perimeter	2	3	place value		5
perpendicular		1	problem-solving	15	6
plane		7	rules	3	
rectangles		1	story problems	18	
square feet		7	test on skills	28	
triangle		2	vocabulary	2	3

Table 2. Continued

	Fractions			Review	
	1954	1964		1954	1964
addition and subtraction	4	7	addition	3	
addition	19	6	all skills	15	
common denominator		5	base 5		9
commutative and associative		3	diagnostic		13
comparison	8		explanations of number		5
decimals	16	21	fraction	3	
explanation	6	5	large number		2
measuring	1		money		1
mixed fraction		6	multiplication	2	
part of whole	3		number line		1
reducing	8		number sentences		1
regrouping		10	number system		
story problem or verbal problem	13	10	place value		4
subtraction	8	7	Roman numerals		2
			semester		2
			story problem	20	
			subtraction	1	
			tests		
			understanding	9	
			year		3
			zero		2

CONCLUSION

Summary of Findings

The 1964 textbooks differed considerably from those of 1954. The Addison-Wesley, the Encyclopaedia Britannica and the Science Research Association textbooks have made the greatest changes.

The most apparent changes in the 1964 textbooks have been: (1) an increased preciseness of language, for greater understanding; (2) the inclusion of the historical development of the base ten number system with an introduction of other numeral and base systems which emphasized the place value system; (3) numerous methods in the development of concepts; (4) perceiving patterns and the awareness of their relationships; (5) the emphasis placed on reasoning and drawing conclusions; (6) the inclusion of geometry and decimals; (7) the gradual, systematical and sequential development of skills; and (8) a premium placed upon understanding rather than numerous pages of practice problems only for the sake of drill.

Fisher (1963, p. 6, unit 1) states:

Children may be exposed to fundamental ideas relating to the structure of our number system. To appreciate the beauty and ordeliness of our decimal . . . Classes may study other systems of numeration at appropriate times in the elementary grades. [An introduction of this was found in the fifth grade textbooks.] We study other systems of numeration to better understand our own. Such study affords a clear picture of why computation operates the way it does, exactly what grouping is and how it works, and the invaluable position place value has in an organized system of numeration

The 1964 arithmetic textbooks treat arithmetic as a part of the board area of mathematics, which is filled with interesting and useful relationships to the world

in which we live; whereas the 1954 books had the tendency to treat only certain parts of mathematics but never showing any relationship between them.

The textbooks are geared in helping children discover with enthusiasm the understanding of their world of quantitative facts.

BIBLIOGRAPHY

- Alberty, Harold, and et al. 1951. Let's look at the attack on the schools. College of Education, Ohio State University, Columbus, Ohio. (Mimeographed)
- Alder, I. 1960. Numbers old and new. The John Day Company Inc., New York.
- Anderson, R. W. 1961. Romping through mathematics. Alfred Knopf Inc., New York.
- Ausubel, David P. 1964. Some psychological and educational limitations by discovery. *The Arithmetic Teacher* 11:290-301.
- Deck, Robert H. (ed). 1956. The three R's plus. University of Minnesota Press, Minneapolis, Minnesota.
- Brownell, William A. 1938. Readiness and the arithmetic curriculum. *Elementary School Journal* 38:344-354.
- Brownell, William A. 1954. The revolution in arithmetic. *The Arithmetic Teacher* 1:1-5.
- Brownell, William A., and Harold E. Moser. 1949. Meaningful vs. mechanical learning: A study in grade III subtraction. In *Duke University Research Studies on Education Number 8*. Duke University Press, Durham, North Carolina. p. 19-20.
- Brownell, William A. 1945. Psychological consideration in the learning and the teaching of arithmetic. *The Teaching of Arithmetic. Tenth Yearbook, National Council of Teachers of Mathematics, Washington, D. C.* p. 1-31.
- Brueckner, Leo J., and Foster E. Grossnickle. 1953. Making arithmetic meaningful. John C. Winston, Philadelphia, Pennsylvania.
- Brueckner, Leo J., Elda L. Merton, and Foster E. Grossnickle. 1953. Exploring numbers. The John C. Winston Company, Philadelphia, Pennsylvania.
- Buckingham, B. R. 1951. The social point of view in arithmetic. *National Society for the Study of Education. Fiftieth Yearbook Part 2*:279.
- Buswell, G. T. 1951. Needed research on arithmetic. *The Teaching of Arithmetic. Fiftieth Yearbook of the National Society for the Study of Education Part 2.* University of Chicago Press, Chicago, Illinois. pp. 282-297.

- Clark, John R. , Charlotte W. Junge, and Harold E. Moser. 1952. *Growth in Arithmetic*. World Book Company. New York.
- Combs, Arthur W. 1959. *New ideas about personality theory and its implications for development. Learning more about living.* Association for Supervision and Curriculum Development, Washington, D. C. February.
- Daboll, Nathan. 1807. *The schoolmaster's assistant.* '807 edition. Preface, p. v.
- Davis, O. L. Jr. 1959. *Children can learn complex concepts.* Educational Leadership. 17:170-5. December.
- Dean, Edwina. 1963. *Elementary school mathematics.* U. S. Department of Health, Education and Welfare. Bulletin No. 13.
- Dean, Edwina, Robert B. Kane, George A. McMeen, and Robert A. Oesterle. 1964. *Learning mathematics.* American Book Company, San Francisco.
- DeVault, Vere M. 1961. *Improving mathematics program--trends and issues in the elementary school.* Charles E. Merrill Books, Inc., Columbus, Ohio.
- Dutton, William H., and L. J. Adams. 1962. *Arithmetic for teachers.* Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
- Eicholz, Robert E., Phares G. O'Daffer, Charles F. Brumfield and Merrill E. Shanks. 1964. *Elementary school mathematics.* Addison-Wesley Book Co., Reading, Massachusetts.
- Fawcett, Harold P. 1949. *Mathematics and the core curriculum.* Mathematics Teacher 42:6-13. January.
- Fisher, Loretta B. 1961. *New mathematics extension service, one year school wide project, grades K to 6.* Science Research Association, Inc., Chicago, Illinois, Units 1 through 8.
- Flournoy, Frances. 1964. *Elementary school mathematics.* The Center for Applied Research in Education, Inc., Washington, D. C.
- Freeburg, H. A. 1961. *A history of mathematics.* MacMillan Co., New York.
- Glennon, Vincent J. 1949. *A study in needed redirection in the preparation of arithmetic.* Mathematics Teacher. 42: 389-396. December.

- Glennon, Vincent J. 1958. What does research say about arithmetic? Revised edition. Association for Supervision and Curriculum Development. National Education Association, Washington, D. C.
- Glennon, Vincent J. 1961. Developing meaningful practices in arithmetic. Central New York Study Council, Syracuse, New York.
- Hartung, Maurice L., Henry Van Engen, James E. Stochl, and Lois Knowles. Teaching trends in mathematics. Scott Foresman and Company, Chicago.
- Hilari, Paul. 1964. New numerals for base-five arithmetic. *Arithmetic Teacher* 11:331.
- Irish, Elizabeth H. 1964. Improving problem-solving by improving verbal generalization. *Arithmetic Teacher* 11:169-174.
- Johnson, Donovan A., and William H. Glenn. 1960. Sets, sentences and operations. Webster Publishing Company, St. Louis, Mo.
- Kattsoff, Louis O. 1948. A philosophy of mathematics. Iowa State College Press, Ames, Iowa.
- Lanton, Wendell C. 1954. Comparison of the reading, arithmetic and spelling achievement of third and fifth grade pupils in 1953 and 1934. Unpublished PhD, Northwestern University, Evanston, Illinois.
- Larson, Harold D. 1954. Arithmetic for colleges. MacMillan Company, New York.
- Lay, L. Clark. 1961. Structure for the natural numbers. *California Journal of Education* 30:39-42.
- Marks, John L., Richard Purdy, and Lucien B. Kinney. 1958. Teaching arithmetic for understanding. McGraw-Hill Book Co., New York.
- McMurry, C. A. 1905. Special method in arithmetic. MacMillan Company, New York.
- McSwain, E. T., Kenneth E. Brown, Bernall H. Gundlock, and Ralph J. Cooke. 1965. Arithmetic. Laidlow Brothers Publishers, Palo Alto, California.
- McSwain, E. T., and Ralph J. Cooke. 1958. Understanding and teaching arithmetic. Henry Holt and Company, New York.
- Monroe, W. S. 1917. Development of arithmetic as a school subject. Government Printing Office, Washington, D. C.

- Morton, Robert Lee., Merle Gray, Elizabeth Springstrum, and William L. Schaaf. 1951. *Making sure of arithmetic*. Silver-Burdett Company, New York.
- Morton, Robert Lee., Merle Gray, Elizabeth Springstrum and William L. Schaaf. 1965. *Modern arithmetic through discovery*. Silver-Burdett Company, New York.
- Morton, Robert Lee. 1963. *Teaching children arithmetic*. Henry Holt and Company, New York.
- Mueller, Francis J. 1956. *Arithmetic its structure and concept*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
- National Council of Teachers of Mathematics. 1961. *The revolution in school mathematics*. National Council of Teachers of Mathematics. A Department of National Education Association, Washington, D. C.
- National Society for the Study of Education. 1951. *The teaching of arithmetic*. Fiftieth Yearbook Part 2. The University of Chicago Press, Chicago, Illinois.
- Overman, James Robert. 1964. *The teaching of arithmetic*. Lyons and Carahan, San Francisco, California.
- Purdy, C. Richard. 1961. A look at the current position of mathematics in the curriculum. *California Journal of Education* 30:50-53.
- Quinn, Daniel C., and Member of the Mathematics Department of Science Research Associates, Inc. 1964. *A guide to modern mathematics*. Science Research Associates, Inc., Chicago, Illinois.
- Ragan, William B. 1962. *Modern elementary curriculum*. Holt, Rinehart, and Winston, New York.
- Science Research Associates, Inc. 1964. *Greater Cleveland mathematics program*. E. Science Research Associates, Inc., Chicago, Illinois.
- Science Research Associates, Inc., 1962. *Key topics in mathematics for the primary teachers*. Science Research Associates, Inc., Chicago, Illinois.
- Scott, Foresman and Company. 1960. *Studies in mathematics education--a brief survey of improvement programs for school mathematics*. Scott Foresman and Company, Palo Alto, California.
- Shipp, Donald E., and Sam Adams. 1964. *Developing arithmetic concepts and skills*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

- Spencer, Peter Lincoln and Marguerite Brydegaard. 1952. Building mathematic concepts. Henry Holt and Company, New York.
- Spitzer, Herbert F. 1962. Teaching arithmetic. What research says to the teacher. Revised edition, November. National Education Association, Washington, D. C.
- Spitzer, Herbert F. 1956. Practical classroom procedures for enriching arithmetic. Webster Publishing Company, St. Louis, Missouri.
- Spitzer, Herbert F. 1954. The teaching of arithmetic. Houghton Mifflin Company, San Francisco, California.
- Spitzer, Herbert F. 1961. The teaching of arithmetic. Houghton Mifflin Company, San Francisco, California.
- Swain, Robert Lamond. 1957. Understanding arithmetic. Rhinehart, New York.
- Swenson, Esther J. 1964. Teaching arithmetic to children. MacMillan Company, New York.
- Taylor, E. H., and C. N. Mills. 1955. Arithmetic for teacher-training classes. Henry Holt and Company, Inc., New York.
- Thorpe, Cleota B. 1962. Teaching Elementary Arithmetic. Harper S. Row Publishers, New York.
- Tiegs, Ernest W. 1949. A comparison of pupil achievement in the basic skills before and after 1945. Growing Points in Research. Official Report of the American Educational Research Association. p. 50-57.
- Upton, Clifford B., and Kenneth G. Fuller. 1951. American Arithmetic Grade 5. Cincinnati, Ohio.
- U. S. Department of Health, Education, and Welfare. 1963. Elementary school mathematics. U. S. Government Printing Press, Washington, D. C.
- Van Der Waerden, B. L. 1954. Science awakening. P. Noordhoff Ltd., Groningen, Holland.
- Willerding, Margaret E. 1961. What is the new arithmetic? California Journal of Education 30:5-38.
- Wilson, Guy M. 1951. Teaching the new arithmetic. McGraw-Hill Book Company, Inc., New York.
- Wilson, Guy M. 1926. What arithmetic shall we teach? Houghton Mifflin Company, Inc., Boston, Massachusetts.

Wirtz, Robert W., and Morton Botel. 1961. Math workshop for children general guide. Encyclopedia Britannica Films, Inc., U.S.A.

Wirtz, Robert W., Morton Botel, and W. W. Sawyer. 1964. Math workshop for children. E. Encyclopedia Britannica, Inc., U.S.A.