AN OVERVIEW OF THE ELEMENTARY ARITHMETIC,
SOCIAL STUDIES, AND SCIENCE CURRICULUM

A Field Report
Presented to
The Graduate Division
Drake University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science in Education

by
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This does not mean, however, that the elementary school or its practices have been static. Caswell sums this up quite well in his reflection of what has taken place in the elementary school in the last half century.

Significant progress has been made in elementary education, particularly since 1900. Best practice today represents a tremendous advance over best practice forty or fifty years ago. Opportunities for children have been greatly broadened; teaching methods have been improved most significantly; organization of schools and classrooms provides more favorable working and living situations; the all-round development of children is given much greater consideration. There can be no doubt about the important achievements of these years.

The purpose of this study was to take an overall look at the curricula of arithmetic, social studies, and science.

A view of the great changes that have taken place in the last half century it seemed desirable to find out the current aims and practices as well as the trends for the future in the social studies, arithmetic, and science curricula.

CHAPTER I

INTRODUCTION

With such a large investigation only the highlights could be covered. This was in accord with the objective of having a report that teachers, administrators, and parents could use for a short concise overview of the areas of the elementary school. Traditionally it is the school of the people. This does not mean, however, that the elementary school or its practices have been static. Caswell sums this up quite well in his reflection of what has taken place in the elementary school in the last half century.

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1. LIMITATIONS

With such a large area of investigation only the highlight could be covered. This was in accord with the objective of having a report that teachers, administrators, and parents could use for a short concise overview of the areas of the curriculum studied. The bibliography contains references to more detailed investigations of the particular areas of the curriculum. These references should be consulted if such detailed information is desired.

The actual activities carried on in the classroom of the investigation of the various areas of the elementary curriculum can then be evaluated in terms of the characteristics of a good elementary school. The results of the characteristics of the children in that classroom. The purpose of this section was to give each teacher a foundation upon which to build her own plan of study, to show her what the average child will have learned already, and to indicate what he will be expected to learn in the future.

Any such general curriculum investigation of this type is, of necessity, planned for the average child. It is the responsibility of the individual teacher to plan work that permits the accelerated pupil advancing as rapidly as his ability permits. Although this investigation was broken down into separate subject areas, this was done solely for the convenience...
of organization. There are many instances where correlation of areas produces the most effective learning.

No matter what the grade level, the teacher must remember that her task is not to fit the child into a mold for the grade above, but to lead him through a year's growth. A good elementary school is one in which the growth is fostered.

but all II. GOOD ELEMENTARY SCHOOL CHARACTERISTICS

results of this investigation because of their general nature. To more fully understand the scope and role of the
the limited nature of this study, Caswell's full list of characteristics of a good elementary school. The results
of the investigation of the various areas of the elementary curriculum can then be evaluated in terms of these character-
istics. In this area, as well as many other areas of edu-

The study was based on readings in several areas, selected books on general curriculum were read and were very
are educators. This made the choice of characteristics diffi-
cult. However, Caswell's listing seemed to be representative
as being helpful in specific areas of the curriculum. Reading as well as encompassing.

1. A good elementary school is one in which the program is conceived and operated as a whole.
2. A good elementary school is one which provides a rounded program of living for children.
3. A good elementary school is one which contributes to the maximum realization of democratic ideals in the actual living of pupils.
4. A good elementary school is one in which the program is based on the interests, needs, and capacities of the children it serves.
5. A good elementary school is one in which children are afforded guided experiences compatible with their maturity in all areas of living.
6. A good elementary school is one which is an integral part of the immediate community it serves.

7. A good elementary school is one in which physical facilities and instructional supplies facilitate desirable pupil activities.

8. A good elementary school is one in which the growth and welfare of all members of the professional staff are fostered.

9. A good elementary school will organize the general life of the school so as to foster democratic values.1

Not all of these characteristics were used to evaluate the results of this investigation because of their general nature and the limited nature of this study. Caswell's full list was included, though, because it was felt that not to do so would tend to distort the total picture.

III. PROCEDURE

The study was based on readings in several areas. Selected books on general curriculum were read and were very useful in gaining an overall view of the curriculum as well as being helpful in specific areas of the curriculum. Reading of books, yearbooks, and research studies written about specific areas of the curriculum proved valuable in developing the chapters on those specific areas. Study of representative courses of study and series of textbooks rounded out the reading portion of the investigation.

1Caswell and Foshay, op. cit. pp. 47-61.
A chapter was devoted to each area of the curriculum investigated. Each chapter was then divided into sections on definition, aims, trends, and grade level specifics.

This analysis of the arithmetic curriculum in the
small elementary school is a composite picture developed
by bringing together information derived from several text-
book series, research studies, and writings of authorities.
This chapter is subdivided into four areas: definition of
arithmetic; objectives of arithmetic; trends in arithmetic;
and arithmetic grade level specifics.

I. DEFINITION OF ARITHMETIC

Herrick defines arithmetic in a variety of ways.

First, arithmetic must be seen as a product of the mind of
man—an invention conceived by man as he put his intelligence
to work on those problems of daily living which demanded
quantitative thought for solution. Second, arithmetic is
a language for recording and communication thought about
quantitative experience. Third, arithmetic is a logically
organized system of interrelated ideas. Fourth, arithmetic
is a way of thinking. Fifth, arithmetic is part of what is
commonly called social studies in the elementary school pre-
CHAPTER I

I. DEFINITION OF ARITHMETIC

This analysis of the arithmetic curriculum in the modern elementary school is a composite picture developed by bringing together information derived from several textbook series, research studies, and writings of authorities. This chapter is subdivided into four areas: definition of arithmetic; objectives of arithmetic; trends in arithmetic; and arithmetic grade level specifics.

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gram. Sixth, arithmetic is a science, and terms important in insurance, investments, business practices, etc.)

II. OBJECTIVES OF ARITHMETIC

The objectives for the teaching of arithmetic adopted as the major statement of aims in the recent yearbook on arithmetic produced by the National Society for the Study of Education are as follows:

1. Computational skill:
Facility and accuracy in operations with whole numbers, common fractions, decimals, and percents...

2. Mathematical understandings:
   a. Meaningful conceptions of quantity, of the number system, of whole numbers, of common fractions, of measures, etc.
   b. A meaningful vocabulary of the useful technical terms of arithmetic which designate quantitative ideas and the relationships between them.
   c. Grasp of important arithmetical generalizations.
   d. Understanding of the meanings and mathematical functions of the fundamental operations.
   e. Understanding of important arithmetical relationships, such as those which function in reasonably sound estimations and approximations, in accurate checking, and in ingenious and resourceful solutions.
   f. Some understanding of the rational principles which govern number relations and computational procedures.

3. Sensitiveness to number in social situations and the habit of using number effectively in such situations:
   a. Vocabulary of selected quantitative terms of common usage (such as kilowatt hour, miles per

---

2. From hour, decrease and increase, and terms important in insurance, investments, business practices, etc.)
3. Knowledge of selected business practices and other economic applications of number.
4. Ability to use and interpret graphs, simple statistics, and tabular presentations of quantitative data (as in study in school and in practical activities outside of school).
5. Awareness of the usefulness of quantity and number in dealing with many aspects of life. Here belongs some understanding of the important contribution of number in their evolution.
6. Tendency to sense the quantitative as part of nonformal experience, including vicarious experience, needs in reading, in observation, and in projected activity and imaginative thinking.
7. Ability to make (and the habit of making) sound judgments with respect to practical quantitative problems.
8. Disposition to extend one's sensitiveness to the quantitative as this occurs socially, and to improve and extend one's ability to deal effectively with the quantitative when so encountered or discovered.¹
9. From quantitative to its integrative use in the teaching of arithmetic to its greater value as a teaching technique.
10. From continued emphasis on language to the emphasis on the major role of arithmetic in the teaching of arithmetic as revealed from a comparison of the 1930 and 1951 National Society for the Study of Education Yearbooks reports these changes:
11. From learning as a preparation for life to learning as a well-rounded living, contributing greatly toward understanding of democratic ideals through the actual living of children.
12. From impressing the child primarily as a measuring device to its greater value as a teaching tool.

2. From the teaching of accepted judgments, attitudes, ideals, and ambitions to the guiding of experiences to develop the ability of children to arrive at such desirable ends.

3. From confidence in the ability to predict future needs to the acceptance of future as an indeterminant.

4. From arithmetic as a body of objective scientific data to an arithmetic which goes beyond this limited scope and includes also the means of meeting the many social needs of the child.

5. From utilization only of "known" facts in the educational program to welcoming of classroom experimentation as a necessity for a growing curriculum.

6. From strict adherence to rigid preconceived plans to flexible plans which provide for continuous change as needed.

7. From great concern regarding grade placement for content materials to a greater concern for an understanding of readiness so as to teach effectively whenever the child is ready.

8. From perpetuating an isolated arithmetic course to its integration into the general curriculum.

9. From curriculum construction by experts who "know best" to curriculum construction whose planning body includes the contributions of all, including the children, who are influenced by it.

10. From "atomizing" the subject matter of arithmetic to its integration into meaningful units.

11. From continued subdivision of the group to the acceptance of the group as a whole where each individual contributes to the extent of his ability.

12. From the major aim of mastery of accuracy and facility for mastery's sake to mastery for the purpose of meeting social needs through understanding.

13. From the narrow pencil-and-paper testing program to the broader continuous program including in addition the oral and essay types.

14. From great use of and confidence in standard tests and corresponding norms, to their more limited and qualified uses with greater emphasis on correctness of application and evaluation.

15. From impressing the test primarily as a measuring device to its greater value as a teaching technique thoroughly understood by the children.

16. From concern only about answers to greater consideration of details of the related process.
17. From problems only requiring exactness in answer to the inclusion of some requiring mentally developed approximations.¹

Addition and subtraction are inversely related.

IV. ARITHMETIC SKILLS AND UNDERSTANDINGS

Hickerson points out that actually there are three kinds of mathematical thinking.

1. Representing with mathematical symbols the quantitative aspects of concrete situation,
2. computing, and
3. understanding the theory or science of mathematics.²

The first two kinds of thinking are discussed later in the section on skills. The following is a list of some of the understandings necessary to more fully appreciate the third kind of thinking. They are basic to an effective job of teaching and effective learning for the child.

1. Our number system is based on ten
2. The zero is a place holder
3. The zero is a digit meaning "not any"
4. Counting leads to addition and in turn to multiplication.

5. Counting backward leads to subtraction and in turn to division.

6. Addition and subtraction are inversely related.

7. Multiplication and division are inversely related.

In the compilation of arithmetic skills for the specific grades, the author found general agreement among textbook authors. They differed only on very minor points. For example, one series of texts makes an informal introduction to per cents and ratio in the latter part of the sixth grade. In another series they wait and introduce per cents and ratio in the early part of the seventh grade. The following list of specific skills for each grade level is a composite picture of skills presented for these grades by four different series of textbooks.¹

1. Kindergarten
   a. Counting of objects
   b. Telling of time by hours
   c. Calling days and months by name
   d. Use of language of numbers

2. First Grade
   a. Writing numbers to 100 in sequence
   b. Counting by ones, fives, and tens to one hundred
   c. Addition and subtraction by grouping
   d. Number words through six
   e. Understanding ten as the base
3. Second grade
   a. Reading and writing numbers to two hundred
   b. Addition and subtraction facts through nine
   c. Recognizing halves of wholes and groups
   d. Value of coins
   e. Measurement to the inch, pint, and quart
   f. Time to the half hour
4. Third grade
   a. Roman numerals through XII
   b. Multiplying facts twos, threes, and fives
   c. Value of coins
   d. Dividing two and three place numbers
   e. Parts of whole—one half, one third, and one fourth
   f. Recognition of square, circle, rectangle, and triangle
5. Fourth grade
   a. Roman numerals through XXX
   b. Completion of multiplication facts
c. Operations with dollars and cents

d. Addition and subtraction of easy fractions by
   visualisation

Fe. Two step problem solving

Unit f. Use of length, width, weights, dimensions, etc.

Year 6. Fifth Grade

from this, 1. Roman numerals through CC

understand 2. Dividing with two figure divisors

through c. Addition and subtraction of fractions

d. Changing fractions to higher and lower forms

e. Three step problem solving

F. Area and perimeter of rectangles

Sixth grade

material

Geography. Multiplication and division of fractions

icology, b. Roman numerals through MM

are many. Three figure divisors

all second. Multiplication and division of decimals

content e. Meaning of volume has been drawn primarily from

social. Informal introduction to ratio and per cent

The second is that this content, however organised, is to be
used in increasing understanding of, and skill in human

---

1 John U. Michaelis, Social Studies for Children in a
II. THE SOCIAL STUDIES

This analysis is an effort to determine the objectives, content, and trends of the social studies by study of research, writings of authorities, and textbooks. Evolving from this is a compilation of specific skills, attitudes, understandings, and applications for each grade kindergarten through sixth.

I. DEFINITION OF THE SOCIAL STUDIES

The major purpose of the social studies is to help the child to:

1. Become a democratic citizen
2. Develop a sense of inter-group relations
3. Develop a sense of opinion and convictions
4. Form an attitude of respect for others
5. Form an attitude of respect for the past
6. Form an attitude of respect for the present

The social studies in the elementary school embrace material related to human relationships drawn from history, geography, political science, economics, anthropology, sociology, science, and the arts.¹ Herrick points out that there are many different definitions of the social studies but they all seem to emphasize two basic ideas. The first is that the content of the social studies has been drawn primarily from the social sciences and adapted for instructional purposes. The second is that this content, however organized, is to be used in increasing understanding of, and skill in human

II. THE PURPOSES OF SOCIAL STUDIES

The primary objective of the social studies program in the modern elementary school is the improvement of group living. Most courses of study state the social studies objectives or purposes in terms of social attitudes, desirable behavior traits, and useful information. In an analysis of forty-four recently published courses of study, Michaelis reports the following:

The major purposes of the social studies are to help child to:

1. Become a democratic person whose behavior is guided by democratic values, who is loyal to the American way of life, and who appreciates the sacrifices and contributions made to promote democratic living here and throughout the world.

2. Develop modes of behavior consistent with democratic values, such as responsibility, concern for others, open-mindedness, creativeness and cooperation, and to use them in relationships with others.

3. Develop group-action skills and social competency in inter-group relations, recognizing the value of group decision making; showing respect for differences of opinion, and exhibiting high regard for rights of minorities yet abiding by majority decisions.

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Develop the ability to think critically and creatively and use problem-solving skills in situations involving human relationships; use dependable sources of information; locate, evaluate, select, organize, and present information effectively; and base action on sound conclusions.

5. Appreciate and respect other persons, cultural similarities and differences among peoples, and the contributions of others to our ways of living,
1. Realizing that human dignity and personality are of first importance in human relationships regard-
2. less of race, color, or class.

6. Acquire and use functional information, concepts, and understandings of basic social functions of human living such as production of goods and services, transportation and communication, conservation of resources, artistic and religious expression, education, recreation, and government; the impact of scientific advance and education upon ways of living; the effect of moral and spiritual values upon human behavior; ways to improve family life, community living, and national-international welfare; and the increasing interdependence characteristic of modern living.

7. Become responsive to needs and problems of others and act courageously and with integrity to bring about changes consistent with democratic ideals and processes.

III. TRENDS IN THE SOCIAL STUDIES

To more fully appreciate what is happening presently in the social studies and what possibly may happen in the future, it was necessary to examine the present trends in the field of the social studies in a composite picture. This compo-

1Michaelis, op. cit., p. 12.
teaching of the social studies. The following summary of the trends in the social studies by Michaelis was based on a review of newer courses of study and on discussions with supervisors, directors of curriculum, and, most important of all, outstanding teachers of the social studies.

1. A broadening conception of social studies is steadily emerging. . . .
2. There is increasing emphasis upon democratic behavior, ideals, and processes. . . .
3. There is increasing emphasis upon the use of child growth and development data in the planning and development of social studies programs. . . .
4. Social community relations are assuming greater importance in the social studies. . . .
5. Sound planning with attention to flexibility to meet individual needs in replacing both incidental and formal approaches. . . .
6. Comprehensive units of work are used to organize and to develop learning experiences. . . .
7. Critical thinking and the development of problem-solving techniques are being given greater emphasis. . . .
8. There is increasing emphasis upon the use of a variety of learning experiences. . . .
9. Evaluation is being viewed as a continuous, cooperative process concerned with all of the outcomes of the social studies program. . . .

The following outline breakdown, by grade, of the specific skills, attitudes, understandings and applications of the social studies is a composite picture. This composit


Michaelis, op. cit.; Carroll, op. cit.; Ragas, op. cit.
The picture includes information derived from a study by Owen, several courses of study, and several reference books on the social studies.

I. Kindergarten

A. Skills

1. Group planning
2. Following directions
3. Leading group action and thinking
4. Interdependence in activity
5. Self-control
6. Seeing simple relationships
7. Evaluating conduct of group and self

B. Attitudes

1. Respect for property of self and others

3 Michaelis, op. cit.; Caswell and Foshay, op. cit.; Ragan, op. cit.
II. Purpose

1. Respect for people's rights
   A. Consideration for others
      1. Sharing of materials and experiences
      2. Concern for group and individual standards
      3. Respect for group decisions

C. Understandings
   1. Planning is necessary
   2. All people have certain rights
   3. Each individual has responsibilities
   4. Property has value
   5. Many people can share materials
   6. Cleanliness and good health help the individual and group

D. Applications
   1. Sharing materials
   2. Sharing experiences
   3. Planning the day's activities
   4. Working in small groups
   5. Responsibility for tasks in the room
   6. Following rules established by the group or by the school
   7. Telling personal experiences as related to problems as hand
II. First grade

A. Skills
1. Interdependence in activity
2. Following directions
3. Seeing simple relationships
4. Planning use of time
5. Group planning
6. Concentration
7. Organization of information
8. Reading simple maps

B. Attitudes
1. Respect for people's rights
2. Consideration for others
3. Respect for property of self and others
4. Respect for work
5. Sharing of materials and experiences
6. Concern for group and individual standards
7. Respect for group decisions
8. Desire to assume responsibility for tasks

C. Understandings
1. Each individual has responsibilities
2. Planning is necessary
3. The wishes of all are considered in group planning
III. Second  
4. All people have certain rights
   A. Many people can share materials
   5. Homes differ
   6. Property has value
   7. Social consideration for others in 
      necessary in group activities
   8. Safety helps the individual and group
   9. Cleanliness and good health help the 
      individual and group

D. Applications
   1. Working in small groups
   2. Contributing materials for individual 
      or group projects
   3. Sharing experiences
   4. Telling personal experiences as related to 
      problems at hand
   5. Sharing materials
   6. Responsibility for tasks in room, at home, 
      etc.
   7. Planning the day's activities
   8. Contributing toward development of group 
      and school standards
   9. Supporting schoolboy patrol and following 
      other traffic regulations
III. Second grade

A. Skills
   1. Determining gross inconsistencies
   2. Differentiating between fact and imagination
   3. Sensing simple time and space relationships
   4. Evaluating appropriateness of statement, picture, etc.
   5. Making and reading simple maps
   6. Drawing conclusions from data
   7. Following written directions
   8. Determining essential data to record
   9. Keeping simple records
  10. Evaluating proposals
  11. Preparing bulletin board to present information
  12. Beginning parliamentary procedure in group discussion

B. Attitudes
   1. Desire for self-improvement
   2. Desire to improve group and community conditions
   3. Desire to assist in community projects
4. Concern for maintenance and improvement of community standards

5. Judgment in thought and action in group relationships

6. Cheerful acceptance of group decision in group problem

7. Respect for community property, regulations, people, service, and etc.

C. Understandings

1. Individuals depend upon each other for their needs

2. Farm and city people are interdependent

3. All people in the community should help the community

4. The community takes care of some of the needs of its citizens

5. The community is organized to make living more comfortable for everyone

6. Community rules are made for the good of all the people

IV. Third

A. 7. The community has a government which helps the people

8. Cooperation of people is necessary to prevent and solve community problems
D. Applications

1. Observing school and city regulations in riding bicycles, crossing streets, disposal of garbage
2. Cooperating with local officials in prevention of spread of communicable diseases
3. Participating in community activities such as clean-up and fire prevention
4. Contacting people in and out of school for materials and information
5. Assuming school responsibilities
6. Obtaining permission to use property of others
7. Assuming responsibility for public property and property of others
8. Informing officials of damages observed or caused by the individual
9. Returning or reporting found property

IV. Third grade
A. Skills
C. 1. Solving personal problems
   2. Seeing cause and effect relationships
   3. Keeping records
54. Identifying inconsistencies and inaccuracies
55. Interpreting data given on simple types of maps
56. Reading simple charts and tables
57. Beginning selection of references
58. Beginning reading of globes

B. Attitudes
1. Desire to assume increasing responsibility
2. Desire to improve living conditions in the group
3. Respect for contributions of other communities to our community
4. Feeling of responsibility to other communities
5. Feeling of responsibility for contributing to or participating in state projects
6. Respect for state property
7. Concern for maintenance and improvement of state standards

C. Understandings
1. Communities are interdependent
2. Change is continuous
3. Variety of occupation makes the people more interdependent

4. Human activities are affected by environment

5. No state is economically self-sufficient

6. Communities are closer together because of improved transportation and communication

7. The state takes care of some of the needs of its citizens

8. The ways in which people live have changed in Iowa

9. Resources must be conserved

10. Recreation is necessary for healthful living

D. Application

1. Conserving of public and private property

2. Observing state laws concerning use of state parks, highways, fire crackers, state buildings, historical sites, etc.

3. Participating in state activities such as weed control, safety campaigns, health campaigns, etc.

4. Interviewing people in and out of school

5. Supporting functions sponsored by the elementary school
6. Exhibiting initiative in improving group conduct in corridors, rest rooms, fire drills, and at times of special functions

7. Displaying initiative in filling responsibilities as room officers

8. Showing initiative in improving room or school and community conditions

V. Fourth grade

Skills

1. Understanding complex relationships of cause and effect and time and space

2. Solving group problems

3. Recognizing and explaining inconsistencies

4. Differentiating between fact and opinion

5. Determining authenticity of information

6. Selecting pertinent data from sources

7. Preparing graphs to show pertinent data

8. Reading simple graphs

9. Following parliamentary procedures in election, panels, homeroom business, etc.

B. Attitudes

1. Sense of responsibility for individual and group self-discipline
2. Respect for peoples of different races, religions, and customs
3. Respect for the different occupational groups
4. Respect for contributions of other areas of the United States to our area
5. Feeling of responsibility to other areas
6. Desire to contribute toward state projects
7. Unwillingness to accept individual or group tasks poorly done
8. Need for critical evaluation in choice of people for positions
9. Need for deliberation before speaking or acting

C. Understandings
1. All communities of the United States are dependent upon each other
2. No nation is economically self-sufficient
3. Cooperation between parts of the country is mutually beneficial
4. Political and economic conditions in one part of the country affect other parts
5. National controls are necessary for the common good
VI. FIFTH

6. The United States helps provide for the health, recreating, and education of the people.

7. A complex national type of government is necessary in our society today.

8. Economic efficiency depends upon good distribution.

9. Natural resources must be conserved.

D. Applications

1. Observing federal laws concerning interstate traffic; use of national parks, monuments, preserves; use of federal buildings; protection of migratory waterfowl.

2. Conserving federal property.

3. Participating in federal activities such as purchase of bonds and stamps, Memorial Day, Flag Day, and Arbor Day.

4. Assisting people in need as the following:

   - flood, fire, earthquakes, tornado, minority groups, organizations.

5. Using parliamentary procedures in panel, committee, room as a whole, elections.

6. Observing various types of occupations.
VI. Fifth grade

A. Skills
1. Selecting and using sources of information
2. Interpretation of data from maps, tables, charts, and graphs
3. Using proven facts in group discussions
4. Drawing conclusions
5. Summary and outline of information for report and record
6. Reading various types of maps
7. Reading various types of map projections
8. Using time lines

B. Attitudes
1. Consideration for others, although wide differences between individuals or groups exist
2. Respect for people of other nations, races, religions, and customs
3. Respect for contributions of other countries
4. Need for development of better inter-country relationships in the Western Hemisphere
5. Feeling of responsibility to other countries
6. Desire to contribute toward national resources
7. Concern for conservation of natural resources through conservation of products used daily
8. Desire for school improvement
9. Willingness to accept responsibility, although chosen for a task not desired

C. Understandings
1. No nation in the Western Hemisphere is economically self-sufficient
2. People of the Western Hemisphere are mutually dependent upon each other
3. Cooperation between countries of the Western Hemisphere is mutually beneficial
4. The Western Hemisphere is and has been influenced by the culture of the rest of the world
5. Freedom is one part of the Western Hemisphere is dependent upon freedom everywhere else
6. Social lags in one part of the Western Hemisphere adversely affect other parts
7. Variety in environment in the Western Hemisphere results in wide differences in occupations and ways of living
8. Better ways of living and understanding are attempted by the United Nations

9. Political and economic conditions in one part of the country affect other parts

10. Our country has not always been as it now is

11. Our type of democracy is developed through a gradual process

VII. Sixth

D. Applications

1. Independence in good social behavior

2. Imposing and enforcing higher standards of individual and group conduct

3. Initiating and participating in school improvement projects and in continuous school improvement

4. Initiative in writing to firms, agencies, etc. for information and collection of materials essential to promotion of study in room

5. Collecting authentic information from other countries

6. Disseminating authentic information and materials to children of other countries

7. Corresponding with children of other countries
8. Publication of articles written by children of other countries in school newspaper
9. Welcoming citizens of other countries to our country
10. Planning and directing school and community projects

VII. Sixth grade

A. Skills
1. Critical evaluation of current information
2. Determining authenticity of sources
3. Critical comparison of data given in different sources
4. Determining desirable method of presenting data
5. Preparation of graph for purposes of comparison
6. Use of complex charts and graphs
7. Use of complex maps

B. Attitudes
1. Openmindedness toward differences of opinion
2. Insistence upon getting truth to assist in solution of problems
3. Persistence in meeting tasks at hand
4. Unbiased approach to problems
5. Enthusiasm for promoting of conditions desirable for the group
6. Desire for improvement of school attitudes, morale, habits, and general living conditions

C. Understandings
D. 1. No nation in the world is economically self-sufficient
2. Cooperation between countries of the world is mutually beneficial
3. Political and economic conditions in one part of the world adversely affect other parts
4. Freedom in one part of the world is dependent upon freedom everywhere else
5. Social lags in one part of the world adversely affect other parts
6. Misery and injustice exist in many parts of the world
7. Educational opportunities differ in many countries of the world
8. Prosperity of one nation is dependent upon the prosperity of all nations

In the present points were listed. Some did not present such points.
however, the Variety in environment in the world results
in wide differences in occupations, way
of living and thinking
listed for grades.
11. Better understandings and ways of living
are attempted by the United Nations

D. Applications
1. Corresponding with children of other
countries
2. Initiating and participating in school
improvement projects and in continuous
school improvement
3. Initiative in writing to firms, agencies,
etc., for information and collection of
materials essential to promotion of study
in the room
4. Planning and directing school and community
projects
5. Collecting authentic information from other
countries
6. Disseminating authentic information and
material to children of other countries
In the preceding list only major and representative
points were listed. Space did not permit going into detail.
However, the author would like the reader to understand that even though a specific point is not listed it still may be applicable. This was especially true for points that were listed for a specific grade and not for the succeeding or preceding grades.

I. DEFINITION OF SCIENCE

Burnett in his definition of science states it may be subdivided into three aspects. First, it is an attempt to bring together divergent thinking and practices in the teaching of science. It includes material gained from current classroom practice, research studies, and writings of educators. Science is subdivided into the four areas of determination of science: objectives of science, trends in science, surveys of science, and science.
CHAPTER IV

SCIENCE

II. OBJECTIVES OF SCIENCE

This analysis of the science program in the modern elementary school is an attempt to bring together present day thinking and practice in the teaching of science. It includes material gained from several textbook series, research studies, and writings of authorities. This chapter is subdivided into the four areas of definition of science, objectives of science, trends in science, and grade level specifics.

I. DEFINITION OF SCIENCE

Burnett in his definition of science breaks it down into three aspects. First, it is the facts about things and events that careful observation, experimentation, and reasoning have shown to be apparently true. In other words, the organized and classified data that the facts, conclusions, and generalizations through tested experience best explain or interpret phenomena. Second, science is also a point of view or attitude toward phenomena that assumes natural causes for all things that can be detected by the senses. Third, science is a general method of investigation or search for as many as possible of the relevant facts and relationships,
and the forming of tentative conclusions that appear to be in keeping with them.¹

II. OBJECTIVES OF SCIENCE

The primary objective of science is developing a way of seeing, defining, and dealing with problems in such a manner that they can be dealt with more effectively the next time they are faced. The following list of objectives by Webb in the National Elementary Principal's Thirty-Second Yearbook elaborates the objectives of science in the elementary school more fully:

Science is taught in today's elementary schools:

1. To give practice in simple observations—as background for future investigation and understanding of the environment.

2. To give practice in purposeful activity—as background for future experimentation and constructive labor.

3. To give experience in combining the factual and the emotional (as caring for a well-loved pet or flower)—as background for future appreciation of natural law and beauty.

4. To enlarge the vocabulary with the names of simple objects and processes—as background for the future use of necessary technical terms.

5. To guide emotional responses away from the highly subjective and toward the objective—as background for future sensible attitudes and desirable behavior.

6. To start habits of scientific thinking in simple matters—as background for scientific thinking in important future decisions.

7. To start building attitudes toward the simple social effects of science—as background for future cooperation in community programs of health and welfare.

8. To develop simple concepts such as cause and effect, balance of nature, cycles of nature, and the like—as background for future understanding of broad concepts like conservation of resources, the laws of learning, and even the sacredness of truth.

9. To develop a simple reverence for nature—as background for future appreciation of the wisdom and power of God.  

III. TRENDS IN SCIENCE

A review of the National Elementary Principal's Thirty-second Yearbook and Part I of the National Society for the Study of Education Forty-sixth Yearbook reveal the following trends in the teaching of science in the elementary school.

1. There is a trend toward emphasizing the social applications of science and the scientific method.

2. There is a trend toward having general science courses

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2 Ibid. 1-296.

The examination school

The trend toward the teacher recognition method is a trend toward the development of a cooperative atmosphere with the teacher.

For the teacher to be needed, there must be a trend toward the teacher recognition method.

In the trend toward the teacher recognition method, the teacher is needed to be a leader in the recognition of the student's method of learning.

Group planning, group work, and co-operative expression of ideas are now widely used in the examination system. The examination teacher is no longer a passive role in the system, but rather a leader in the development of the student's method of learning.

There is a trend toward the development of a cooperative atmosphere with the teacher.

Science teacher

Rather than a cooperative for each phase of science,
he selected seventeen specialists on the basis of their prominence in the elementary school science field, as evidenced by textbooks written, articles published, membership on national committees, and professional positions. They each in turn also suggested some teachers who were actively engaged in teaching of science in the elementary grades. From this final list of 148 jurors for his survey he received returns from 101. From a list of eighty-three science principles he asked each of these people to indicate the grade level at which each of the principles, in their opinions, could be best introduced. The results indicated that in no instance did more than 50 per cent of the jurors select any single grade for the introduction of a principle.\(^1\)

This finding is in accord with what Herrick\(^2\) reports as the findings of several similar studies\(^3\).

In a discussion of grade placement of the content of science

\(^1\)Leonelli, National Education Association \textit{op. cit.}, pp. 129-134.

\(^2\)Herrick, \textit{op. cit.}, p. 225.

\(^3\)James E. Hillman, Some Aspects of Science in the Elementary Schools, Peabody Contributions to Education Nos. 8-14 (Nashville: George Peabody College for Teachers, 1922); Alice Gilbert, "Science Content in the Elementary School," \textit{School Science and Mathematics}, XLIII (November, 1943), 769-774; and, An unpublished study made by Frank J. Estvan under the direction of Virgil E. Herrick for use in the Field Program of the Committee on Surveys and Field Services Department of Education (Chicago: University of Chicago, 1948).
the elementary science curriculum, present day thinking is
well summed up in the following excerpt from Part I of the
Forty-six Yearbook of the National Society for the Study of
Education.

It is most important that the material selected for
each grade be balanced to include the elements of learn-
ing which represent a rich experience with science. Each
level should give the child some opportunity for
exploration with content derived from the five great
major fields of science: astronomy, biology, chemistry,
geology, and physics. This cannot be accomplished by
studying only plants and animals.

There should also be balanced instruction as to the
types of activities employed. Children should have rich
opportunity to develop their abilities in discussion,
in experimentation, in observing in the out of doors,
and reading for information and motivation. A complete
program of instruction can be maintained only by the
full utilization of all these activities, for each plays
its part in the development of the purposes of science
education.1

This type of curriculum development exemplifies what
can be termed as spiral development. Each year, as all areas
of science are sampled, broader understandings are developed.
More emphasis may be placed on various problems within a par-
ticular area in one year, yet all areas are touched upon. In
succeeding years problems in other areas may be more heav-
ily emphasized. The total effect is that the child has ever
broadening problem-solving experiences in wide areas of sci-

1 National Society for the Study of Education, Forty-
sixth Yearbook, Part I, op. cit., p. 84.
ence through the use of the scientific method.

To be more specific as to the particular areas of science that are explored each year, the following list from Part I of the Forty-sixth Yearbook of the National Society for the study of Education is representative.

1. The Universe. Here provision is made for the study of the stars, the sun, the moon, the planets, and their interrelationships. Pertinent materials would include those essential to an understanding of the causes of day and night, seasonal changes, tides, eclipses, and (less completely) of the vastness of the Milky Way galaxy and galactic systems beyond our own.

2. The Earth. Among the pertinent topics in this phase of the environment are such problems as the origin of the earth, the formation of mountains, weathering of rock into soil, erosion, volcanism, pre-historic life, and the forces which have changed and are still changing the surface of the earth.

3. Conditions necessary to life. What living things need in order to exist, how they are affected by changes in the environment, and the struggle for the conditions necessary to life are suggested materials in the development of this aspect of the environment.

4. Living things. Suitable materials include the variety of living things, the social life of animals, adaptations for protection, life cycles of plants and animals, how living things obtain their food, the economic importance of living things, and man's influence upon nature.

5. Physical and chemical phenomena. Such chemical phenomena as rusting are considered in this phase of the environment. Physical phenomena which may be appropriate include: light, sound, gravity, magnetism and electricity, changes in state of matter, and the phenomena associated with radiant energy and atmospheric changes.
6. man's attempt to control his environment. In this aspect of science the child may study man's control in gardens, on farms, in orchards; his inventions and discoveries; his use of power, of minerals; his control over living things; his study of places he cannot reach directly; and other such areas of research.

Though these areas deal primarily with the physical and biological environment, consideration should be given to the areas growing out of the living and social needs such as health, safety, conservation, and economics. It is evident that these areas of living will utilize content described in areas of the physical and biological environment and will form a basis for the development of desirable knowledges, attitudes, and appreciations.

To verify to a degree the validity of the use of the spiral development in the elementary school science curriculum today the author surveyed several series of textbooks.

and several curriculum guides. This was done by checking each textbook series and curriculum guide against the six areas of science previously listed.

A study of each of the textbook series and curriculum guides it was found that material assignable to each major area was presented as content for each grade level. There was variance among the sources as to the amount of content from each area for each grade, but each area was represented in each grade in each source.

A typical illustration of how the units fall into the general pattern of the major areas can be seen from the following:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Spiders</td>
</tr>
<tr>
<td>II</td>
<td>Life in Ponds and Streams</td>
</tr>
<tr>
<td>III</td>
<td>Trees in Autumn</td>
</tr>
<tr>
<td>IV</td>
<td>How Plants Grow and Store Food</td>
</tr>
<tr>
<td>V</td>
<td>How Weather Changes Rocks and Makes Soil</td>
</tr>
<tr>
<td>VI</td>
<td>Winter Birds</td>
</tr>
<tr>
<td>VII</td>
<td>Caring for Our Pets</td>
</tr>
<tr>
<td>VIII</td>
<td>Getting Acquainted with Stars</td>
</tr>
<tr>
<td>IX</td>
<td>Magnets and How They Work</td>
</tr>
<tr>
<td>X</td>
<td>Spring Birds</td>
</tr>
<tr>
<td>XI</td>
<td>Wild Flowers Around Waterloo</td>
</tr>
<tr>
<td>XII</td>
<td>Insects That Live and Work Together</td>
</tr>
</tbody>
</table>


These twelve units are suggested for the fourth grade. A comparison of the listed topics and the major areas previously discussed shows how they fall into those major cases. A study of the actual material given in the science guide more fully shows this relationship.

It was found that there was general agreement among writers of textbooks and other authorities as to grade placement of specific studies.

In the matter of whether arithmetic should be taught as a separate subject or part of the whole curriculum, the following was the opinion of the Committee of 1923 of the Fiftieth Session of the National Congress of the Study of
SUMMARY AND CONCLUSIONS

A study of the listed aims and objectives of the arithmetic, social studies, and science areas of the curriculum reveals that they all were in accord with the general objectives of a good elementary school previously listed. However, the arithmetic, social studies, and science areas of the curriculum each had their own particular way of determining their content, development, and teaching.

Arithmetic is one of the traditional elementary school subjects. The content of arithmetic is such that the child must understand previous concepts in order to learn new ones. The combination of these two factors results in a more formal curriculum than that of the social studies or science.

I. ARITHMETIC

It was found that there was general agreement among writers of textbooks and other arithmetic authorities on the principles that something a child understands has more meaning for him than something that the arithmetic curriculum is becoming foreign to the needs of children.

Consequently it was felt that the psychological learning principles that something a child understands has more meaning for him than something foreign to the needs of children.

In the matter of whether arithmetic should be taught as a separate subject or part of the broad curriculum, the following was the opinion of the committee of Part II of the Fiftieth Yearbook of the National Society for the Study of
Education: followed by drill. Instead, the child attempts a new problem. It is the unanimous opinion of the present committee, however, that after careful appraisal of such evidence as does exist, and after giving full credit to what has been or is likely to be accomplished under integrated work plans, such plans by themselves cannot be depended upon to develop arithmetical concepts and abilities to levels and scope required in life. An especially designed program of instruction is essential, and such a program should include not only provision for systematic and meaningful learning in the arithmetic class but also attention to the mathematical needs and contributions of other areas.¹

Tests no longer are used only to grade certain skills in arithmetic. Most educators will agree, however, that there is opportunity for much meaningful arithmetic experience in every area of the curriculum. The utilization of these opportunities to further the child's interest and understandings will contribute to his education.

In reviewing the trends in arithmetic, it was noted that there were several indications that the arithmetic curriculum is becoming more flexible in meeting the needs of children.

Cognizance is being taken of the psychological learning principles that something the child understands has more meaning for him than note learning. The arithmetic class is no longer conducted on the basis of giving a rule, then the student is asked to apply it in a routine situation. Instead, the child is given a problem which he is to analyze and work out for himself in whatever way he can. He is not told what to do but is encouraged to think and act for himself. We need to recognize the fact that just because a child can solve a problem as shown by a test does not mean that he can use the same principles in another situation or handle a more complex problem.

example, followed by drill. Instead, the child attacks a new problem on the basis of previous concepts and, with the aid of the teacher, develops new understandings. He then works out his own rule and is able to solve problems on the basis of understanding rather than just using a meaningless rule. 

In the child and the home, testing in arithmetic has taken over a new role. Tests no longer are used only as an objective measure of the degree certain skills have been mastered. They have become a valuable tool for teaching these skills as well. Arithmetic tests have been broadened in scope to include oral and essay types as well as the objective.

II. SOCIAL STUDIES

The Social studies have a very broad content base by the very nature of the broad fields they encompass. The concept of the social studies in their simplest form is a matter of increasing understanding of and skill in human relationships. For content material they have adapted the social sciences for instructional purposes. A review of the information resulting from the author’s research presented in the chapter on social studies bears out this concept. The social studies seemed to have a quite definite
pattern in the general organization of the content for each grade but quite wide variance in specific organization. The general pattern was based on ever widening circles of understandings. Its main focus was on the problems, interaction and reaction, and interdependence of human beings. At the center is the child and the understandings expand to the home, to the classroom, to the school, to the community, to the surrounding communities, to the state, to the nation, to the Western Hemisphere, and to the entire world. There seems to be general acceptance of this type of organization but the implementation in the individual classroom is unique to that classroom. This is only natural when the purposes of the social studies are considered. For example, one of the understandings for the second grade is that individuals depend upon each other for their needs. One common approach to this is through a study of occupations with the emphasis on the problems of the worker rather than on the type of work well done. The resources at the disposal of the teacher in a rural community and a teacher in a city system are vastly different. The children in various schools in a city system often represent wide differences in socio-economic backgrounds. Yet each teacher using local resources can bring each child to an understanding that individuals depend upon each other for their needs. The classroom material and pro-
edure in each case will probably differ but the outcomes will be the same.

One of the trends indicated that the concept of the social studies is being broadened. Content material of the separate subjects is being viewed as resource material to draw upon to solve problems of significance to the group. If the objectives of the social studies that were listed are valid, this idea is important to all teachers no matter what sort of curriculum has been set up in their school. This is true because with this view the teacher is able to proceed with her group where she finds them. She is free to mold the curriculum to fit the group rather than trying to mold the group to fit the curriculum.

III. SCIENCE

The organization of the science curriculum is built on the spiral concept as discussed in the chapter on science. This does not mean, however, that the child will cover the same subject matter each year. The total area of science is so great that there need not be repetition, but in practice the content will be used in different years with emphasis on different facets. This, of course, is not a basic concern since the real objective of science teaching is not subject matter but rather a way of solving problems and an under-
standing of concepts. The subject matter is just the vehicle used to arrive at the desired goals.

The scientific method is no longer an isolated step by step process but rather a way of thinking. This problem solving technique of the field of science carries over as a valuable problem-solving tool to all areas of the curriculum. Similarly to arithmetic is the role of science in the elementary school. A look at the objectives of science in the elementary school reveals the great change that has taken place in the perspective of science. Science teaching is no longer so greatly concerned with the subject matter of science, but rather the social aspects and consequences of science have assumed the dominant role.

IV. OVERVIEW OF ARITHMETIC, SOCIAL STUDIES, AND SCIENCE

The three areas, arithmetic, social studies, and science, each represent a different form of curriculum construction. Arithmetic typifies the step by step or stair-case development. The child's learning is based on specific learnings of previous years. The social studies illustrates the concentric circle development. Some authors liken it to the everwidening circles formed when a pebble is dropped into quiet water. The child is in the center and his understand-
ings extend ever further into his environment. Science is an example of the spiral development whereby every year certain areas are touched upon with progressively greater understandings being the result.

Arithmetic seems to be retaining its identity in the elementary school curriculum. A special time devoted exclusively to arithmetic is the rule. Social studies and science are being correlated in many classrooms. Any unit undertaken in the social studies has scientific aspects and the use of the scientific method of problem solving is almost a must. There is increasing importance being attached to the social aspects of science. Science and social studies lend themselves very readily to correlation.

The general objectives of the elementary school and the objectives of arithmetic, social studies, and science recognize that interests and needs of children are the basis for effective learning. They all either directly or indirectly take cognizance of the individual differences of children and groups. The whole investigation because of its general nature was based on the average child. Parents, teachers, and administrators must view the information in this study as an average and not as a specific maximum or minimum yardstick for any individual child or any particular group.
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SELECTED BIBLIOGRAPHY


A. BOOKS


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E. COURSES OF STUDY


