

A CONTENT STUDY OF EARTH SCIENCE TEXTBOOKS
APPROVED FOR KANSAS JUNIOR HIGH SCHOOLS

by

Thomas Joe Norris

B. S. E., Oklahoma Christian College, 1964

A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

Kansas State University
Manhattan, Kansas

1967

Approved by:


Charles M. Puccio
Major Professor

LD
2668
R4
1467
N 85-9
C.2

ACKNOWLEDGMENT

The writer wishes to express his sincere appreciation to Dr. Charles M. Peccolo for his encouragement and assistance given during the preparation of this report.

TABLE OF CONTENTS

	Page
INTRODUCTION.	1
Statement of the Problem.	2
Importance of the Study.	2
Limitations.	3
Definition of Terms.	4
Earth Science.	4
Content.	4
REVIEW OF LITERATURE.	5
Need for Earth Science.	5
Growth of Earth Science.	6
Why Study Earth Science?.	7
Textbooks.	9
Content Evaluation.	10
DESIGN OF THE STUDY.	12
PRESENTATION OF DATA.	16
SUMMARY AND CONCLUSIONS.	30
BIBLIOGRAPHY.	35

LIST OF TABLES

TABLE	PAGE
I. Topics Related to History of the Earth	17
II. Topics Related to Earth and Its Land Forms . .	18
III. Topics Related to Oceans of the Earth	22
IV. Topics Related to Climates of the Earth . . .	23
V. Topics Related to Earth's Atmosphere	24
VI. Topics Related to Earth and the Universe . . .	26
VII. Levels of Reading Difficulty	28
VIII. Grade Levels of Difficulty Equivalent to Reading Difficulty Scores	29
IX. Summary of Content Analysis	32

INTRODUCTION

The launching of the first Sputnik caused men to realize that they were living in a completely new and almost mysterious age. This event immediately created a new interest in the study of the earth and space. Education and government officials realized that traditional science courses were not preparing the nation's young people for life in the space age.

The re-evaluation of science curricula revealed a void at the junior high level.¹ Mostly, the offering was limited to a course of study called "General Science." General science courses are usually bits and pieces of information pulled from the areas of biology, chemistry, physics, meteorology, and geology. There has been no effort to connect these areas of study except the binding of the book.² A course of study with a definite theme and goal was needed for the junior high school.

Earth science is a course which has a definite purpose and offers a unifying theme between the different areas

¹T. N. Hubbard, "Earth Science Now 'in Orbit.'," The American School Board Journal, 151:26-27, July, 1965.

²E. John De Waard (ed.), "Earth Science Course: Effective Science Experiment for the Junior High School," Current Science Teacher's Edition, 51:1, January 26, 1966.

which it encompasses. The major areas of earth science are closely connected to each other. The carry-over of basic facts and principles from one area to another gives more time to investigate each area at a greater depth.

Statement of the Problem.

The purpose of this study was to (1) determine what topics should be included in an earth science textbook; (2) compare the content of four earth science textbooks with the list of topics which should be included in an earth science textbook as determined by the study; and (3) recommend the textbook or textbooks which would best meet the needs for teaching earth science in the junior high school.

Importance of the Study.

Textbooks are the most important teaching tool. The textbook is the basis of every curriculum and determines to a great extent what will be taught.³ The selection of the right textbook is a very important step in assuring the success of any school subject.

It is hoped that the results from this study may be used to reach decisions regarding the adoption of earth science textbooks.

³William H. James, and Harold H. Eibling, "Is Your District Using the Right Textbooks?," School Management, 8:80, October, 1964.

Limitations.

The study was limited to the four earth science textbooks approved by the Kansas State Textbook Screening Committee for the 1967-1968 school year.⁴ The textbooks studied were:

Mac Cracken, Helen Dolman, et al., Basic Earth Science. Syracuse: L. W. Singer Company, 1964.

Namowitz, Samuel N. and Stone, Donald B. Earth Science--The World We Live In.*

Thurber, Walter A. and Kilburn, Robert E. Exploring Earth Science. Boston: Allyn and Bacon, Inc., 1966.

Wolfe, C. Wroe, et al., Earth and Space Science. Boston: D. C. Heath and Company, 1966.

Only the content of the textbooks was compared. Analyses of factors, other than content, involved in textbook evaluation were considered beyond the scope of this study.

The study was limited to the writer's opinion as to what topics should be included in a study of earth science. The writer had in mind the needs of the Junction City Junior High School when this study was made. Other raters would likely include other topics and exclude others. This would

⁴Textbooks Suitable for use in Kansas Schools and Applicable Statutes, Regulations and Policies, A List of Textbooks and Workbooks. Approved by the State Textbook Screening Committee (Topeka, Kansas: State Printer, 1967), pp. 61-62.

*In the following pages this title will be referred to as Earth Science.

be particularly true of raters in larger or smaller schools or in other areas of the United States.

The numerical rating of the content was almost completely subjective. This rating was based solely upon the opinion of this writer and was therefore considered a limitation to this study.

The readability of the textual material was tested using only the Flesch formula.

Definition of Terms.

Earth Science. Earth science as investigated in this study was defined as a study of the basic concepts of astronomy, meteorology, geology, oceanography, and physical geography.

Content. Content as used in this study refers only to the printed text and illustrations.

REVIEW OF LITERATURE

Need for Earth Science.

The study of earth science is not new. Physiography was commonly taught in many of the nation's schools about 50 years ago. This course was designed to introduce the student to the planet earth. In the following years, rapid advances were made in the fields of biology, chemistry, and physics. As a result, earth science virtually disappeared from the secondary school curriculum.⁵

For many years, the junior high science program consisted mostly of general science. The junior high science program has been continually weakened by the strengthening of the science program in the elementary schools and the thorough revision of the senior high school science offerings.⁶ Recently, there has been a considerable amount of dissatisfaction with the general science courses in the junior high. There were two basic reasons for this dissatisfaction: "first, the repetition that occurs in such a program, and secondly, the great diversity of topics that

⁵William H. Matthews, "Growth of Earth Science in Secondary Schools," School Science and Mathematics, 63:637, November, 1963.

⁶De Waard, loc. cit.

are attempted."⁷

Growth of Earth Science.

Recent studies have shown that general science as an offering is on the decline in terms of both schools offering it and students enrolled in it.⁸ "Earth science . . . is rapidly rising to the status of biology, chemistry, and physics to become the fourth basic subject for the secondary level."⁹

In 1958, only 9 schools in Pennsylvania included earth science in the curriculum. By 1963 more than 400 schools offered earth science.¹⁰

In 1963 the Texas Education Agency estimated that "during the next few years" almost every junior high school in the state would offer courses in earth science. Likewise in New Jersey there was a 600% increase in earth science offerings from 1959 to 1963.¹¹

⁷John C. Hook, "New Programs in Earth Science," The Teachers College Journal, 33:123, March, 1962.

⁸Paul M. Tweeten, "Science Curriculum Trends in Iowa," School Science and Mathematics, 67:36, January, 1967.

⁹Hubbard, loc. cit.

¹⁰Matthews, op. cit., p. 638.

¹¹Ibid.

Why Study Earth Science?

Earth science contributes directly to the students general education by providing a better understanding of many of the most important and familiar aspects of our environment.¹² Schering and Shupack stated that:

Every intelligent young person should have at least a basic knowledge of the weather, of the solar system, of the use of maps, of the appearance of the stars in the heavens, of the forces that have changed and are changing the face of the earth. By becoming familiar with these and innumerable other topics within the scope of earth science, you will make yourself a more informed, able, and interesting person.¹³

A working knowledge of earth science will equip people to take part in many interesting hobbies. For example, sailing requires a knowledge of tides, currents, weather, and navigation. Other hobbies based on earth science are; rock collecting, amateur astronomy, and hiking. A study of earth science can result in a greater appreciation of nature which is a hobby in itself.

Earth science has a definite value in preparing students for various occupations associated with earth science. Careers could include such fields as minerology, petroleum geology, farming, astronomy, meteorology, aviation, marine navigation, cartography, and others.¹⁴

¹²John S. Richardson, Science Teaching in Secondary Schools (Englewood Cliffs, New Jersey: Prentice-Hall, 1957), p. 48.

¹³Fred J. Schering and Ben Shupack, Mastering Earth Science (New York: Oxford Book Company, 1963), p. 3.

¹⁴Ibid., p. 4.

Students in the past have been taught many concepts of earth science under the traditional general science curriculum. Many supporters of the general science program have made this statement. Earth science seems to be more stimulating and thought provoking for the junior high science student. Also, the topics in each subject area are developed to a greater depth than they are in general science.¹⁵ Therefore, it appears logical that students taking earth science as compared to those enrolled in general science would learn more about the basic concepts of astronomy, geology, meteorology, oceanography, and physical geography; even though the same areas are studied in both programs.

Davison and Fowler conducted a study to determine if students in earth and space science classes learn "more earth and space science" than students do in general science classes. The results showed conclusively that:

the ninth grade earth science students were superior to the ninth grade general science students in the area tested . . . On no items did the general science group score significantly higher than the earth science group. ¹⁶

¹⁵Donald L. Pollinger and Eugene R. Syrewicz, "Earth Science," School and Community, 53:17, November, 1966.

¹⁶Hugh M. Davison and H. Seymour Fowler, "Earth Science Course Evaluation: What Do They Learn in Earth Science?," Science Education, 49:184-185, March, 1965.

Textbooks.

"It has always been true and will probably continue so for many years that the textbook determines to a very large extent the nature of the experiences that students have in science."¹⁷

The textbook ranks second to none as a teaching aid. Projectors, films, recorders, record players and other teaching aids are valuable teaching aids, but they do not begin to compare with the textbook.¹⁸

The increased enrollment of students in earth science opened a new door of opportunity for many textbook publishers. Each was eager to get his book on the market before anyone else. As a result, many of the earth science textbooks published a few years ago were of poor quality. In 1961, Caldwell reported that few textbooks then on the market were "well fitted to the needs of the secondary school earth science course."¹⁹

Since 1961 there have been many revised and completely new earth science textbooks placed on the market. It was the purpose of this study to determine whether the more recent earth science textbooks would meet the needs of today's

¹⁷Richardson, op. cit., p. 41.

¹⁸James, loc. cit.

¹⁹Loren T. Caldwell, "The New Role of Earth Science in Emerging School Science Programs," Geotimes, 5:27, March, 1961.

earth science courses.

Content Evaluation.

There are many factors involved in evaluating textbooks. Mallinson, who has done extensive and numerous writings on readability suggested that the following factors be considered: content, vocabulary load, sentence structure, illustrations, interest level, and supplementary materials.²⁰ The writer feels that a careful check for the completeness and accuracy of the glossary should be included in the evaluation of textbooks. According to a study by Laurence, the "glossary was the teaching aid most widely used . . ." ²¹

The reading level of a science textbook is hard to determine accurately because of the number of technical words peculiar to science. Several research studies have clearly indicated that experts vary greatly in the evaluation of reading difficulty, and the "opinion of teachers vary a great deal more; often by as much as nine grades." ²²

²⁰George G. Mallinson, "Reading and the Teaching of Science," School Science and Mathematics, 44:148-153, February, 1964.

²¹Francis St. Laurence, "Are Heavy Textbooks Necessary?," The Science Teacher, 18:73, March, 1951.

²²Mallinson, op. cit., p. 151.

Brown also states that ". . . it seems logical to suggest that the application of the readability formulas to science books be done with caution."²³

Reading difficulty levels of texts may not be as great a problem in the junior high school as it is in the senior high school. In an earlier study Mallinson concluded that:

In general, textbooks for junior high school science are not likely to cause difficulty for the average student, although they are likely to cause some difficulty for the below-average student. Further, some passages in all of the textbooks are likely to be difficult for all but the superior student. ²⁴

The reading level of textbooks is of great importance and should be considered by everyone involved in the selection of textbooks. Reading level of textbooks is not more important than other qualities of the books.²⁵ Just because a textbook is easy to read does not mean that it would be the best available for teaching an effective earth science course.

²³Walter R. Brown, "Science Textbook Selection and the Dale-Chall Formula," School Science and Mathematics, 65:166, February, 1965.

²⁴George G. Mallinson, "The Readability of High School Science Texts," The Science Teacher, 18:253-256, November, 1951.

²⁵Brown, loc. cit.

DESIGN OF THE STUDY

The four earth science textbooks used in this study were read carefully and the content tabulated under one of six broad areas of earth science. Topics related to a broad area were selected from a list of topics which current literature indicated should be taught in an earth science course and, also, from the content outlines of the four textbooks used in this study.²⁶ The broad areas of earth science and the related topics used were as follows:

- I. History Of the Earth
 - A. Precambrian through Paleozoic
 - B. Mesozoic and Cenozoic
 - C. Prehistoric Man
 - D. Record of the rocks
- II. Earth and Its Land Forms
 - A. Minerals in the rocks
 - B. Economic importance of minerals
 - C. Origin of rocks
 - D. Reading topographic maps
 - E. Rock weathering and gravity
 - F. Underground water
 - G. Wind and land forms
 - H. Running water and land forms
 - I. Earth movements and earth quakes
 - J. Vulcanism and volcanoes
 - K. Plains, plateaus, and mountains
 - L. Lakes, reservoirs, and water conservation
 - M. Floods and soil conservation
 - N. Physiographic provinces of the United States
- III. Oceans of the Earth
 - A. The ocean and its currents
 - B. Waves, shore currents, and shorelines

²⁶John M. Chapman and Loren T. Caldwell, "A content Study of Earth Science Courses in Selected Secondary Schools," Science Education, 48:430-436, December, 1964.

- IV. Climates of the Earth
 - A. Factors that control climate
 - B. World climates
- V. Earth's Atmosphere
 - A. Nature of the atmosphere
 - B. Heating and cooling of the atmosphere
 - C. Air Pressure
 - D. Changing winds of the atmosphere
 - E. Water vapor enters the atmosphere
 - F. Condensation and clouds
 - G. Precipitation of moisture
 - H. Air masses and fronts
 - I. Cyclones and Thunderstorms
 - J. The weather bureau and its work
 - K. Light and color of the sky
- VI. Earth and the Universe
 - A. Stars and galaxies
 - B. The sun and the solar system
 - C. Our satellite, the moon
 - D. The Earth, its motions and seasons
 - E. Location and navigation
 - F. Keeping time
 - G. Space exploration

This list of topics was used as a check list for comparing the content of the four textbooks studied.

The topics discussed in each textbook were recorded in tabular form under the appropriate area of study. Page numbers were noted so the material could be easily located. Just because the topics happened to be discussed in a textbook was no indication that all the authors treated each subject alike or placed the same amount of emphasis on it. Therefore, in order to gain a more accurate comparison of content, the content under each topic was evaluated and a numerical rating recorded. The numerical rating scale was as follows:

- 3--topic covered in great detail,
- 2--topic covered adequately,
- 1--topic covered briefly.

Additional topics not on the check list were also noted. These topics were not considered essential to a study of earth science, but added to the quality and uniqueness of the various texts.

Under each broad area, the percent of topics covered by each textbook, as compared to the check list, was noted. The average numerical evaluation was also noted in order to have a better comparison of the detail with which these topics were discussed.

The readability of the textbooks studied was found by using a modification of the sampling technique suggested by Flesch for use with his formula.²⁷

A systematic random sampling was used. Page 25 was selected at random and every 50th page thereafter, i.e., pages 25, 75, 125, etc. to the end of the book.

A one-hundred word sample was taken for each page thus selected by counting from the first word of the first new paragraph on that page. If the page contained no reading material, the sample was selected from the next page

²⁷Rudolf Flesch, The Art of Plain Talk (New York: Harper and Brothers, 1946), p. 196.

that did. The introductions and summaries of chapters as well as legends under illustrations were disregarded. The samples were analyzed by use of the Flesch Formula.²⁸

Three things make for simple language: short sentences, few affixes, and many personal references. The Flesch takes into consideration the average number of words per sentence, the number of personal references in the passages, and the number of affixes to the words. These various aspects of sentence structure were measured in each of the one-hundred word samples and translated into a reading difficulty score by means of the formula. The reading difficulty score was converted into a grade value of reading difficulty.

²⁸Ibid., pp. 195-97.

PRESENTATION OF DATA

Table I showed that all the authors of the textbooks evaluated considered the material relating to the history of the earth important. Three of the four topics were common to all the texts. The Earth Science and Exploring Earth Science textbooks did not include material relating to pre-historic man. The Earth Science and Earth and Space Science texts, as compared to the other two books, tended to discuss the topics more thoroughly. The Basic Earth Science text was the only one of those studied that included a discussion of the controversial topic of Darwin's Theory of Evolution. This topic was not considered important enough to place it on the check list, but it would be useful when discussing the record of the rocks.

The author of Basic Earth Science included only fifty-three percent or eight of the fifteen topics, appearing on the check list, related to the earth and its land forms. Table II also indicated that the three other texts had eleven of the fifteen topics in common, or seventy-three percent. Earth Science was the only text that discussed all the topics in this area of study. The Earth and Space Science and Exploring Earth Science textbooks included additional material not on the check list dealing with the nature of soils. This material could be quite useful, especially in the agricultural areas of the United States.

TABLE I
 Topics Relating to
 HISTORY OF THE EARTH

Text	Basic Earth Science		Earth Science		Earth and Space Science		Exploring Earth Science	
	Pages	Rating	Pages	Rating	Pages	Rating	Pages	Rating
Precambrian-Paleozoic	52-55	1	293-304	3	567-579	3	372	1
Mesozoic & Cenozoic	52-53	1	305-319	3	580-586	3	372	1
Prehistoric Man	71-74	3	None	-	587-588	1	None	-
Record of the rocks	54-57, 62-71, 77-84	3	278-289	3	556-565	2	337-365 369-381	3
Darwin's Theory of Evolution*	58-62	-	None	-	None	-	None	-
Percent of topics common to the check list	100%		75%		100%		75%	
Average Rating	2.0		2.3		2.3		1.3	

*Data not included in the results.

TABLE II

Topics Relating to
EARTH AND ITS LAND FORMS

	Basic Earth Science			Earth Science			Earth and Space Science			Exploring Earth Science		
	Pages	Rating	Pages	Rating	Pages	Rating	Pages	Rating	Pages	Rating	Pages	Rating
Minerals in the rocks	101-103	1	3-15,	3	28-36	3	209-215		224-229		2	
Economic importance of minerals	108-118	2	17-26	3	38-47	3	216-223		241-268		2	
Origin of the rocks	104-105		28-38	3	47-51							
			40-56		69-78, 94-							
Reading topographic maps	None	1	59-69	3	108, 111-122	3	400-418				3	
Rock weathering and gravity	None	-	74-89	3	21-27	2	273-281				3	
Underground water	None	-	91-102	3	80-89	2	230-234				2	
Wind and land forms	35	1	105-110	2	178-190	3	282-295				1	
Running water and land forms	35	-	112-134	3	221-233	3					1	
					153-164							
					166-176							
Glaciers and land forms	None	1	138-156	3	162-176	3					3	
Earth movements and earth quakes	31-33, 46	-	160-167	3	192-207	3	391-396				2	
	86-90	2	200-210	3	124-139		382-387				2	
Volcanism and volcanoes	33-34		169-181		140-151	3						
	90-93	2		3	53-67		388-390				1	
Plains, plateaus and mountains	25-29	1	184-198	3	None		None				None	
	94-96											
Lakes, reservoirs, conservation	None	-	212-218	2	182-183		None				None	
Floods and Soil Conservation	None	-	131-133	1	None		None				None	

TABLE II (continued)

	Basic Earth Science		Earth Science		Earth and Space Science		Exploring Earth Science	
	Pages	Rating	Pages	Rating	Pages	Rating	Pages	Rating
Physiographic provinces of the United States	None	-	220-230	2	591-603	3	None	-
Nature of soils*	None	-	None	-	90-92	-	305-332	-
Percent of topics common to the check list	53%		100%		87%		73%	
Average Rating	0.7		2.7		2.2		1.5	

*Data not included in the results

Table III indicated that all the texts included material on the two topics relating to the oceans of the earth, except the Basic Earth Science text. This text did not include material on the topic dealing with waves, shore currents, and shorelines. Two of the books studied went into great detail discussing the oceans. The Earth and Space Science textbook devoted more than one hundred pages of textual material to the study of the ocean. This could be very beneficial to students living close to the ocean.

Basic Earth Science, as indicated in Table IV, was the only textbook that did not discuss both of the topics relating to the climates of the earth. Exploring Earth Science and Earth Science both included considerable material on this area of earth science.

All the textbooks included material on the eleven topics dealing with the earth's atmosphere, except Basic Earth Science, which included material on nine of the eleven topics. Table V showed that this area of earth science received considerable attention from all the authors.

Table VI indicated that seven topics should be discussed in the study of the earth and the universe. Earth Science and Exploring Earth Science included discussion on all seven topics. Earth and Space Science discussed six of

the seven topics, while the Basic Earth Science textbook covered only fifty-seven percent of the topics. Both the Basic Earth Science and Earth Science textbooks included an additional discussion on the origin of the earth and the solar system.

TABLE III

Topics Relating to
OCEANS OF THE EARTH

	Earth Science		Earth and Space Science		Exploring Earth Science	
	Pages	Rating	Pages	Rating	Pages	Rating
141-167	232-259	3	435-552	3	104-107	1
None	260-275	3	208-219	3	297-299	1
Percent of topics common to the check list						
50%	100%		100%		100%	
Average Rating						
1.0	3.0		3.0		1.0	

1. The ocean and its currents
2. Waves, shore currents, shorelines

Percent of topics common to the check list

Average Rating

TABLE IV

Topics Relating to
CLIMATES OF THE EARTH

	Basic Earth Science		Earth Science		Earth and Space Science		Exploring Earth Science	
	Pages	Rating	Pages	Rating	Pages	Rating	Pages	Rating
1. Factors that control climates	39-42	1	540-546	2	355-358	1	82-97	2
2. World climates	None	-	547-563	3	356-357	1	98-103	2
Percent of topics common to the check list								
Average Rating	50%		100%		100%		100%	
	0.5		2.5		1.0		2.0	

TABLE V

Topics Related to
EARTH'S ATMOSPHERE

	Basic Earth Science		Earth Science		Earth and Space Science		Exploring Earth Science	
	Pages	Rating	Pages	Rating	Pages	Rating	Pages	Rating
1. Nature of the atmosphere	36-37 202-206	2	432-435	2	344-347	2	18-20, 22- 23, 41-43	2
2. Heating and cooling	207-211	1	435-447	3	347-358	2	50-59	2
3. Air pressure	211-212 364-367	2	449-456	3	362-366	3	35-39	2
4. Changing winds	214-216	1	463-472 456-460	3	375-389	3	60-62 66-67	1
5. Water vapor enters Atmosphere	None	-	475-478	2	350	1	24-31	2
6. Condensation and clouds	221-226	2	479-489	2	416-420	2	32-33	1
7. Precipitation	39	1	491-498	3	421-426	2	34	1
8. Air masses and fronts	216-217	1	502-511	3	391-396	2	68-73	1
9. Cyclones and Thunderstorms	244-248	2	513-525	3	402-415	3	64-65	2
10. Weather Bureau	218-219, 230- 243, 249-253	3	525-529	2	397-401	1	74-75	1

TABLE V (continued)

	Basic Earth Science	Earth Science	Earth and Space Science	Exploring Earth Science
	Pages	Rating	Pages	Rating
11. Light and color of the sky	None	-	532-536	2
			426-430	2
				21
				1
Percent of tonics common to the check list	82%	100%	100%	100%
Average Rating	1.4	2.5	2.1	1.5

TABLE VI

Topics Related to
EARTH AND THE UNIVERSE

	Basic Earth Science		Earth Science		Earth and Space Science		Exploring Earth Science	
	Pages	Rating	Pages	Rating	Pages	Rating	Pages	Rating
1. Stars and Galaxies	308-316	2	322-344	3	295-307 309-321	3	192-193	1
2. The sun and the solar system	285-308	3	347-362	2	267-284 286-293 249-265	3	130-133, 178- 182, 184-187 3 134-138 188-191	2
3. The moon	400-410	2	386-399	3				
4. Earth, its motions and seasons	None	-	402-410	2	236-244	2	126-129 146-172 114-119	2
5. Location and navigation	None	-	412-419	2	None	-	122-125 120-121	1
6. Keeping time	None	-	422-428	3	244-247	2	182-183	1
7. Space exploration	318-340, 346- 399, 410-423	3	365-384	3	322-341	3	194-204	2
Origin of the earth*	14-20		291-293					

Percent of topics common
to the check list
Average Rating

57%
1.4

100%
2.6

86%
2.3

100%
1.7

*Data not included in the results.

Table VII indicated that Explaining Earth Science was the easiest text to read. The other three textbooks studied had basically the same reading difficulty level. Basic Earth Science was the most difficult to read of those tested.

The reading-difficulty score was converted into a grade-level value of reading difficulty by using Table VIII. This conversion table indicated that Exploring Earth Science could be used in the seventh or eighth grade. The other three texts would be better suited for the ninth grade.

TABLE VII
LEVELS OF READING DIFFICULTY

Textbook	No. of Samples	Average Sentence Length	Average No. of Affixes	Average No. of Personal Words	Average Reading Difficulty Score	Grade Level of Difficulty*
Basic Earth Science	8	19	40	2.0	4.24	IX
Earth Science	11	18	39	0.5	4.15	IX
Earth and Space Science	12	14	47	1.5	4.14	IX
Exploring Earth Science	10	11	41	1.0	3.29	VII

*Grade levels of difficulty were computed by using data in Table VIII.

TABLE VIII
 GRADE LEVELS OF DIFFICULTY EQUIVALENT
 TO READING DIFFICULTY SCORES*

Reading Difficulty Score	Description of Style	Grade Level of Difficulty
0-1	Very easy	Grade IV Completed
1-2	Easy	Grade V Completed
2-3	Fairly easy	Grade VI Completed
3-4	Standard	Grade VII or VIII
4-5	Fairly difficult	Two Years of High School
5-6	Difficult	High School and Some College
6 and up	Very difficult	College Completed

*Flesch, op. cit., p. 205.

SUMMARY AND CONCLUSIONS

The purpose of this study was to compare the content of the four approved earth science textbooks.

A check list consisting of six broad areas and forty-one topics was derived from the review of literature and the examination of the content of the four textbooks. This check list contained the topics which should be included in an earth science course.

Table IX showed that the percent of topics covered by the various textbooks varied from sixty-six to ninety-eight percent. Earth Science contained forty of the forty-one topics on the check list. Earth and Space Science discussed thirty-eight topics and thirty-six topics was covered by the Exploring Earth Science text. Basic Earth Science included discussion on only twenty-seven of the forty-one topics.

The over-all average numerical rating of the textbooks indicated that two of the texts, Earth Science and Earth and Space Science, rated "adequate" or better on the coverage of the topics. Basic Earth Science and Exploring Earth Science had an average numerical rating of 1.1 and 1.5, respectively. According to the scale, 1.0 was considered a "brief" coverage of the material.

The Earth Science textbook was the only one studied that consistently covered the topics adequately. The other three textbooks tended to stress certain areas and slight others.

TABLE IX

SUMMARY OF CONTENT ANALYSIS

Textbook	Basic Earth Science		Earth Science		Earth and Space Science		Exploring Earth Science						
	No. of Topics	Topics in Common %	A.R.* No.	Topics in Common %	A.R.* No.	Topics in Common %	A.R.* No.	Topics in Common %					
History of the Earth	4	100	2.0	3	75	2.3	4	100	2.3	3	75	1.3	
Earth and Its Land Forms	15	53	0.7	15	100	2.7	13	87	2.2	11	73	1.5	
Oceans of the Earth	2	100	1.0	2	100	3.0	2	100	3.0	2	100	1.0	
Climates of the Earth	2	100	0.5	2	100	2.5	2	100	1.0	2	100	2.0	
Earth's Atmosphere	11	82	1.4	11	100	2.5	11	100	2.1	11	100	1.5	
Earth and the Universe	7	57	1.4	7	100	2.6	6	86	2.3	7	100	1.7	
Totals	41	27	66	1.1	40	98	2.6	38	93	2.0	36	88	1.5

*A.R. stands for the average numerical rating of the material.

3--topic covered in great detail,

2--topic covered adequately,

1--topic covered briefly.

The data of this study indicated that the four earth science textbooks varied considerably on the topics included and also the depth at which the topics were discussed. On the basis of the number of topics discussed and the thoroughness with which the topics were discussed, the Earth Science textbook would be placed at the top of the list. The others in descending order were as follows: Earth and Space Science, Exploring Earth Science, and Basic Earth Science.

The data relating to reading-difficulty level indicated three of the textbooks, Basic Earth Science, Earth and Space Science, and Earth Science, varied little in reading difficulty. These books could be used in the ninth grade or for an advanced eighth grade class. Exploring Earth Science could be used successfully in the seventh or eighth grade.

BIBLIOGRAPHY

BIBLIOGRAPHY

- Brown, Walter R. "Science Textbook Selection and the Dale-Chall Formula," School Science and Mathematics, 65:164-167, February, 1965.
- Caldwell, Loren T. "The New Role of Earth Science in Emerging Science Programs," Geotimes, 5:26-28, March, 1961.
- Chapman, John M. and Caldwell, Loren T. "A Content Study of Earth Science Courses in Selected Secondary Schools," Science Education, 48:430-436, December, 1964.
- Davison, Hugh M. and Fowler, H. Seymour. "Earth Science Course Evaluation: What Do They Learn in Earth Science?," Science Education, 49:184-185, March, 1965.
- De Waard, John E. (ed.). "Earth Science Course: Effective Science Experiment for the Junior High School," Current Science Teacher's Edition, 51:1-3, January 26, 1966.
- Flesch, Rudolf. The Art of Plain Talk. New York: Harper and Brothers, 1946. 210pp.
- Hook, John C. "New Programs in Earth Science," The Teachers College Journal, 33:122-125, March, 1962.
- Hubbard, T. N. "Earth Science Now 'In Orbit'," The American School Board Journal, 151:26-27, July, 1965.
- James, William H. and Eibling, Harold H. "Is Your District Using the Right Textbooks?," School Management, 8:79-86, October, 1964.
- Mac Cracken, Helen Dolman, et al. Basic Earth Science. Syracuse: L. W. Singer Company, 1964. 442 pp.
- Mallinson, George G. "Reading and the Teaching of Science," School Science and Mathematics, 44:148-153, February, 1964.
- Mallinson, George G. "The Readability of High School Science Texts," The Science Teacher, 18:253-256, November, 1951.
- Matthews, William H. "Growth of Earth Science in Secondary Schools," School Science and Mathematics, 63:637-645, November, 1963.

- Namowitz, Samuel N. and Stone, Donald B. Earth Science--The World We Live In. Princeton, New Jersey: D. Van Nostrand Company, 1965. 597 pp.
- Pollinger, Donald L. and Syrewicz, Eugene R. "Earth Science," School and Community, 53:17, November, 1966.
- Schering, Fred J. and Shupack, Ben. Mastering Earth Science. New York: Oxford Book Company, 1963. 430 pp.
- St. Laurence, Francis. "Are Heavy Textbooks Necessary?," The Science Teacher, 18:72-73, March, 1951.
- Richardson, John S. Science Teaching in Secondary Schools. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1957. 363 pp.
- Textbooks Suitable for Use in Kansas Schools and Applicable Statues, Regulations and Policies. A List of Textbooks and Workbooks Approved by the State Textbook Screening Committee. Topeka, Kansas: State Printer, 1967.
- Thurber, Walter A. and Kilburn, Robert E. Exploring Earth Science. Boston: Allyn and Bacon, Inc., 1966. 446 pp.
- Tweeten, Paul W. "Science Curriculum Trends in Iowa," School Science and Mathematics, 67:32-36, January, 1967.
- Wolfe, C. Wroe, et al. Earth and Space Science. Boston: D.C. Heath and Company, 1966. 630 pp.

A CONTENT STUDY OF EARTH SCIENCE TEXTBOOKS
APPROVED FOR KANSAS JUNIOR HIGH SCHOOLS

by

THOMAS JOE NORRIS

B. S. E., Oklahoma Christian College, 1964

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements of the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1967

The purpose of this study was to (1) determine from current literature what topics should be included in an earth science course; (2) compare the content of the four earth science textbooks designed for use at the junior high school level, and (3) recommend a textbook or textbooks which would be best suited for teaching earth science.

The textbooks studied were approved for use in Kansas junior high schools by the Kansas State Textbook Screening Committee for the 1967-1968 school year. The four textbooks were as follows:

Mac Cracken, Helen Dolman, et al. Basic Earth Science.
Syracuse: L. W. Singer Company, 1964.

Namowitz, Samuel N. and Stone, Donald B. Earth Science--
The World We Live In. Princeton, New Jersey:
D. Van Nostrand Company, 1965.

Thurber, Walter A. and Kilburn, Robert E. Exploring
Earth Science. Boston: Allyn and Bacon, 1966.

Wolfe, C. Wroe, et al. Earth and Space Science.
Boston: D. C. Heath and Company, 1966.

The content of these textbooks was compared to a check list derived from a study of current literature. This check list consisted of six broad areas: the earth's history, the earth and its land forms, the earth in space, oceans of the earth, the earth's atmosphere, and climates of the earth. These six broad areas were divided into 41 separate topics.

Content was evaluated by a simple numerical rating

system. Page numbers were recorded so that material related to the topics could be easily located. The average numerical rating and the percentage of common topics as compared to the check list was computed for each broad area of study and for the entire book. This was done for each of the four textbooks studied.

Earth Science--The World We Live In discussed ninety-eight percent of the topics on the check list and had the highest average rating of the material. Ninety-three percent of the topics was included in the Earth and Space Science textbook. The coverage of the material was considered adequate. Exploring Earth Science discussed eighty-eight percent of the topics on the check list, but the average numerical rating indicated that the material was not covered in as much depth as would be desired. The Basic Earth Science textbook included discussion of sixty-six percent of the topics. The average rating indicated a "brief" coverage of the topics included in the book.

The Earth Science--The World We Live In textbook was considered the best of those studied because it covered more of the topics and did a consistently good job of covering the material thoroughly. Earth and Space Science would rank slightly lower.

Three of the textbooks studied, Basic Earth Science, Earth and Space Science, and Earth Science--The World We Live In varied little in reading difficulty. These books could be used in the ninth grade or possibly for an advanced eighth grade class. Exploring Earth Science could be used successfully in the seventh or eighth grade.

The reading level of the textbooks studied was determined by using the Flesch formula.