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AN EVALUATION OF THE READABILITY OF FOUR HEALTH SERIES

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Pamela Abbott Gravatt

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ABSTRACT

The purpose of this study was to evaluate four health series by computing readability scores and the reinforcement of new vocabulary words. The readability scores were calculated using the Harris-Jacobson readability formula. The new vocabulary words introduced in the series were listed on the Worksheet for Analysis of Instructional Materials Beyond Readability Scales (Schindler, 1980). The reinforcements of the new vocabulary words were checked on the Schindler worksheet. From these instruments of comprehensive evaluation, half of the textbooks were seen as being written at a readability level that differed from the publisher's estimated grade level. Only one of the texts in the four health series reinforced adequately the new vocabulary words listed in the introductory lessons. These findings point to the need for publishers as well as teachers to pay attention to the language of health texts due to the impact which textbooks have upon the health curriculum.

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CHAPTER 1

INTRODUCTION

Many believe that classroom health instruction can contribute to the health of our nation's people (Kroger & Yarber, 1980). Health instruction in the public school setting is important and often relies heavily on health series. It is imperative that the series chosen be on an appropriate readability level so that new health information can be readily obtained by the children. Too often, reading levels in health textbooks are beyond the skills of the elementary reader for whom they are intended (Jones, 1952). Publishers may not be willing to devote the time and research necessary to determine adequately the reading grade levels, or readability, of health textbooks. As a result, the classroom teacher is faced with a major problem. If she assumes that the grade level provided by the publisher is correct, she may observe student frustration later because of inaccuracy of readability levels. Lack of studies in this area demonstrates that little effort has been conducted independently toward the comprehensive evaluation of elementary health textbooks. In spite of doing an intensive computer search, this researcher was unable to find any studies in this area since 1952.

Teachers are often responsible for evaluating and choosing the series appropriate for their group of children. Even more frequently they must use materials chosen by a curriculum committee that used unknown criteria for text selection. This criteria may not include evaluating textbook readability. Therefore, teachers are often presented with inappropriate textbooks. Problems in learning may arise if publishers designate inappropriate grade levels to their health texts. According to the only study found (Jones, 1952) this is often the case. Spache (1978) confirmed this idea:

> Publishers customarily designate their readers and other textbooks as suited for specific grade levels. These grade level designations are undoubtedly made in good faith according to the opinions of the author and the publishing staff. but like other pooled judgements they are often erroneous. (p. 31)

The classroom teacher should be responsible for comprehensively evaluating the health series to determine whether or not readability is appropriate regardless of who selects the text. Otherwise, it is highly possible that a significant portion of the target population for whom the text is written may be at a significant disadvantage in terms of the ability to read and adequately comprehend materials available. If the reading material is too difficult, it will matter very little how well organized it is, how attractive the book may appear, or how accurate one

finds the content. Because the health field has changed so drastically, especially in the vocabulary of topics (i.e., ecology, drugs, and human sexuality), it was felt that an investigation of the reading level of textbooks available for usage at the elementary level would be appropriate.

An enormous amount of printed information is produced by health agencies for use in schools, hospitals, and clinics. In 1974 five major agencies in the United States spent in excess of 100 million dollars per year for their health information programs (Weingarten, 1974). Yet in only two instances were those agencies seeking to evaluate the effectiveness of their material, including readability (Holcomb, 1981).

There are many definitions of readability. According to Dale and Chall (1958), the most common use of the term is related to the ease of understanding or comprehension considering the style of writing and the sum total of elements within a specific piece of reading material that affects the success that a group of readers have with it. There are numerous characteristics which affect readability of textbooks and one can see through these elements that the measurement of readability is very complex. Some of the characteristics include: sentence complexity, vocabulary difficulty, the degree of concreteness or abstractness which refers to conceptual understanding, the observed format,

individual reader qualities such as interest and motivation, and literary qualities such as mood and atmosphere.

Schindler (1980) stated that the use of procedures such as readability scales, graded word lists, and worksheets for further analysis can save time and eliminate frustrations for both the teacher and student. These evaluation techniques, as well as being simple to use, prove to be extremely valuable to the educator and student.

Gates found that vocabulary needed to be reinforced 22 times for an I.Q. of 100. Therefore, this is an aspect of textbooks which needs to be considered. Kingsley (1965) stated that a minimum of 5 reinforcements should be in the introductory lesson with other reinforcements found in subsequent lessons.

Statement of the Problem

The purpose of this study was to analyze readability in textbooks in four health series using the Harris-Jacobson Wide Range Readability Formula (Harris & Jacobson, 1985) and the Schindler (1980) Worksheet for Analysis of Instructional Materials Beyond Readability Scales. In this study the following questions are answered:

1. Is there a difference between the publishers' stated grade levels of four health series and the actual readability according to a readability formula?

2. Are the new vocabulary words that are introduced reinforced at least five times within a lesson?

3. Is there a difference in readability results of this study and Jones' 1952 study?

Definition of Terms

In this study the following terms are defined as:

1. Comprehensive evaluation. An evaluation technique for programs using a readability formula and the Worksheet for Analysis of Instructional Materials Beyond Readability Scales (Schindler, 1980).

2. Health program. A published sequence of textbooks, teachers' manuals, and student workbooks. Each book was assigned a grade level by the publisher. These programs were designed to provide specific health information in areas such as nutrition, physical health decisions, stress and your health, and environmental problems.

3. Factors. The characteristics of published materials that had an effect on actual readability of that material. The readability factors were: typography, interest value, style of writing, number of syllables, sentence length, vocabulary words, and frequency of the new word reinforcements.

4. New words. The vocabulary words introduced in each new lesson in a health series.

5. Word lists. Accompany readability formulas to check the percentage of hard words in the formula calculations. These word lists were chosen by the authors of readability scales to validate the calculated results.

6. Readability. The actual grade level calculation derived from a readability formula. The Harris-Jacobson Wide Range Readability Formula was developed as a tool to calculate the actual grade levels of published text materials. Readability is the term used for how readable the material was in printed form.

a. Actual readability. The calculated grade level determined by a readability formula.

b. Estimated readability. The grade level designation publishers placed on the published textbooks.

c. Comprehensive readability. The grade level of books computed by the readability formula and the number of times the new words were reinforced in the published material.

7. Reinforcement. The frequency of new vocabulary words in a health lesson after introduction.

8. Reading. The act of extracting meaning from the printed page. Some skills involved in reading are: word attack, vocabulary recognition, and comprehension.

9. Worksheet for Analysis of Instructional Materials Beyond Readability Scales (Schindler, 1980). A worksheet

used (1) to list new vocabulary words and to check the number of times these words were reinforced in the lesson of introduction and subsequent lessons, and (2) to record and subjectively evaluate the skills printed in the teachers' manuals.

Background

The question of readability of school textbooks is of interest in the selection of instructional materials for children. Mathews, Thornton, and McLean (1985) stated,

> The adequacy of such health material has seldom been addressed. Among the measures of adequacy is the ease of comprehension. A major factor in determining comprehensibility is that of the reading difficulty level of the text. (p. 3)

Aspects of child growth and development need to be given serious consideration if the child is to be educated as a growing organism. In planning and guiding health in the curriculum, the teacher must be assured that the health textbook chosen for a particular group is readable, understandable, and will be most profitable for the children at their particular stage of development.

It appears that health is a very important area of elementary education and textbooks in this area had not been surveyed from the point of view of their inherent reading difficulty since Jones' study in 1952. Jones included grades

4 through 8 and centered on the readability of health textbooks. Three computer searches failed to find any other studies that included the readability of elementary health texts in grades 4 through 6. Jones' study also included the idea that other vocabulary and readability studies for the elementary school textbooks introduced too many new words at the various grade levels. It was further implied that some method of vocabulary control was necessary to lessen the reading difficulties encountered by school children in their attempt at mastery of the text. This study will show to what extent readability has changed in elementary grades 4 through 6 in health texts in use since the 1952 study.

Jones tested 18 health textbooks in the fourth, fifth, and sixth grades. An overall picture of the grade placements of these books showed that 50% of the books rated above the publishers' estimated grade level. In the series of textbooks designated for grade 4 by the publishers, only two rated grade 4 placement after testing, with the remaining four rating beyond the acceptable range. It is important to note that, according to Jones, a rating of 4.5 would theoretically be a perfect placement. In the present study 4.0 was considered a perfect placement. This difference in data interpretation should be noted when comparing these two studies. The interpretation difference of 0.5 continues in grades 5 and 6. Theoretically perfect placements in Jones'

study included 5.5 and 6.5, while the present study considered 5.0 and 6.0 as theoretically perfect placements. Jones' test results in the fifth-grade series indicated 5.8 and 5.9 for two texts and 6.0 through 6.4 on the remaining four texts. Jones' results in the sixth-grade series produced a better match between estimated reading level and actual reading level than any other series. One of the sixth-grade books rated 7.7, which was beyond the acceptable range. Two of the remaining books rated between 6.5 through 7.0.

Jones also examined and compared the general vocabulary and the technical vocabulary as possible causes of reading difficulty of health textbooks. The present study did not examine a comparison between the two studies concerning vocabulary control. The present study compared new vocabulary word reinforcements and readability formula results within grade levels 4, 5, and 6. In this way, two important aspects of readability were examined within each textbook.

Assumptions

The following is a list of assumptions made about health series:

1. The content of each textbook was appropriate for each grade level.

2. Grade levels of the new vocabulary words introduced in each text of a health series were appropriate for the grade level of each book.

3. The readability formula used was valid.

Limitations

1. The 1952 study by Jones was limited by the lack of information available at that time.

2. A different readability formula was used in each study.

3. This study was limited to certain grade levels.

4. This study was limited to certain publishers.

Null Hypotheses

1. There is no difference between the publisher's stated reading level and the level resulting from use of the Harris-Jacobson readability formula.

2. There is no difference between the recommended five or more reinforcements of new vocabulary words and the results after using the Schindler worksheet.

3. The results of this study will not be consistent with the results of Jones' 1952 study.

Summary

There has been little, if any, research in the area concerning the readability of elementary school health textbooks since Jones' (1952) study entitled, An Investigation of the Vocabulary Readability Load Required of Children in Recently Published Health Textbooks for the Elementary School. Health series textbooks are an important part of the total curriculum used extensively in public schools, and the accuracy of their readability is imperative in order for children to gather important new health information. Careful considerations involving readability must be made when selecting an appropriate health series for children.

CHAPTER 2

RELATED LITERATURE

Introduction

The purpose of this chapter is to explain and describe the many aspects of readability, readability in relation to teaching health, and the comprehensive evaluation of readability.

The Aspects of Readability

Sources current at the time of this research highly recommended readability as a key factor in understanding printed information. Mathews et al. (1985) stated,

> It seems apparent that the usefulness of such health material is to a large measure dependent on how well the student, his family, and his friends and associates assimilate, understand, and put into action the content of such materials. A significant factor in the assimilation, understanding and implementation of the information contained within the printed materials is the readability.

Fry (1987) also reinforced the idea of readability:

> Readability has always had an important position in the field of reading and in the International Reading Association, where concern for learning more about readability emerged at the earliest meetings. This early interest is recorded in Jerrold's (1977) history of the Association.

In order for transfer of information from the source to the student to take place, the source must fit the student. Unfortunately, use of printed health information by educators is often based on easy availability, with the materials produced by reputable firms assumed to be effective. The writers of the health series attempt to reach a large, diverse population and must be responsible for considering readability as a major factor in their work. The adequacy of these health series has seldom been addressed.

The popularity of health series in schools of the 1980s led to an emphasis on the need for proper evaluation of the appropriateness of this written material, including the important aspect of readability. A student's reading level is not necessarily equivalent to the grade level completed. It may be higher or lower, emphasizing even more greatly the need for proper textbook evaluation. Maring and Furman (1985) noted that mainstreamed youngsters "typically demonstrate weaknesses in comprehension and in application of reading ability to content area tasks" (p. 178). The content of the health material must be written so that it can be challenging as well as easily read and understood by the child.

Readability formulas have a potential role in the evaluation of student health education materials, but this potential may be limited to serving as a guideline. It is important to have a clear idea of what readability formulas

can and cannot do. They can predict a level of reading difficulty based on an analysis of sentence and word length in a given passage. What they cannot do is take into account intrapersonal variables or the actual content of the materials. Hittleman (cited in Mathews, Thornton, & McLean, 1985, p. 58) pointed out that word frequency and sentence length do not stand in simple relationship to reading difficulty. In other words, the level of difficulty is correlated to the length of words and sentences. However, other factors should also be considered. Understanding reading material is related to the comprehensive readability of the material. Comprehensive readability is related not only to the grade level of each book, but also to the grade levels of the new vocabulary words introduced, and the number of times these new words are reinforced in later material.

Readability in Relation to Teaching Health

Health education is an important subject for the total welfare of all individuals, and health educators are concerned about teaching this information to all students. In order for health education to be most effective, students must understand the material being read. Perhaps health information would reach more students, and in some instances be more enthusiastically received, if the material were presented on a reading level with which the student felt

comfortable and at ease. In the area of health education, this is a very important issue that must be realized and addressed. Health educators need to know the present reading levels, including the strengths and weaknesses, of the reading skill development area of each student. Agin (1975) described situations where teachers of low level students in social studies found significant increases in the achievement of students when a lower reading level textbook was introduced. Also, a positive change in student behavior and attitude was noted after the student achievement levels increased.

According to Cohen and Cohen (1976), the primary purpose of health education is to assist people to establish patterns of living that will discourage disease and enhance health, thus improving the quality of life. Health education should be an ongoing process and immersed throughout the curriculum. Good teaching depends greatly on the understanding of those to be taught. The teacher in every content area, including health, is in the dark unless it is known how the students read. Individual student language difficulties should not interfere with a pupil's opportunity to show what he or she knows. It is extremely important that the student understand the health material being read in order to reach educational objectives. Almost everything done by the health educator is meaningless unless it is

directed at the needs of the learner. The effectiveness of learning opportunities in health education are closely correlated with the accuracy with which student needs are perceived (Lussier, 1972). Student reading ability in the content area is an important factor of which the teacher must be aware. It may help the teacher if it is kept in mind that reading is one of the most complex forms of information processing. The joining of health knowledge and information through reading may encourage students to establish proper habits, attitudes, practices, and appreciation. Reading is an important factor in the total process of comprehending this health knowledge. Klare (1981) stated,

> Formulas are excellent predictors of comprehension. They correlate in the 80's or low 90's with comprehension. Furthermore, compared with other kinds of psycho-educational predictions such as school grades, sales, or success on the job, readability formulas stand up very well indeed. (p. 251)

Even though the knowledge of health and healthful living does not assure formation of proper health habits, without such knowledge there is little hope for improvement in individual health practices. An important aspect of establishing these desirable educational outcomes is a basic understanding of the reading material presented to the student. Teachers may realize that grade level determinations by publishers are sometimes inadequate. As educators we must accept this basic responsibility ourselves,

sometimes resulting in the utilization of more than one health text in a classroom.

Jones' (1952) study of the readability of elementary health textbooks was the only investigation this researcher could find that included the fourth, fifth, and sixth grades in its target audience. A similar study of the readability of seventh- and eighth-grade health textbooks was conducted by Miller, Scheer, and Miller (1974). Miller et al. reported that there had been little, if any, research in the area concerning the readability of health textbooks. Jones began a search to find an area in which the readability problem had not been studied. He found that there was a very important aspect of children's textbooks that had not been surveyed from the point of view of their reading difficulty. According to Jones, no study had been made to determine the relative difficulty of the readability of health materials as published in grades 4 through 8 in the elementary school. Jones used the Yoakam Technique (1948) in his study to meet the necessary requirements for a measuring device. It should be noted that this technique is based exclusively on the factor of vocabulary and the determining factor of word difficulty is the Thorndike Teacher's Wordbook of 20,000 Words. Jones concluded that out of the 32 books he tested by the Yoakam Readability Formula, only 50% were within the grade range claimed by the publishers. According to Jones

(1952), the Yoakam Technique requires a representative sample of the textbook consisting of 15 pages of text distributed at approximately equal distances throughout the book. The number of running words on an average page is then determined. Using the Thorndike Word List all words were recorded with an index number of 4 or more. The page index number was then determined by totaling the index numbers. The total of index numbers from the whole sample was then divided by 15 (the number of pages sampled) to determine the book index number. The grade placement of the book was determined by consulting a table that had been arranged according to the number of words on a page. After analyzing the vocabulary, Jones found that control was needed over the general and technical phases of word selection. Too many compound words were used for which Thorndike gave no rating and Jones stated that there was no justification on the part of publishers and authors for using terms that were obviously too difficult for the reader in elementary school (i.e., acidophilus, adrenocarticatropic, poliomyelitis). Jones concluded with the idea that he concurred with the claims of publishers and believed that a supreme effort was being made to place health material in the grade level where it would benefit the child most. In spite of these efforts, the findings of Jones' study would seem to substantiate the fact that simply because a text in a health series was

labeled fourth grade, its reading difficulty was not indicated in any but a very broad sense.

Comprehensive Evaluation and Readability

Comprehensive evaluation, as conducted by the individual teacher, can be beneficial for numerous reasons. It helps the teacher decide which textbooks are most appropriate and effective for the targeted group of children. Teacher and student frustrations could be greatly decreased through this endeavor, as the materials analyzed are chosen carefully to help ensure that student readability needs are adequately met. This study included the use of a readability formula as well as use of a worksheet for further analysis in its comprehensive evaluation of health textbooks. These two methods were used to help determine the appropriateness of readability in the specified grade levels.

Readability Scales

Dale and Chall's (1958) findings indicated that reading comprehension is related to the interaction of two variables--the reader and the material read. The study of readability is an endeavor by educators to identify in reading material a specific level of difficulty. If the

student encounters readable material, he will gain confidence in his ability to read and comprehend what is read. Also, interest can be better sustained if the readability of material is adjusted to correlate with the reading ability of the child. Clearly, reading skills may enable the student in a traditional public school classroom to succeed in health education. The use of a readability scale can be very beneficial to the teacher in attempting to discern the reading level of difficulty in a health textbook. It should be noted that other factors also contribute to this determination but readability formulas, if used appropriately, can be a major determinant, especially in combination with a method to check on vocabulary control or load.

Numerous readability formulas have been devised to estimate the grade level of textbooks by using a sampling technique. After surveying some of these scales, the Harris-Jacobson Wide Range Readability Formula (1982) was selected for use in this study. This formula may be used with reading materials ranging from preprimer through eighth-reader levels and, by extrapolation, at secondary-school and adult levels. It uses two variables: sentence length and the percentage of hard words. Readability was estimated on the basis of a minimum of five representative samples per textbook. The Harris-Jacobson readability

formula has clearly stated instructions for selecting sample passages. The samples should be taken at equal intervals throughout the book with one page chosen at random from each fifth of the work. The first two paragraphs of a new selection are not used since they often contain a concentration of new vocabulary words. Also, numbers, other nonverbal symbols, or the verbal material in figures and tables are not counted as words. Each sample starts at the beginning of a paragraph and after counting 200 consecutive words ends at the end of the sentence containing the 200th word. The total number of words and sentences in each sample is recorded on a worksheet with each heading and subheading counted as sentences. The percentage of hard words in a sample is the first of two variables used in this readability scale and are words not listed on the word list, except for proper nouns which are counted as easy. This list is composed of the preprimer through Grade-2 words from the basic Alphabetical List, including the inflectional endings shown. A hard word is counted hard only the first time it appears in a sample, but is counted hard both times if it occurs in more than one sample. The number of hard words is divided by the number of words in the sample and the result is multiplied by 100 to obtain a percentage. The result is carried to three decimal places to find the first variable. The second variable is the mean number of words per sentence

or average length of sentence. The number of words in the sample is divided by the number of sentences with the result carried to three decimal places to obtain the second variable. The following equation is used to find the Predicted Raw Score for a sample:

$$\text{Predicted Raw Score} = .245\ V1 + .160\ V2 + .642 \quad .$$

The Readability Score is an adjustment of the Predicted Raw Score. To find the Readability Score for each health textbook, the Readability Scores for each sample are added and then divided by the number of samples. This mean then constitutes the Readability Score for the textbook.

A Worksheet for Further Analysis

In addition to the Harris-Jacobson readability formula, another tool was used in the process of comprehensive evaluation regarding the readability of health textbooks. The Worksheet for Analysis of Instructional Materials Beyond Readability Scales (Schindler, 1980) was also used in this study. This worksheet requires that the user record the number of new vocabulary words introduced in a story, and tabulate the number of times these words are reinforced in content. Repetitions of new vocabulary words are thought to help students learn and recognize the words rapidly.

Kingsley (1965) suggested that there should be at least five repeated citations of a new vocabulary word within the lesson of introduction. Schindler (1980) agreed, stating that for many years special education teachers were taught to teach reading by the rule that children need a minimum of five reinforcements to learn a new word (Kingsley, 1965). Since Schindler felt that an extra evaluation of developmental readers would be highly beneficial, she developed a worksheet to tabulate reinforcements of new vocabulary words in published materials and the skills offered in the teachers' manual. Schindler (1980) related further that published materials did not reinforce words or skills as they should. Harris (1970, p. 21) stated that to be effective, repetition should not be monotonous drill, but should be presented in such a way as to maintain the child's interest at a high level and encourage accuracy of perception. Clearly, the reading difficulty of a health textbook depends to a large extent on the new vocabulary, as well as new word reinforcements. Consequently, vocabulary reinforcement should be one of the chief points addressed in analyzing the reading difficulty level of these texts.

Gates' (1930) investigation of vocabulary loads of various grade levels revealed that students often have difficulty learning new words that have not been adequately reinforced in content. His findings on the number of

reasonable repetitions for new vocabulary words are listed below. These findings strongly support the idea that vocabulary word reinforcements are crucial for students at all ability levels.

120- I.Q. = 20 repetitions

110-119 I.Q. = 30 repetitions

90-109 I.Q. = 35 repetitions

80-89 I.Q. = 40 repetitions

70-79 I.Q. = 45 repetitions

60-69 I.Q. = 55 repetitions

The need for vocabulary control in public school textbooks is a problem that was recognized as long ago as 1939 by Bryson (1947), when he stated that vocabulary should be the chief point of attack in analyzing the difficulty of reading content in textbooks. In discussing reading difficulty he concluded that the difficulty of a book depends largely on the vocabulary it contains. The necessity of repetition of the new words presented as a means of helping the child to adequately learn the word so that he learns to recognize it rapidly, is a very important aspect of vocabulary control that has also long been recognized. It is unfortunate that research continues to show that repetitions of new vocabulary words in the different content areas such as math (O'Connor, 1988) and reading (Watson,

1981) are often neglected, causing difficulty in readability.

Summary

Health textbook series are used widely in elementary public schools and are often relied on heavily for total health instruction. There have been few research studies targeted on the readability of these books. The little research that could be found by this researcher suggested that the health materials published were not always accurate on grade level designations concerning readability, demonstrating a need for a comprehensive evaluation of health textbooks. This evaluation includes (a) a worksheet to record new word reinforcements in the health texts, and (b) a readability formula to calculate grade levels. Evaluations such as these are necessary in order to ensure that readability levels are adequate enough to promote, rather than discourage, health learning in our schools.

CHAPTER 3

DESIGN FOR EVALUATION OF HEALTH SERIES

Purpose

The purposes of this study were as follows:

1. To determine if there existed a difference between the publishers' estimated grade levels of four health series and their actual readability according to a readability formula.

2. To determine whether or not a difference existed between the number of times the new vocabulary words were reinforced and the recommended five times.

3. To determine if there was a difference between the readability results from the Jones 1952 study and this study.

Data Collection Procedures

For this study the researcher chose four health series which were utilized by various public schools in Tennessee. The health series chosen were as follows:

1. Choosing Good Health (1983), levels 4, 5, and 6, published by Scott, Foresman and Company, Glenview,

Illinois (authors M. L. Thompson and R. A. Althaus).

2. Health: Focus on You (1984), published by Merrill Publishing Company, Columbus, Ohio (authors L. B. Meeks and P. Heit).
3. Good Health for You (1983), levels 4, 5, and 6, published by Laidlaw Brothers Publishers, Northridge, California (authors J. T. Fodor and L. H. Glass).
4. Choosing Good Health (1983), levels 4, 5, and 6, published by Steck-Vaughn Company, Austin, Texas (author M. B. Merki).

The data in this study were collected solely by this researcher over a 6-month period. The health textbooks used were available through the Chattanooga City Schools, Chattanooga, Tennessee. Five samples were taken from each book and analyzed using the Harris-Jacobson readability formula.

Instrumentation

The two instruments that were used to collect data for this study were (1) The Harris-Jacobson Wide Range Readability Formula (see Appendix A), and (2) the Worksheet for Analysis of Instructional Materials Beyond Readability

Scales (Schindler, 1980) (see Appendix B). Both instruments were chosen due to predictive validity and ease of administration. The Harris-Jacobson readability formula was particularly attractive since it utilized five 200-word samples; 100-word samples have been shown to be comparatively unreliable.

The Harris-Jacobson readability formula uses five 200-word samples from a selected textbook. In these samples the following were checked:

1. Number of words.
2. Number of sentences.
3. Number of words not on the readability list, or number of hard words.
4. Average sentence length, or mean number of words per sentence.

A predicted raw score was calculated and then converted to a corrected grade level.

The Worksheet for Analysis of Instructional Materials Beyond Readability Scales (Schindler, 1980) took samplings of three sections of the textbook, (beginning, middle, end). The new vocabulary words introduced in these samples were recorded and checked for number of reinforcements in content. The reinforcements were also checked in the following three lessons.

Data Analysis

The data were analyzed by charting each health series according to readability scores and frequency of new word reinforcements.

In order to compare the results, an index number for each health textbook was computed using a ratio that placed the publishers' estimated grade level over the readability level computed by this researcher using the Harris-Jacobson readability formula. Then the result was subtracted from 1 and a 20% confidence interval was utilized as the allowable tolerance for the index numbers closest to 0, +.1, and -1. A positive index number shows that the actual readability level is higher than the publishers' estimated level, while a negative index number shows that the actual readability is lower than the publishers' estimation.

All new vocabulary words in a specified lesson were listed on the Worksheet for Analysis of Instructional Materials Beyond Readability Scales, with the number of reinforcements for each new word checked and categorized into three columns (<5, 5, and >5). Percentages were calculated by placing the number of reinforcements over the total number of new words presented in each textbook.

In order to determine if a significant difference existed between the standard error of the means, the mean

readability scores at each grade level were examined in both studies by using the F-test. Also, the t-test was used in both studies to determine if a difference existed between the means of each grade level.

Summary

This chapter described the design by which the health series were evaluated, as well as listing the four specific series used in this study. The two instruments utilized for evaluation of these health series were also listed and described, and the process for the analysis of the data was discussed.

CHAPTER 4

RESULTS

Introduction

The purpose of this study was to comprehensively evaluate four health series. This chapter contains the null hypotheses and the actual results of the study analyzed in two separate sections. The first section, "Individual Analysis of Each Health Series," contains the null hypotheses. The second section "Comparative Analysis of the Four Health Series," contains information about each program.

The four health series are dealt with in this order:

1. Choosing Good Health (1983), Scott, Foresman, and Company,
2. Health: Focus on You (1984), Merrill Publishing Company,
3. Good Health for You (1983), Laidlaw Brothers Publishers,
4. Choosing Good Health (1983), Steck-Vaughn Company.

All four series were analyzed according to the null hypotheses, by applying the Harris-Jacobson readability formula and the Worksheet for Analysis of Instructional

Materials Beyond Readability Scales. New vocabulary word reinforcements were checked in the three lessons following the introductory lesson.

Individual Analysis of Each Hypothesis

Hyo:1. There is no difference between the publisher's stated reading level and the level resulting from use of the Harris-Jacobson readability formula.

Scott, Foresman. The fourth-grade text had an actual readability (4.8) which might be difficult for this grade level. The index number for this text (.17) seemed to indicate that the printed material might be somewhat difficult for its intended grade level. The fifth-grade text had an actual readability (5.6) which also might be too difficult for students at this grade level. The index number for this text (.11) was close to the confidence interval (-.1 through +.1) that is tolerable for this study. The sixth-grade text had an actual readability (7.7) which might be far too difficult for this grade level. The index number for this text (.22) was the farthest away from the publisher's estimated grade level according to the calculated index numbers.

Merrill. The fourth-grade text had an actual readability (4.6) which might be difficult for students at this grade level. The index number for this text (.13) was greater than the tolerable index for this study. The fifth-grade text had an actual readability (5.4) which was greater than the publisher's estimated grade level. The index number for this text (.07) was within the chosen confidence interval. The sixth-grade text had an actual readability (5.6) that was below the publisher's estimated grade level. The index number for this text (-.07) was in the tolerable confidence interval for this study.

Laidlaw. The fourth-grade text had an actual readability (3.7) which was below the publisher's estimated grade level. The index number for this text (-.08) was within the stated index range. The fifth-grade text had an actual readability score (5.1) which was very close to the publisher's estimated grade level. The text index number (.02) seemed to indicate that it was well suited for its targeted grade level. The sixth-grade text had an actual readability (5.0) which was well below the publisher's estimated grade level. The index number for this text was 0.2. It was interesting to note that this text could be more suitable for fifth-grade level readers.

Steck-Vaughn. The fourth-grade text had an actual readability (4.3) which was close to the publisher's estimated grade level. The index number for this text (.07) was within the tolerable confidence interval for this study. The fifth-grade text might be far too difficult for this grade level due to the actual readability of 6.2. The index number for the fifth grade (.19) was beyond the tolerable confidence interval. The sixth-grade text was the only text in this study with an actual readability (6.0) equal to the publisher's estimate. The index number for this Steck-Vaughn text (0.) indicated that it was very well suited for its grade level (see Table 1).

Hyo:2. There is no difference between the recommended five or more reinforcements of new vocabulary words and the results after using the Schindler worksheet.

Scott, Foresman. The texts for the fourth and fifth grades each reinforced over 75% of the new vocabulary words the recommended five or more times. The sixth-grade text had only 33% of the new vocabulary words reinforced at the recommended number of times (see Table 1).

Merrill. The fourth-grade text had 42% of the new vocabulary words reinforced the recommended five times or

Table 1

Estimated and Actual Readability, Index, and Percentage New Word Reinforcements for All Series

Text	Estimated	Actual	Index	Percentage reinforced <5	5	>5
Choosing Good Health Scott Foresman (1983)	4	4.8	.17	0	0	100
	5	5.6	.11	20	0	80
	6	7.7	.22	67	0	33
Means			.17	29	0	71
Health: Focus on You Merrill (1984)	4	4.6	.13	58	10	32
	5	5.4	.07	50	50	0
	6	5.6	-.07	50	6	44
Means			.04	53	22	25
Good Health for You Laidlaw (1983)	4	3.7	-.08	38	0	62
	5	5.1	.02	71	29	0
	6	5.0	-.20	71	0	29
Means			-.09	60	10	30
Choosing Good Health Steck-Vaughn (1983)	4	4.3	.07	82	0	18
	5	6.2	.19	68	3	29
	6	6.0	0	61	8	31
Means			.09	70	4	26

more than five times. The fifth-grade text reinforced 50% of the new vocabulary words only five times with no new vocabulary words reinforced more than five times. The sixth-grade text also had 50% of the new vocabulary words reinforced at the recommended five or more times (see Table 1).

Laidlaw. The fourth-grade text had 62% of the new vocabulary words reinforced at the recommended five times or more than five times. The fifth- and sixth-grade texts fell far below the recommended five or more times. The fifth-grade text had 29% of the new vocabulary words reinforced at the recommended number of times. The sixth-grade text was the same as the fifth-grade text with a finding of 29% (see Table 1).

Steck-Vaughn. The fourth-grade text had only 18% of the new vocabulary words reinforced more than the recommended five times or more than five times. The fifth-grade text reinforced 32% of the new vocabulary words the recommended times. The sixth-grade text had the best percentage in this are with only 39% of the new vocabulary words reinforced at the recommended five or more times (see Table 1).

Comparative Analysis of the Four Health Programs

The four health programs were analyzed across text to evaluate the means values for the series. The mean index numbers and the mean percentages of reinforcements are shown in Table 2. These means were used to compare the four health series with one another. The Merrill mean scores were the most appropriate among the series. The mean index number (.04) was well within the tolerable confidence interval for this study. The mean index numbers of the Laidlaw series (-.09) and the Steck-Vaughn series (.09) were also within the stated confidence interval. This was due to the Steck-Vaughn sixth-grade text having an actual readability equal to the publisher's estimate. The other texts in the Steck-Vaughn series had an actual readability above the publisher's estimate. The Laidlaw series fourth- and sixth-grade texts were below the publisher's estimated grade levels. Averaging the index numbers (see Table 2) canceled out inconsistencies of the scores, as can be seen in Table 1. The mean index number (.17) for the Scott, Foresman series indicated that the actual readability was higher than the publisher's estimated grade level. Three of the four series fell below the recommended five times or more than five times reinforcement of new vocabulary words within the lesson of introduction. The Merrill series had 47% of the new vocabulary words reinforced adequately. The Laidlaw

Table 2

Mean Index, Percentage New Words Reinforced

Series	Mean index	Mean percentage reinforced		
		<5	5	>5
Choosing Good Health Scott Foresman (1983)	.17	29	0	71
Health: Focus on You Merrill (1984)	.04	53	22	25
Good Health for You Laidlaw (1983)	-.09	60	10	30
Choosing Good Health Steck-Vaughn (1983)	.09	70	4	26

series reinforced new vocabulary words adequately 40% of the time. The Steck-Vaughn series at 30% was least adequate in this area. The Scott, Foresman series reinforced 70% of the new vocabulary words the recommended five times or more than five times. This series ranked first in new vocabulary word reinforcement. These percentages indicated a lack of attention to new vocabulary word reinforcements in these health textbooks. This lack of attention, in addition to the average sentence length and number of hard words in the text, contributed to the overall difficulty of the series.

Hyo:3. The results of this study will not be consistent with the results of Jones' 1952 study.

The mean readability of the fourth-grade texts as manifested in this research (4.4) was lower than the mean readability of the fourth-grade texts in the 1952 study (4.9). The difference between the two means was 0.5. The mean readability of the fifth grade texts (5.6) was lower than the mean readability of all the fifth grade texts in the 1952 study (6.0). The difference between these two means was 0.4. The mean readability of the sixth-grade texts (6.1) was lower than the mean readability of all the sixth grade texts in the 1952 study (6.6) which was a difference of 0.5. (see Table 3).

Table 3

Mean Readability and Mean Index of Fourth-, Fifth-, and Sixth-Grade Texts in the Gravatt 1988 Study and the Jones 1952 Study

	Estimated	Mean Readabilty	Mean Index
Gravatt 1988 study	4	4.4	.07
	5	5.6	.1
	6	6.1	-.01
Means		5.2	.05
Jones 1952 study	4	4.9	.17
	5	6.0	.17
	6	6.6	.09
Means		5.8	.14

The mean readability scores at each grade level in both studies were examined using the F test to determine if a significant difference existed between the standard error of the means. It was found that there was no significant difference at the .05 level. The t test was used to determine if a difference existed between the means of each grade level in both studies. It was found that there was no significant difference in the means at the .05 level.

The 1952 study and this study used two of the same publishers. Both studies used Scott, Foresman and Laidlaw. Only one of these 12 texts had an actual readability equal to the publishers' estimates (see Table 4). Hypothesis 3 was rejected at the .05 level of significance.

It is interesting to compare the results of the Jones (1952) study to this study (see Table 5). In the 1952 study Jones found that only one publisher consistently placed books within the proper readability level. Jones' research found that four of the six fourth- and fifth-grade texts had actual readability above the publishers' estimated reading levels. Only one of the sixth grade books tested by Jones rated outside the sixth grade range. An overall picture of the readability levels of the 18 fourth-, fifth-, and sixth-grade texts tested by Jones showed that 50% were above the publishers' estimated readability levels. This study found that two of the four fourth-grade texts, two of the

Table 4

Estimated and Actual Readability, and Index for All Series in the Gravatt 1988 Study and the Series in Jones' 1952 Study With the Same Grade Estimated Grade Level and Publisher

Text	Estimated	Actual	Index
Choosing Good Health Scott Foresman (1983)	4	4.8	.17
	5	5.6	.11
	6	7.7	.22
Means			.17
The Girl Next Door Scott Foresman (1948) You Scott Foresman (1948) You and Others Scott Foresman (1949)	4	4.0	0
	5	5.8	.14
	6	6.1	.02
Means			.05
Good Health for You Laidlaw (1983)	4	3.7	-.08
	5	5.1	.0
	6	5.0	-.20
Means			-.09
Health Trials Laidlaw (1950) Your Health and You Laidlaw (1950) Keeping Healthy Laidlaw (1950)	4	5.0	.2
	5	6.2	.19
	6	6.1	.02
Means			.14

Table 5

Results of Analysis of Significance Between the Gravatt 1988 Study and the Jones 1952 Study

	Mean readability		Analysis of variance		Analysis of means	
Estimated grade level	Current study	1952 study	F-score	Rejection region	t-score	Rejection region
4	4.4	4.9	2.05	-9.0<F>9.0	-1.38	-2.1<T>2.1
5	5.6	6.0	4.6	-9.0<F>9.0	-1.87	-2.1<T>2.1
6	6.1	6.6	3.7	-9.0<F>9.0	-.90	-2.1<T>2.1

four fifth grade texts, and one of the four sixth-grade texts, or a total of 40%, were above the publishers' estimated grade levels.

Summary

Analysis of health series available in the 1952 Jones study and the four used in this investigation revealed that there had been little change in the instructional readability levels of material in over 35 years. Further there had been no research done in the area of readability of elementary health texts during this time.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

Discussion

The purpose of this chapter is to discuss the results of the comprehensive evaluation process in relation to the four health series and to discuss the correlation between this 1988 study and the 1952 study. Analysis of the four health series were analyzed adequately through the data available in the comprehensive evaluation. The comparative analysis showed that only one series, Scott, Foresman, was outside the confidence interval tolerable for this study according to the mean index number for that series. The other three series appeared to be within the confidence interval when the mean index numbers were presented. The actual index scores of some of the texts caused the true inconsistencies to be cancelled out when they were averaged with the scores from the other texts. Each of the series that were within the confidence interval had at least one text with an actual readability which was either on or below the publishers' estimated grade levels. The Merrill sixth grade text (5.6), the Laidlaw fourth-grade text (3.7), and the Laidlaw sixth-grade text (5.0) were below the estimated

grade levels. The Steck-Vaughn sixth-grade text was at the estimated grade level with an actual readability of 6.0.

The sixth-grade texts, with the exception of the Steck-Vaughn, showed the greatest discrepancies between actual readability and the publishers' estimated grade levels. The Steck-Vaughn text was the only sixth-grade text that was on the sixth grade level. The sixth-grade texts had a total readability range from 5.0 to 7.7 with an average of 6.1.

Fifty percent of the fifth-grade texts did not have actual readabilities within the fifth grade level. The two most difficult texts were the Scott, Foresman (5.6) and the Steck-Vaughn (6.2). These texts ranged from somewhat difficult to very difficult for this grade level. The readability range for the fifth-grade text was 5.1 to 6.2 with an average actual readability of 5.6. Three of the fourth-grade texts had readability indexes on, or close to, the stated confidence interval. The Scott, Foresman mean index deviates the most from the accepted fourth-grade texts, with an index of .17. The actual readability of the fourth-grade texts ranged from 3.7 to 4.8 with an average readability of 4.4. It is interesting to note that none of the publishers placed their health texts consistently within the proper grade range.

According to the Worksheet for Analysis of Instructional Materials Beyond Readability Scales, only one of the

texts did an adequate job of reinforcing the new vocabulary words five or more times. The text that had the highest percentage of reinforcements was Choosing Good Health (Scott, Foresman). The Scott, Foresman series had the highest percentage of new words reinforced at the recommended five or more times at all three grade levels. Even though this score was highest among the series, it still points out the lack of attention to the reinforcement of new vocabulary words by all the publishers in this study.

Even though the vocabulary reinforcements in the Laidlow series did not appear to be adequate this series seems to be most suited for its intended grade level because the actual readability is below the publisher's estimate in the fourth (3.7) and sixth (5.0) grade level. The readability of the fifth grade text (5.1) is very close to the publisher's estimate. One would assume that lower actual readability scores indicate that the vocabulary words are less difficult.

The comparison of Jones' (1952) investigation of health series readability and this evaluation revealed no significant changes in the readability since 1952. Since Jones found the readability of health series too high for the group of children intended to read them, one would assume that this transfer of important health information was greatly hindered. One might also assume that since no

significant change had occurred in this area in over 35 years, this information transfer continued to be obstructed because of inadequate readability levels. As stated earlier in this study, traditional classrooms rely heavily on health series to convey invaluable health messages to the youth of our nation. The consequences of these messages not being adequately transferred could lead to overall deterioration of health education in our country.

Conclusions

Results of this study strongly suggest that publishers need to pay more attention to readability levels of health series in order to improve the exchange of information from series to student. Observations of this study revealed additional possibilities for further research in areas such as health content, as well as closer evaluation of readability and vocabulary control in health textbooks. Student attitudes towards health are often affected by their experiences with the series and if these experiences are negative due to inappropriate reading levels, interest in health may be low. The effectiveness of the lessons could be diminished by the students lack of comprehension of the textbook material due to inappropriate readability levels.

Teachers using health series in their classrooms need to be aware of the implications of this study for researchers and educators, as well as for publishers.

Implications for Researchers

Researchers need to explore other aspects of health materials such as, Is the content presented current? Is the content in keeping with good safe health practices and procedures? Is the material factually precise and accurate? Is the material presented appropriate for the developmental level of the children for whom it is prepared? Are supplemental materials such as workbooks accurate and precisely developed?

Implications for Educators

Educators should become aware that there are many discrepancies in the reading levels and reinforcement schedules of published health texts. Many children will find the materials well beyond their ability to comprehend. Teachers therefore should supplement the materials with additional reinforcements and information given in smaller increments.

Implications for Publishers

Publishers should convey to their writers the necessity to prepare materials which can be comprehended by children.

These materials must be readable as well as reinforcing of concepts and skills. All written materials presented to children should abide by the rules of good reading practices: Reading materials which are inconsistent in difficulty will most likely result in inconsistent conceptual and factual development in the consumers of those materials. Consumers should be able to assume that a textbook is written in such a manner that the material is within the range the publisher states. At the time of this research, that was not so.

Summary

This chapter has discussed the results of the comprehensive evaluation process in relation to the four health series, and the correlation between this 1988 study and the 1952 Jones study. Implications were generated for researchers, educators, and publishers. It was concluded that health series as they have existed for 35 years have been inadequate to convey information to the population for which they have been developed.

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APPENDICES

APPENDIX A

HARRIS-JACOBSON WIDE RANGE READABILITY FORMULA

TEXT _____ PUBLISHER'S GRADE LEVEL _____

PUBLISHER _____

ARTICLE _____ FROM (PAGE #) _____ TO (PAGE #) _____

1. Number of words in the sample ..... _____
2. Number of hard words ..... _____
3. Number of sentences in the sample ..... _____
4. Percent hard words (divide 2 by 1, multiply by 100) ..... _____
5. Average sentence length (divide 1 by 3) ..... _____
6. Multiply percent hard words by (.245) ..... _____
7. Multiply average sentence length by (160) ..... _____
8. Add formula constant ..... .642
9. Formula raw score (add 6, 7, and 8) ..... _____
10. Corrected grade level ..... _____

APPENDIX B

WORKSHEET FOR ANALYSIS OF INSTRUCTIONAL MATERIALS BEYOND READABILITY SCALES
(Schindler, 1980)

Name of Book _____

Workbook _____

Publisher _____

Proposed Grade Level _____

Other Information _____

Pick a story at the beginning, middle and end of each level and analyze according to information requested below:

List New Words	Number of times reinforced	Reinforcements in next 3 stories

List New Words	Number of times reinforced	Reinforcements in next 3 stories

Looking at teachers manual, list skills to be taught in this lesson:

Skills	Are they taught

Skills to be taught or reinforced in workbook	Check appropriate observation taught	reinforced	neither

APPENDIX C

WORKSHEET FOR STATISTICAL ANALYSIS

GRADE LEVEL _____

CURRENT STUDY		1952 STUDY	
TEXT _____	PUBLISHER _____	TEXT _____	PUBLISHER _____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

1. Mean readability score _____ _____
2. Number of texts, N1 _____ N2, _____
3. Sum of readability scores _____ _____
4. Sum of readability scores squared _____ _____
5. Sum of the squares of the readability scores _____ _____
6. Deviation of each score from the mean (Step 5-(4/N1)) _____ (5-(4/N2) _____
7. Variance (divide Step 6 by N1) _____ (divide Step 6 by N2) _____
8. F-score (divide larger variance by smaller variance) _____
9. Test for significance using statistical tables _____
9. Add Step 6 for both studies divide by ((N1+N2) minus two) then multiply by (1/N1+1/N2), take the square root _____
10. T-score (the difference between the mean readabilities divided by Step 9) _____
11. Test for significance using statistics tables _____

VITA

Pamela Abbott Gravatt was born in Knoxville, Tennessee, on June 3, 1952. She attended Pond Gap Elementary School and was graduated from West High School in 1970. The following year, she entered the University of Tennessee, Knoxville. After three years of study at this university, she took a sabbatical and lived and worked in Ansbach, Germany, where her sister taught elementary school for the American Armed Forces. After extensive travel in Europe, Pam returned to the University of Tennessee to complete her Bachelor of Science degree in elementary education. She graduated in August 1978.

Pam was employed by Riverbend School at Lakeshore Mental Health Institute for one year, where she taught severely emotionally disturbed or autistic-like children, ages 3 through 12. She moved to the Crow Creek Sioux Indian Reservation at Fort Thompson, South Dakota, where she taught second-grade elementary school and was a member of the Child Protection Team, Inc., as the representative of Fort Thompson Elementary School. The following year Pam was the director of Red Horse Lodge, which was a new home for neglected and/or abused children. After one year at Red Horse Lodge, Pam returned to Knoxville and again taught at Riverbend School for two years in an elementary school

setting for severely emotionally disturbed children. She then taught academics to mentally retarded adults for two years at Sertoma Learning Center in Knoxville. At the time of this research, Pam was in her second year teaching emotionally disturbed children in a behavior management class for Hamilton County Schools, Chattanooga, Tennessee. She received a Master of Science degree in special education from the University of Tennessee, Knoxville, in May 1989.