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ABSTRACT

This appraisal of the readability of materials used by Adult Basic Education (ABE) teachers determines readability by using the Dale-Chall Readability Formula, the Fry Readability Graph, and the Gunning Fog Readability Formula. An introductory chapter states the problem, defines terms, and presents the importance, hypotheses, design, limitations, assumptions, and organization of the study. Chapter 2 is a review of related literature; chapter 3 describes the procedures used; chapter 4 is a presentation and interpretation of the data; chapter 5 contains a summary, conclusions, and recommendations. A bibliography and four appendixes are included. The study found that formula estimates, teacher judgments, and publisher ratings do not consistently support each other when measuring the readability of instructional materials. The data suggests that ABE teachers need to use a combination of assessment measures to select the best instructional materials. It is suggested that research comparing the predicted reading difficulty of materials with adult reading performance be undertaken. (DI)

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**A READABILITY ANALYSIS OF READING MATERIALS USED IN
ADULT BASIC EDUCATION**

**THE READING CENTER
MEMPHIS STATE UNIVERSITY**

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TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION	1
Statement of the Problem	1
Definition of Terms	2
Importance of the Study	5
Hypotheses	6
Design of the Study	8
Sample	8
Analysis of data	9
Limitations of the Study	11
Assumptions	11
Organization of the Study	11
II. REVIEW OF RELATED LITERATURE	13
Overview	13
Readability in Adult Basic Education	16
Professional or Teacher Judgement	20
Summary	25
III. PROCEDURES	28
The Sample	28
Instruments	30
Analysis of the Data	39

CHAPTER	PAGE
	vi
IV. PRESENTATION AND INTERPRETATION OF DATA	43
Results	43
Summary	49
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS . . .	52
Summary	52
The problem	52
Importance of the study	53
Procedures and instruments used	53
Analysis of data	55
Results	56
Conclusions	58
Recommendations	60
BIBLIOGRAPHY	62
APPENDICES	71
A. OPINIONNAIRE	72
B. FRY READABILITY GRAPH	74
C. MATERIALS USED FOR THE STUDY	75
D. COMPARATIVE TABLES	76

LIST OF TABLES

TABLE	PAGE
I. Mean Teacher Estimates and Publisher Ratings . .	76
II. Mean Dale-Chall Indices and Publisher Ratings .	77
III. Mean Fry Readability Indices and Publisher Ratings	78
IV. Mean Gunning Fog Indices and Publisher Ratings .	79
V. Overall Mean Formula Indices and Publisher Ratings	80
VI. Mean Dale-Chall Indices and Mean Teacher Ratings	81
VII. Mean Fry Readability Indices and Mean Teacher Ratings	82
VIII. Mean Gunning Fog Indices and Mean Teacher Ratings	83
IX. Overall Mean Formula Indices and Mean Teacher Ratings	84
X. Correlation Between Formula Indices	85
XI. F Values for Formula Indices	86
XII. Materials Showing Significant Interaction Between Formula as Measured by Duncan's New Multiple Range Test	87
XIII. Analysis of Variance (Significant)	88

CHAPTER I

INTRODUCTION

I. STATEMENT OF THE PROBLEM

Readability research has contributed to adult education in the following two areas: (1) techniques for the evaluation, selection and preparation of materials for literacy and citizenship; and (2) evidence as to the difficulty of newspapers, magazines, library books and textbooks. However, there is a lack of comparative readability research involving reading materials used in Adult Basic Education (ABE) classes on levels above grade three.

Therefore, the purposes of this study were: (1) to organize and conduct a readability appraisal of frequently used reading materials by a random sample of ABE teachers; (2) to locate the readability level provided by the application of the Dale-Chall Readability Formula, the Fry Readability Graph, and the Gunning Fog Readability Formula on reading materials used in ABE classes in Tennessee; (3) to compare ABE teacher readability appraisals with publisher readability estimates; (4) to ascertain the degree of correlation and degree of difference between the Dale-Chall Readability Formula, the Fry Readability Graph, and the Gunning Fog Readability Formula when applied to identical samples of

reading materials used in ABE classes in Tennessee; and (5) to indicate, where possible, a direction for continued investigation or classroom application of the results of the study.

II. DEFINITION OF TERMS

Adult Basic Education (ABE). The Bureau of Adult and Vocational Education defined Adult Basic Education as:

. . . a sequential program of instruction designed: (1) to eliminate the inability of adults in need of basic education to read and write English; (2) to raise substantially the educational level of such adults with a view to make them less likely to become dependent on others; (3) to improve ability to benefit from some occupational training; (4) to increase opportunity for more productive and profitable employment; and (5) to make them better able to meet their adult responsibilities.¹

Adult Basic Education Teacher. Any teacher who is employed and teaching one or more ABE classes per week is considered as an Adult Basic Education teacher.

Adult Basic Education Reading Materials. An ABE reading material is any printed material that is used primarily for the improvement of reading skills in the ABE classroom.

¹Bureau of Adult and Vocational Education, Curriculum Guide to Adult Basic Education, a report prepared by the Bureau of Adult and Vocational Education on Adult Basic Education (Washington: United States Government Printing Office, 1966), p. 1.

1. Level II Materials. Level II materials include the level of academic competency that would normally be attained in grades four, five, and six.

2. Level III Materials. The Level III category includes those materials generally associated with grades seven and higher. The Level III student is the most advanced student who is often working toward a General Equivalency Diploma.

Publisher's Suggested Readability Level. The grading by publishers may be described as grade level designations made in good faith and thereby being as accurate as trained opinion will permit.²

Readability. For the purposes of this study readability will refer to the ease or difficulty of reading which may be referred to as a grade level equivalent or unconverted raw score. Chall relates a more global explanation by stating: ". . . readability is the sum total (including the interactions) of all those elements within a given piece of printed material that affects the success a group of readers have with it."³

²George D. Spache, Good Reading for Poor Readers (Champaign Illinois: Garrard Publishing Company, 1970), p. 31.

³Jeanne S. Chall, Readability: An Appraisal of Research and Application (Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1958), p. 7.

Readability Formula. A readability formula is a predictive device used to estimate the probable success a reader will have in reading and understanding a sample of writing.⁴ In this study the term will refer to an objective measure of the difficulty of a printed material in terms of average sentence length and vocabulary load.⁵

Readability Level. A readability level refers to a particular grade level or raw score based on carefully considered opinions or statistical analysis of a specific printed material.⁶

Teacher Appraisal of Judgement. Teacher judgement is based on previous experience and subjective knowledge of judging the reading difficulty of printed materials.⁷ In this study, teacher estimates of readability appraisals will be made without the direct application of an objective process of readability measurement.

⁴George R. Klare, The Measurement of Readability (Ames, Iowa: Iowa State University Press, 1963), pp. 33-34.

⁵Delwyn S. Schubert, A Dictionary of Terms and Concepts in Reading (Springfield, Illinois: Charles C. Thomas Publisher, 1969), p. 255.

⁶Spache, loc. cit.

⁷Ibid., p. 30.

III. IMPORTANCE OF THE STUDY

An expanding market of instructional materials has made the selection of reading materials a difficult task. One major problem involved in selecting reading materials is determining the level of difficulty or readability of the material. Readability, or factors which make a selection easy or difficult to comprehend, has a limited research history. Prior to mid century, factors such as sentence structure, vocabulary load, idea density, and human interest were studied and incorporated into formulas to predict the difficulty of prose selections.⁸ The Lorge, Gunning, Dale-Chall, and Flesch formulas have frequently been used to grade adult materials according to difficulty level.

In recent years the need for basic education for undereducated adults has received more and more attention from local, state, and federal agencies. In 1965 increased federal funding made ABE programs available to nearly every school system in Tennessee. Over 95 percent of Tennessee's public school districts are currently operating ABE programs.

Numerous research projects involving many aspects of readability have been conducted for several types of materials. The application of these findings to a particular

⁸Op. cit., p. 152.

content or area of the curriculum has usually been limited to texts for either elementary, secondary, or college level students. In comparison, readability studies based on ABE reading materials are conspicuously few in number and are usually oriented toward literacy materials.

A review of the literature has shown that: (1) there are few quantitative studies in which readability formula indexes are compared with teacher judgement; (2) the results of comparative studies are conflicting; and (3) upper levels or higher graded level materials used in ABE classes have not been investigated. The study investigates the above mentioned areas.

IV. HYPOTHESES

1. There is no difference between teacher estimates of readability and publisher suggested readability levels.

2. There is no difference between publisher suggested readability levels and Dale-Chall Readability Formula scores.

3. There is no difference between the publisher suggested readability levels and Fry Readability Graph Scores.

4. There is no difference between publisher suggested readability levels and Gunning Fog Index of Readability scores.

5. There is no difference between publisher suggested readability levels and overall readability formula scores.

6. There is no difference between teacher estimates of readability and Dale-Chall Readability Formula scores.

7. There is no difference between teacher estimates of readability and Fry Readability Graph scores.

8. There is no difference between teacher estimates of readability and Gunning Fog Index of Readability scores.

9. There is no difference between teacher estimates of readability and overall readability formula scores.

10. There is no significant correlation between Dale-Chall Readability Formula scores and Fry Readability Graph scores.

11. There is no significant correlation between Dale-Chall Readability Formula scores and Gunning Fog Index of Readability scores.

12. There is no significant correlation between Fry Readability scores and Gunning Fog Index of Readability scores.

13. There is no significant difference between Dale-Chall Readability Formula scores, Fry Readability Graph scores, and Gunning Fog Index scores.

V. DESIGN OF THE STUDY

Sample. A representative sample of Level II and Level III reading materials were used in the study. Reading materials used on Level II are more numerous than those materials used on Level III. Therefore an arbitrary number of five Level II and three Level III materials were selected to: (1) serve as the representative sample of frequently used reading materials; and (2) provide the one hundred word random samples needed for applying the readability formulas.

It is the policy of ABE supervisors to administer local ABE programs. Four state and six local ABE supervisors were contacted in compiling a list of frequently used reading materials on Level II and Level III. The supervisors surveyed represent areas throughout the state of Tennessee.

The materials used in this study were the most recent editions of each of the following materials published by five different publishers.

A. Activities for Reading Improvement, Books 1, 2, 3 Steck Vaughn, Inc.

B. Be A Better Reader Series, Books A, B, C, 1, 2, 3 Prentice-Hall, Inc.

C. How to Read Better, Books 1, 2. Steck Vaughan, Inc.

D. Reader's Digest Skill Builders, Books 4, 5, 6 - Part one Reader's Digest Services, Inc.

E. Reader's Digest Advanced Skill Builders, Books A, B, C Reader's Digest Services, Inc.

F. System For Success, Book 2 Follett Publishing Company.

G. Science Research Associates Laboratory Kit IIIA SRA, Inc.

Further discussion of the samples may be found in Chapter III.

The reading materials listed by the ABE supervisors were tabulated and the five most frequently used reading materials on Level II and the three most frequently used reading materials on Level III were included on a teacher opinionnaire. See Appendix A. The opinionnaire contained a listing of reading materials with corresponding blanks for teacher judgement of the readability level.

The opinionnaires were administered by the writer at each of three ABE institutes held during the summer of 1971. A random sample of forty-three ABE teachers from across the state of Tennessee was taken from eighty-seven teachers in attendance at each of the institutes.

Analysis of Data. A random sample of approximately one hundred words was taken in proportion to the total number of pages per book or test. The Dale-Chall formula was used as one objective assessment of readability. The Dale-

Dale-Chall Formula was calculated by the IBM System 360/65 computer. The computer program has been developed by Reese and Smith, Department of Business Education, University of Tennessee. The program is developed so as to produce the following analysis of each sample of material. (1) the Dale-Chall readability index; (2) the total number of words in the sample; (3) the number of words not on the Dale list; (4) the number of sentences; (5) the average sentence length; and (6) the total number of syllables subdivided by one, two, three and four syllable categories. The statistical appraisal of readability suggested is consistent with the manner specifically suggested by the authors of the instrument.

The same one hundred word samples were analyzed by the writer through the use of the Gunning Fog Index of Readability and The Fry Readability Graph. The Fog Index and the Fry Graph serve as two of the more recently developed measures of readability assessment which may be calculated in much less time than the Dale-Chall formula.

Statistical analysis of coefficients of correlation, one way analysis of variance, and Duncan's New Multiple Range Test were determined. Overall range and percents are compared for teacher estimates and publisher estimates. The data comparisons of readability scores are presented in Chapter IV.

VI. LIMITATIONS OF THE STUDY

The study was conducted with the following limitations: (1) only three types of objective readability measurement were applied; (2) the materials analyzed were the eight most frequently used instructional materials in ABE classes in Tennessee; (3) only reading materials in ABE Level II and Level III classes were used; and (4) only one aspect of readability was measured, that of difficulty.

VII. ASSUMPTIONS

The following assumptions were made concerning the study: (1) teachers of ABE students are capable of making readability judgements of Level II and Level III reading materials; (2) the random samples taken from each material are representative of the reading within the materials; and (3) the materials listed as most frequently used reading materials are representative of materials used in ABE classes in Tennessee.

VIII. ORGANIZATION OF THE STUDY

Chapter I includes the statement of the problem, definition of terms, importance of the study, hypotheses, design of the study, limitations of the study, assumptions of the study and procedures for the study.

Chapter II includes a review of literature which will focus upon comparative readability studies involving adult materials and professional judgement of materials.

Chapter III includes the procedures necessary in implementing the study.

Chapter IV presents the results of each portion of the study and a comparison of these results.

Chapter V includes a summary of previous chapters, conclusions drawn from the study, and recommendations for further investigation.

CHAPTER II

REVIEW OF RELATED LITERATURE

Chapter II contains a review of published literature concerning professional or expert judgment and readability formula measures. Included also is a discussion of studies that have lead to the selection of the current topic of investigation.

I. OVERVIEW

Books by Chall,¹ Gray and Leary,² and Gunning,³ and Klare⁴ and articles by Bormuth,⁵ Chall,⁶ Coleman,⁷

¹Jeanne S. Chall, Readability: An Appraisal of Research and Application (Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1958).

²W. D. Gray and B. E. Leary, What Makes A Book Readable (Chicago, Illinois: The University of Chicago Press, 1935).

³Robert Gunning, The Technique of Clear Writing (New York: McGraw-Hill, Inc., 1952).

⁴George R. Klare, The Measurement of Readability (Ames, Iowa: Iowa State University Press, 1963).

⁵John R. Bormuth, Readability in 1958, (National Council of Teachers of English, 1968).

⁶Jeanne S. Chall, "This Business of Readability: A Second Look," Educational Research Bulletin, 35: 89-99, 111, 112, April, 1956.

⁷E. B. Coleman, "Experimental Studies of Readability," Elementary English Journal, 45: 166-178, February, 1968: E. B. Coleman, "Experimental Studies of Readability," Elementary English Journal, 45: 316-323, 33, March, 1968.

Kingston and Weaver,⁸ Koenke,⁹ Snortum,¹⁰ and Witty¹¹ serve as comprehensive reviews of readability research.

Beginning in 1889, Rubakin made an analysis of the readability of materials in Russia.¹² Another early study by James Yen investigated Chinese characters as to their frequency of use.¹³ One of the earliest American readability studies was conducted by Sherman, who concluded that sentence length was the single more significant element affecting the readability of a printed material.¹⁴ Forms of objective readability measurement were introduced by Kitson and Gray in 1931 and 1935 respectively.¹⁵

The volume of readability research increased after Thorndike's study of word frequency in 1921. During the

⁸Albert J. Kingston and Wendell W. Weaver, "Recent Developments in Readability and Appraisal," Journal of Reading, 5: 44-47, October, 1967.

⁹Karl Koenke, "Another Practical Note on Readability Formulas," Journal of Reading, 15: 203-208, December, 1971.

¹⁰Niel Snortum, "Readability Re-examined," Journal of Communication, 14: 136-150, September, 1964.

¹¹Paul Witty, "Improving Readability of Printed Materials," Elementary English, 28: 392-401, 409, November.

¹²George R. Klare and Byron Buck, Know Your Reader (New York: Hermitage House, 1954), p. 36.

¹³Ibid., p. 37.

¹⁴Ibid., p. 42.

¹⁵Snortum, op. cit., p. 136.

period from 1923-1953 over twenty-nine objective studies were reported.¹⁶ Although numerous factors were investigated, vocabulary and sentence length were explored most often.¹⁷ According to Klare, the period from 1953-1959 may be identified by its specialized formulas.¹⁸ The Winnetka, Dale-Tayler, Gray-Leary, Lorge, Flesch, and Dale-Chall Readability Formulas are products of this period and have offered some degree of validity in assessing readability.¹⁹ Other short methods presented by Gunning,²⁰ Fry,²¹ and McLaughlin²² are somewhat more easily determined but there is less research to support a high degree of validity for these formulas.

¹⁶George D. Spache, Good Reading for Poor Readers (Champaign, Illinois: Garrard Publishing Company, 1970), p. 31.

¹⁷Ibid., p. 34.

¹⁸Klare, op. cit., p. 66.

¹⁹Wayne D. Lee, "What Does Research in Readability Tell the Classroom Teacher?" Journal of Reading, 8: 141, November, 1964.

²⁰Gunning, loc. cit.

²¹Edward Fry, "A Readability Formula That Saves Time," Journal of Reading, 11: 513-516, 575-578, April, 1968.

²²Harry McLaughlin, "Smog Grading - A New Readability Formula," Journal of Reading, 12: 639-646, May, 1969.

A current approach to readability assessment is the "cloze" procedure. Studies by Bormuth,²³ Rankin,²⁴ and Taylor²⁵ have been most prominent. Unlike readability formulas, the "cloze" technique involves a series of word deletions for every nth word. After the reader has filled in the blanks, the number of correct responses is counted. The resulting score or percent correct may then be compared to a conversion table in which the "cloze" percentage may be compared to an equivalent percent on a traditional question type of comprehension check. Cloze studies dealing with comprehension ability or comprehension difficulty have been encouraging; however, more investigation will be necessary to support the variety of claims cited for the "cloze" procedure.

II. READABILITY IN ADULT BASIC EDUCATION

Readability research has been conducted involving many affective elements ranging from vocabulary, sentence length, sentence structure, linguistic factors and other items.

²³J. R. Bormuth, Development of Readability Analysis, U. S. Department of Health, Education, and Welfare Washington: Government Printing Office, March, 1969).

²⁴E. J. Rankin, Jr., "An Evaluation of the Cloze Procedure as a Technique for Measuring Reading Comprehension (unpublished doctoral dissertation, University of Michigan, 1957).

²⁵W. L. Taylor, "Recent Developments in the Use of 'Cloze Procedure,'" Journalism Quarterly, 33: 42-48, 99, Winter, 1956.

Several studies involving the readability of school textbooks have been conducted.²⁶ There is however, a lack of application of the research techniques to materials used in ABE classes.

Although much has been written concerning ABE, Sheldon stated ". . . that adequate research and a sound rationale for methods and materials are virtually non-existent."²⁷ In a 1964 U. S. Office of Education survey, some five hundred different types of commercially prepared materials were examined and found unsuitable for the groups for which they

²⁶Nancy Jean Allbough, "A Comparison of Three Levels of Social Studies Material As Designated by a Readability Formula" (unpublished doctoral dissertation, University of Iowa, 1968); H. I. Berger, "The Difficulty of Third Grade Readers," Elementary School Journal, 47: 391-95, March, 1947; J. E. Burkey, "The Readability of Elementary Science Materials," Dissertation Abstracts, 14: 1328, September, 1954; G. G. Mallison, "The Readability of High School Science Texts," The Science Teacher, 18: 253-56, November, 1951; D. P. Ogdon, "Flesch Counts of Eight Current Texts for Introductory Psychology," American Psychologist, 9: 143-44, April, 1954; Robert D. Ramsey, "An Analysis of the Readability and Difficulty of Instructional Materials in a Junior High School" (unpublished doctoral dissertation, University of Kansas, 1961); T. E. Robinson, "Reading Difficulty of History Textbooks" (unpublished master's thesis, Rutgers University, 1940); Carlton W. Sprague, "Textbook Readability: Measurement by Objective Formulas Compared to Judgements of Experienced Teachers" (unpublished doctoral dissertation, University of North Carolina at Chapel Hill, 1968); L. N. Wood, "Readability of Certain Textbooks," Elementary English, 31: 214-16, April, 1954.

²⁷William D. Sheldon, "Criteria for a Sound Literacy Program," Forging Ahead in Reading, J. A. Figurel, editor (Newark, Delaware: International Reading Association, 1968), p. 413.

were being used. Of particular note was that the readability level of many materials was often two or three grade levels too high.²⁸

From a national survey of ABE programs Otto and Ford reported that nearly fifty percent of the students participating in three hundred and sixty programs were reading at a level equivalent to fourth-sixth grade or higher.²⁹ As stated previously, little investigation has been reported for ABE materials used on these levels.

One ABE readability study was reported by Londoner in 1967.³⁰ The study was conducted to determine the readability levels of both basic education and vocational education curriculum materials. The study was initiated in 1967 after the results of a U. S. Office of Education report on ABE materials.³¹ Londoner's results were similar to

²⁸U. S. Department of Health, Education, and Welfare, Office of Education, Report of the Task Force on Adult Basic Education Instructional Materials and Related Media (Washington: Government Printing Office, January, 1964).

²⁹Wayne Otto and D. Ford, "Basic Literacy Programs for Adults: A National Survey," Junior College and Adult Reading Programs, G. B. Schick and M. M. May, editors, Sixteenth Yearbook of the National Reading Conference, pp. 244-45, 1967.

³⁰Carroll A. Londoner, A Readability Analysis of Randomly Selected Basic Education and Vocational Education Curriculum Materials Used at the Atterbury Job Corps Center as Measured by the Gunning Fog Index, School of Education, Indiana University, January, 1967.

several of the findings of the U. S. Office of Education study and neither included comparisons or correlations by other means of readability assessment. While Londoner's study was valid within its stated purposes, further comparative data of both a subjective and objective nature would be a helpful addition to the study.

The volume of ABE reading materials has expanded since the 1964 survey³² and in many cases careful measurement of readability has been neglected. With reference to the Buffalo Literacy Research Center, Brown explained:

At the Buffalo Literacy Research Center a study was made of supposedly "beginning" level reading materials presently in use for adult literacy training. Through the use of readability formulas, rough estimates were made of the level of difficulty of the materials. Although some materials began as low as upper first-grade level, other materials inaugurated "beginning" reading instruction at the fifth-grade level. In some textbook series, the first book of the series was more difficult than the second in terms of the readability formulas. And in several cases, the reading difficulty at the end of the first book was higher than at the end of the second book in the series. In other cases the reading difficulty increased so rapidly from one lesson to the next that, in the course of the completion of one workbook, a student would supposedly have had to increase in reading ability several grades in order to keep pace with the reading material. On the other hand, one beginning reading level workbook made no appreciable gain in difficulty from the first page to the last.³³

³²Londoner, loc. cit.

³³Don A. Brown, "Measuring the Reading Ability and Potential of Adult Illiterates," Measurement and Evaluation of Reading, Roger Farr, editor (New York: Harcourt, Brace & World, Inc., 1970), pp. 156-57.

Since 1965, efforts have been launched to offer effective means of improving teacher training and instructional materials for use in ABE classes. ABE reading materials now in use are relatively untested and have been described as too difficult and are poorly and improperly paced.³⁴ In appraising adult materials, reports by *Publisher's Weekly*³⁵ and Kempfer³⁶ further highlight the shortage of suitable reading materials.

III. PROFESSIONAL OR TEACHER JUDGEMENT

One means of checking the validity of readability formulas has been the use of professional or teacher judgement. Studies reflect assessments made by librarians, teachers, and reading experts for a variety of materials, excluding reading materials used in ABE classes. No studies are available in published literature in which materials used in ABE classes were rated by teacher judges.

³⁴Brown, loc. cit.

³⁵*Publishers Weekly*, "War on Poverty: Book Publishing's Role in Adult Education, Job Training," Report of Conference Sponsored by the U. S. Department of Health, Education, and Welfare, Office of Education, and American Textbook Publishers Institute, *Publishers Weekly*, 185: 38-40, February 17, 1964.

³⁶Homer Kempfer, "Simpler Reading Materials Needed for 50,000 Adults," *School Life*, 33: 115, 127, May, 1950.

Bergman,³⁷ in one of the earliest studies of its type, analyzed seventy supplementary reading books comparing the Washburne-Morphett formula with teacher judgements. He found an overall correlation of .69.³⁸

After this early study over a dozen similar studies are reported comparing formula estimates and professional judgements. Of these, approximately three-fifths report a positive correlation or high percent of agreement between mean scores of objective-subjective readability measures.³⁹

³⁷W. G. Bergman, "Objective and Subjective Grade Placement of Supplementary Readers," Reconstructing Education Through Research: Official Report (Washington, D.C.: American Educational Research Association, 1936), pp. 263-71.

³⁸Ibid., p. 268.

³⁹James Wert, "A Technique for Determining Levels of Group Reading," Educational Research Bulletin, 16: 113-21, 136, May 19, 1937; Mable Jackman, "The Relation Between Maturity of Content and Simplicity of Style in Selected Books of Fiction," Library Quarterly, 11: 302-27, July, 1941; Cyrilla Walther, "The Reading Difficulty of Magazines," School Review, 51: 100-105, February, 1943; S. S. Stevens and G. Stone, "Psychological Writing, East and Hard," American Psychologist, 2: 230-35, July, 1947; S. N. Guckenheimer, "The Readability of Pamphlets on International Relationships," Educational Research Bulletin, 26: 231-38, December, 1947; Edgar Dale and J. S. Chall, "A Formula for Predicting Readability," Educational Research Bulletin, 27: 11-20, January, 1948; A. S. Gilinsky, "How Valid is the Flesch Readability Formula?" American Psychologist, 3: 261, July, 1948; E. H. Latimer, "A Comparative Study of Recent Techniques for Judging Readability," (unpublished doctoral dissertation, University of Pittsburgh, 1948); D. H. Russell and A. F. Merrill, "Children's Librarians Rate the Difficulty of Well-Known Juvenile Books," Elementary English, 28: 263-68, May, 1951; D. H. Russell and H. R. Fea, "Validity of Six Readability Formulas as Measures of Juvenile Fiction,"

since 1958 there has been an abrupt decline in comparative studies involving teacher judgement. This is due in part, to changing interests toward such areas as the cloze procedure, linguistic factors, and factor analysis techniques.

In reviewing the available studies, Russell and Merrill⁴⁰ reported one of the most interesting and well designed studies. Sixty-three librarians rated twelve juvenile books according to their reading difficulty. The expert ratings were compared to scores determined by six readability formulas. The librarian's ratings varied, and the results revealed that children's librarians do not agree closely with each other.

However, over all mean ratings compare favorably with mean formula ratings based on the Dale-Chall, Flesch,

Elementary School Journal, 52: 136-44, November, 1951; James E. Inskip, Jr., "A Comparison of Several Methods of Estimating Readability of Elementary School Reading Material," (unpublished doctoral dissertation, University of Minnesota, 1960); R. W. Pitcher, "An Experimental Investigation of the Validity of the Flesch Readability Formula as Related to Adult Materials," (unpublished doctoral dissertation, University of Michigan, 1953); R. F. Lockman, "A Note on Understandability," Journal of Applied Psychology, 40: 195-96, June, 1956; R. L. Herrington and G. G. Mallison, "An Investigation of two Methods of Measuring the Reading Difficulty of Materials for Elementary Science," Science Education, 42: 385-90, December, 1958.

⁴⁰Russell & Merrill, loc. cit.

Lewerentz, Lorge, Washburne-Morphett and Yoakam formulas.⁴¹

It should be noted that in some cases of the readability formula scores varied as much or more than did the librarian's estimates. The Dale-Chall and Lorge formula appeared to offer equally good measures of readability.⁴² The Dale-Chall was considered to correlate most closely with professional judgement in this study.⁴³

In a study by Inskeep, the Dale-Chall and Spache formulas were validated against comprehension scores of children and the teacher estimates of readability of ten selected materials. Inskeep reported that the means of teacher judgements and formula scores correlated .9515 and that teacher estimates of readability and children's comprehension scores correlated .84.⁴⁴

Dale and Chall reported data to support a close correlation between formulas and professional judgement.⁴⁵

⁴¹Ibid.

⁴²Klare, op. cit., p. 140.

⁴³George D. Spache, Good Reading for Poor Readers (Champaign, Illinois: Garrard Publishing Company, 1970), p. 32.

⁴⁴Inskeep, op. cit., pp. 105-106.

⁴⁵Dale-Chall, loc. cit.

A correlation of .90 and .92 is reported when comparing teacher and formula estimates of difficulty for foreign affairs passages and health education texts respectively.⁴⁶ Supportive results are reported by Guckenheimer who found a correlation of .86 between the Dale-Chall formula scores and difficulty judgement of seven experts for a series of thirty-six passages from international affairs material.⁴⁷

Other studies reveal somewhat less favorable findings. Jackman reported a negative correlation of $-.129$ in his comparison using books of fiction.⁴⁸ In another study using adult magazines the correlation between Gray-Leary formula scores and subjective judgement revealed a figure of $.40$.⁴⁹ Pitcher conducted a study of comprehension and rate of reading on three different readability levels and three different contents. In this study using adult reading materials with college students, Pitcher reported a correlation of $.59$ between interest and difficulty of selected passages.⁵⁰

⁴⁶Ibid., p. 18.

⁴⁷Buckenheimer, op. cit., p. 237.

⁴⁸Jackman, op. cit., p. 316.

⁴⁹Wert, op. cit., p. 119.

⁵⁰Pitcher, loc. cit.

IV. SUMMARY

A review of comparative readability research has revealed that: (1) the correlation between readability formula estimates and teacher judgements is uncertain; and (2) no comparative readability studies have been reported in published literature involving reading materials used on Level II (grades four, five, and six) and Level III (grades seven through high school) in adult basic education classes.

Concerning classroom teacher estimates of readability Chall stated: ". . . there is overwhelming evidence to show that many children, directed by such judgement, were given material that was too hard for them to read and comprehend."⁵¹ This study examines the extent to which Chall's statement, made in 1958, is true more than a decade later for ABE teachers.

The history of readability research has been an attempt at refinement. Early efforts included simply devising both subjective and objective methods of measurement. A second era was introduced through a series of vocabulary studies which were prompted by Thorndike in 1921. A third stage of refinement has followed in which researchers have attempted to compare and improve existing

⁵¹Chall, Readability: An Appraisal of Research and Application, op. cit., p. 9.

measures and develop new means of assessment. Referring to readability research Mavis Martin stated:

Refinement can be said to take two major directions: attempts to (1) sharpen, in some way, the predictive power of a tool or (2) make a formula more efficient without loss in prediction so that essentially the same results will be achieved for a more realistic investment in time and effort.⁵²

"Comparative studies are difficult to interpret. . . ." ⁵³ stated Klare. He goes on to state that more of the high intercorrelations have involved the Dale-Chall formula than any other formula.⁵⁴ Sufficient comparisons between the Dale-Chall, the Fry Readability Graph and the Gunning Fog Index are unreported, as are comparisons of formulas applied to materials used in ABE classes. The present study investigates these needed comparisons while also examining the predictive value and practical, realistic potential of selected techniques for estimating readability.

⁵²Mavis Martin, "Refinement of a Readability Formula," Problems, Programs, and Projects in College-Adult Reading, R. C. Staiger and C. Y. Melton, editors (Milwaukee, Wisconsin: National Reading Conference, 1963), Eleventh Yearbook of The National Reading Conference, pp. 244-245, 1963.

⁵³Klare, op. cit., p. 119.

⁵⁴Ibid., p. 120.

Referring to the need for continued efforts involving comparative readability and validity studies, Chall suggested the following three areas: (1) a need for more evidence of the validity of the grade-placement indexes computed by formulas; (2) a need for studies in which estimates of various formulas are compared on materials in many subject fields; and (3) more studies at the upper levels of difficulty are needed.⁵⁵ The current study is directly concerned with the latter two of Chall's suggestions by comparing the Dale-Chall Readability Formula, the Fry Readability Graph, and the Gunning Fog Index of Readability for materials used in Level II and Level III ABE classes. The addition of the element of teacher judgement of readability serves to extend this study beyond Chall's original thesis.

⁵⁵ J. S. Chall, "This Business of Readability: A Second Look," Educational Research Bulletin, 35: 99, April, 1956.

CHAPTER III

PROCEDURES

In this chapter the procedures followed in the study are described. A discussion of the sample of materials, opinionnaires, teacher raters, instruments used, and statistical treatment of data is included. Explanatory data are given for each readability formula used as well as specific descriptions of the sampling techniques employed. Pertinent explanations of the statistical procedures employed appear at the conclusion of the chapter.

I. THE SAMPLE

The cooperation of the Tennessee State Department of Education, Adult Division, was obtained in the selection of frequently used ABE materials in the state. A representative sample of Level II and Level III ABE materials was obtained. It is the policy of ABE supervisors to administer local ABE programs. Ten ABE supervisors were contacted and from their reports, a list of frequently used reading materials on Level II and Level III was obtained. The supervisors surveyed represent areas throughout the state of Tennessee and include both rural and urban programs.

The reading materials listed by the ABE supervisors were reviewed and the five most frequently used reading

materials on Level II and the three most frequently used reading materials on Level III were included on a teacher opinionnaire. The opinionnaire contains a listing of these materials with corresponding blanks for teacher estimates of readability. The opinionnaire is presented in Appendix A.

During the opening day of each of three summer reading institutes the writer administered the opinionnaires to a population of eighty-seven participants, forty-three of whom were randomly selected to serve as a sample for the study. The opinionnaires were administered on the opening day at institutes held at: Tennessee State University from June 14-25, 1971; Memphis State University from July 5-16, 1971; and The University of Tennessee from July 19-30, 1971.

In addition to the opinionnaire there was a separate package containing the materials to be judged. Sample pages were duplicated directly from each material and available to the rater while completing the opinionnaire. The opinionnaires were administered to a total group at each institute without their having received prior instructions as to the nature of the survey.

The respondents in the study were all ABE teachers in attendance at the institutes on a voluntary basis. The following data reflects a partial profile of those teachers who completed the readability opinionnaires.

- A. The majority were females (54 percent).
- B. The majority were thirty-five years of age or older (71.3 percent).
- C. The majority were white (54 percent).
- D. The majority possessed less than a masters degree (67.8 percent).
- E. The majority possessed more than three years teaching experience in ABE (54.1 percent).
- F. The majority possessed more than ten years teaching experience in the public schools other than ABE (58.6 percent).
- G. The majority were part-time employees in ABE (81.6 percent).¹

II. INSTRUMENTS

The readability formulas chosen for the study were the Dale-Chall,² the Fry Readability Graph,³ and the Gunning Fog Index of Readability.⁴ Each of the three formulas represents a period in readability research ranging from the

¹Donnie Dutton and Luke Easter, The Formulation, Implementation and Evaluation of Adult Education Institutes in Tennessee 1971, Memphis State University, September, 1971, p. 38.

²Edgar Dale and Jeanne S. Chall, "A Formula For Predicting Readability," Educational Research Bulletin, 27: 11-20, January, 1948; Edgar Dale and Jeanne S. Chall, "A Formula For Predicting Readability: Instructions," Educational Research Bulletin, 27: 37-54, February, 1948.

³Edward Fry, "A Readability Formula That Saves Time," Journal of Reading, 11: 513-516, 575-578, April 1968.

⁴Robert Gunning, The Technique of Clear Writing (New York: McGraw-Hill Book Company, Inc., 1968).

expansion period from 1923-1953,⁵ to formulas developed from research emphasizing efficiency and simplicity of use.⁶

A sample of approximately one hundred words was taken in proportion to the total number of pages per material analyzed.⁷ Following specific instructions of the authors of the Dale-Chall formula,⁸ the samples were selected on a random basis using a table of randomly assorted digits.⁹ Of the readability formulas intended for the appraisal of adult materials, the Dale-Chall formula is considered the most accurate.¹⁰

Introduced in 1948, the Dale-Chall readability formula was designed as a revision to the Flesch formula.

⁵George D. Spache, Good Reading for Poor Readers (Champaign, Illinois: Garrard Publishing Company, 1970), p. 34.

⁶Ibid., p. 35.

⁷Jeanne S. Chall, "Readability: An Appraisal of Research and Application," (unpublished doctoral dissertation, Ohio State University, 1952), p. 82; Mavis Martin and Wayne D. Lee, "Sample Frequency in Application of Dale-Chall Readability Formula," Educational Research Bulletin, 40: 147, September, 1961.

⁸Dale & Chall, "A Formula for Predicting Readability: Instructions," loc. cit.

⁹W. W. Wyatt and C. M. Bridges, Statistics for the Behavioral Sciences (Englewood: D. C. Heath and Company, 1967), pp. 352-355.

¹⁰George R. Klare, The Measurement of Readability (Ames, Iowa: Iowa State University Press, 1963), p. 22.

The revisions are primarily based on the thesis that (1) a larger word list would be of a higher predictive value than the Dale 769-word list; (2) a count of personal references and affixes is unnecessary; and (3) a shorter, more efficient measure could be developed.¹¹ The procedure for applying the Dale-Chall formula is:

Select 100-word samples throughout the material to be rated;

Compute the average sentence length in words (X_2);

Compute the percentage of words outside the Dale list of 3000 (X_1 , or Dale score);

Apply in the formula:¹²

$$X_{c50} = .1579 \times 1 + .0496 \times 2 + 3.6365$$

Corrected grade levels are available to help interpret the raw scores obtained by the Dale-Chall formula. For example, a selection having a formula score of 6.2 should be within the comprehension of readers who have sixth to seventh grade reading ability. The corrected grade levels presented by Dale-Chall are given in the following list:

¹¹Dale & Chall, "A Formula For Predicting Readability," op. cit., p. 15.

¹²Ibid., p. 18.

Formula Score	Corrected Grade Levels
4.9 and below	Grade IV and below
5.0 to 5.9	Grades V-VI
6.0 to 6.9	Grades VII-VIII
7.0 to 7.9	Grades IX-X
8.0 to 8.9	Grades XI-XII
9.0 to 9.9	Grades XIII-XV (college)
10.0 and above	Grades XVI - (college graduate) ¹³

The Dale-Chall readability formula was originally validated on the McCall-Crabbs Standard Test Lessons in Reading.¹⁴ The authors used 376 passages in Books II through V of the McCall-Crabbs lessons in determining the relative number of words in the test lessons not contained on the Dale list of 3,000 words. The readability level was determined by equating the formula score with the test results of school pupils who were able to answer one-half of the text questions used in the series of passages. The multiple correlation coefficient of the two factors (Dale score and average sentence length) with the criterion measure which was the pupil comprehension score, was .6833 in the original study.¹⁵ Later a further predictive study was

¹³Ibid.

¹⁴M. A. McCall and Lelah Crabbs, McCall-Crabbs Standard Test Lessons in Reading. (New York: Bureau of Publications, Teachers College, Columbia University, 1926).

¹⁵Dale & Chall, "A Formula For Predicting Readability," op. cit., p. 16.

made using health and social studies materials.¹⁶ Dale and Chall found that for fifty-five passages of health-education material, ranging from fourth grade to college level in difficulty, their formula estimates correlated .92 with expert judgements. Further study using seventy-eight passages on foreign affairs revealed a correlation of .90 with social studies teacher judgements.¹⁷

More than two dozen comparative or validative readability studies using the Dale-Chall formula are reported.¹⁸ Studies by other investigators have affirmed the validity of the instrument for a variety of materials. Reports by Johnson,¹⁹ Nyman, Kearl, and Powers,²⁰ Moore,²¹

¹⁶ Ibid., p. 18.

¹⁷ Ibid.

¹⁸ Klare, op. cit., p. 118; Barbara Seels and Edgar Dale, Readability and Reading: An Annotated Bibliography (Newark, Delaware: International Reading Association, 1971).

¹⁹ D. A. Johnson, "The Readability of Mathematics Books," The Mathematics Teacher, L (February, 1957), 106-107.

²⁰ Patricia Nyman, Bryant E. Kearl, and Richard Powers, "An Attempt to Shorten the Word List with the Dale-Chall Readability Formula," Educational Research Bulletin, 40: 50, September 13, 1961.

²¹ A. J. Moore, "Science Instructional Materials For the Low Ability Junior High Student," School Science and Mathematics, 62: 561, November, 1962.

Klare,²² Snortum,²³ Lee,²⁴ Lee and Belden,²⁵ Pauk,²⁶ Sprague,²⁷ Dulin,²⁸ and Koenke²⁹ support a research basis for the accuracy and reliability of the Dale-Chall formula.

Despite the disparity found in many correlational studies, Klare reported the following conclusions concerning the Dale-Chall formula:

²²Klare, op. cit., p. 22.

²³N. K. Snortum, "Readability Re-examined," Journal of Communication, 14: 137, September, 1964.

²⁴Wayne D. Lee, "What Does Research in Readability Tell the Classroom Teacher?" Journal of Reading, 8: 141, November, 1964.

²⁵Wayne D. Lee and B. R. Belden, "A Cross Validation Readability Study of General Psychology Textbook Material and the Dale-Chall Readability Formula," Journal of Educational Research, 59: 369-73, April, 1966.

²⁶Walter Pauk, "A Practical Note on Readability Formulas," Journal of Reading, 13: 209-210, December, 1969.

²⁷C. W. Sprague, "Textbook Readability: Measured by Objective Formulas Compared to Judgements of Experienced Teachers," (unpublished doctoral dissertation, University of North Carolina at Chapel Hill, 1968).

²⁸K. L. Dulin, "Readability Levels of Adult Magazine Material," The Psychology of Reading Behavior, G. B. Schick and M. M. May, editors, Eighteenth Yearbook of the National Reading Conference, pp. 176-77, 180, 1969.

²⁹Karl Koenke, "Another Practical Note on Readability Formulas," Journal of Reading, 15: 204, December, 1971.

1. In available studies, the Dale-Chall and Flesch Reading Ease formulas provide the most consistently comparable results in terms of both correlational and grade placement data.

2. More of the high intercorrelations have involved Dale-Chall scores than those of any other formula, relative to the number of comparisons made.³⁰

During the past two decades three new readability formulas have emerged with an assertion of simpler and quicker application as their primary justification. Fry,³¹ Gunning,³² and McLaughlin³³ have offered such formulas.

It is because of the recency of the new formulas, their ease of application, and a lack of comparative research for these measures, that the Fry Readability Graph³⁴ and the Gunning Fog Index of Readability³⁵ were selected for the study. In *The Technique of Clear Writing* originally published in 1952, Robert Gunning presented the Gunning Fog

³⁰Klare, op. cit., p. 120.

³¹Fry, loc. cit.

³²Gunning, loc. cit.

³³G. H. McLaughlin, "SMOG Grading: A New Readability Formula," Journal of Reading, 12: 639-646, May, 1969.

³⁴Fry, loc. cit.

³⁵Gunning, loc. cit.

Index. The steps required in applying the Gunning Fog Index are:

Take systematic samples of 100 words;

Divide number of words by number of sentences to get sentence length;

Count the number of words of three or more syllables (with certain exceptions) to get percentages of hard words;

To get the Fog Index, total the two factors above and multiply by .4.³⁶

The score obtained by computing the Fog Index represents the reading level required for understanding the material, which is very similar to the corrected Dale-Chall score. The accuracy of the Fog Index is based on increasing values for hard words and sentence length. The formula was developed using both pulp (e.g. Reader's Digest, Time, True Confessions) and class (e.g. Atlantic Monthly, Harper's) magazines as well as the McCall-Crabbs Standard Test Lessons in Reading.³⁷ The Gunning Fog Index has not been sufficiently validated by correlation with judgement, readership, comprehension, or other formula comparison.

³⁶ Ibid.

³⁷ McCall-Crabbs, loc. cit.

The recently developed Fry Readability Graph was selected for the study and differs from the Gunning Fog Index in that the Fry Graph employs a separate graph upon which a combined score, including the average sentence length and total number of syllables per one hundred words is plotted. See Appendix B for the Fry Readability Graph.

The Readability Graph was first developed by Fry in Uganda, and originally appeared in publications read primarily by British readers.³⁸ Early validation of the Fry Readability Graph was reported by Kistulentz³⁹ who found a correlation of .94 with the Dale-Chall formula and .96 with the Flesch formula. In another study of popular magazines, Dulin found favorable correlations ranging from .955 to .731 between the Fry Readability Graph and the Flesch, the Farr-Jenkins-Paterson, and the Gunning Fog Index formulas.⁴⁰

For the purposes of this study the Fry Readability Graph and the Gunning Fog Index were calculated by the writer

³⁸Edward Fry, "A Readability Formula That Saves Time," Multidisciplinary Aspects of College-Adult Reading, G. B. Schick and M. M. May, editors, Seventeenth Yearbook of the National Reading Conference, pp. 199-204, 1968.

³⁹A. C. Kistulentz, "Five Readability Ratings Compared to Comprehension Test Scores on Ten High School Literature Books," (unpublished master's thesis, Rutgers University, 1967).

⁴⁰Dulin, op. cit., p. 179.

with exact adherence to the authors' instruction for application. The Dale-Chall formula was calculated by the IBM 360/65 computer. The computer program was developed strictly according to the authors' instructions for application.⁴¹ The computer program was developed so as to produce the following analysis of each sample of material: (1) the Dale-Chall readability index score; (2) the total number of words in the sample; (3) the number of words not appearing on the Dale-List; (4) the number of sentences; (5) the average sentence length; (6) the exact sample as analyzed; (7) an alphabetized list of all words in the sample along with their frequency of occurrence; (8) the exact number of syllables in each word; (9) the total number of syllables in the sample; and (10) a listing of the number of one, two, three, four, and five or more syllable words.

III. ANALYSIS OF THE DATA

Formula derived readability indices and mean scores were tabulated for the following materials:

⁴¹Dale & Chall, "A Formula for Predicting Readability: Instructions," loc. cit.

1. Activities for Reading Improvement, Books 1, 2, 3 Steck Vaughn, Inc.
2. Be a Better Reader Series, Books A, B, C, 1, 2, 3 Prentice-Hall, Inc.
3. How To Read Better, Books 1, 2 Steck Vaughn, Inc.
4. Reader's Digest Skill Builders, Books 4, 5, 6 - Part One Reader's Digest Services, Inc.
5. Reader's Digest Advanced Skill Builders, Books A, B, C
6. System For Success, Book 2 Follett Publishing Company
7. Science Research Associates Laboratory Kit IIIA SRA, Inc.

Tables were prepared for the purpose of comparing the readability estimates on each material by the Dale-Chall Readability Formula, the Fry Readability Graph, the Gunning Fog Index, publisher's suggested readability level, and mean teacher readability ratings. Additional tables were also prepared including data resulting from the one way analysis of variance, coefficients of correlation, and Duncan's New Multiple Range Test.

A comparison of the range within each material was determined by considering a range of plus or minus two standard errors for determining the significance of deviation at the .05 level of confidence. Statistical analysis of

coefficients of correlation, one way analysis of variance, and Duncan's New Multiple Range Test were computed for the three readability formulas used in the study. A correlation technique was used to test for significance of correlation among formula scores. Analysis of variance was used for comparing samples of measurements (readability scores) with the intention of determining whether the observed differences among those samples was of a magnitude small enough to attribute to sampling variation.⁴² Duncan's New Multiple Range Test⁴³ allowed the comparison of pairs of data within the analysis of variance design. By looking at individual groups of scores by formula, it is often possible to locate the source of differences that may be reflected in the analysis of variance. For example, an analysis may reflect a significant difference between the scores of three different readability formulas ; the Duncan's Test may indicate the source or particular two formulas which affect this difference.

The following PERT Table represents the organizational structure of the study (Table I).

⁴²R. J. Senter, Analysis of Data (Glenview, Illinois: Scott, Foresman and Company, 1969), p. 250.

⁴³D. B. Duncan, "Multiple Range and Multiple F Tests," Biometrics, 11: 1-42, January, 1955.

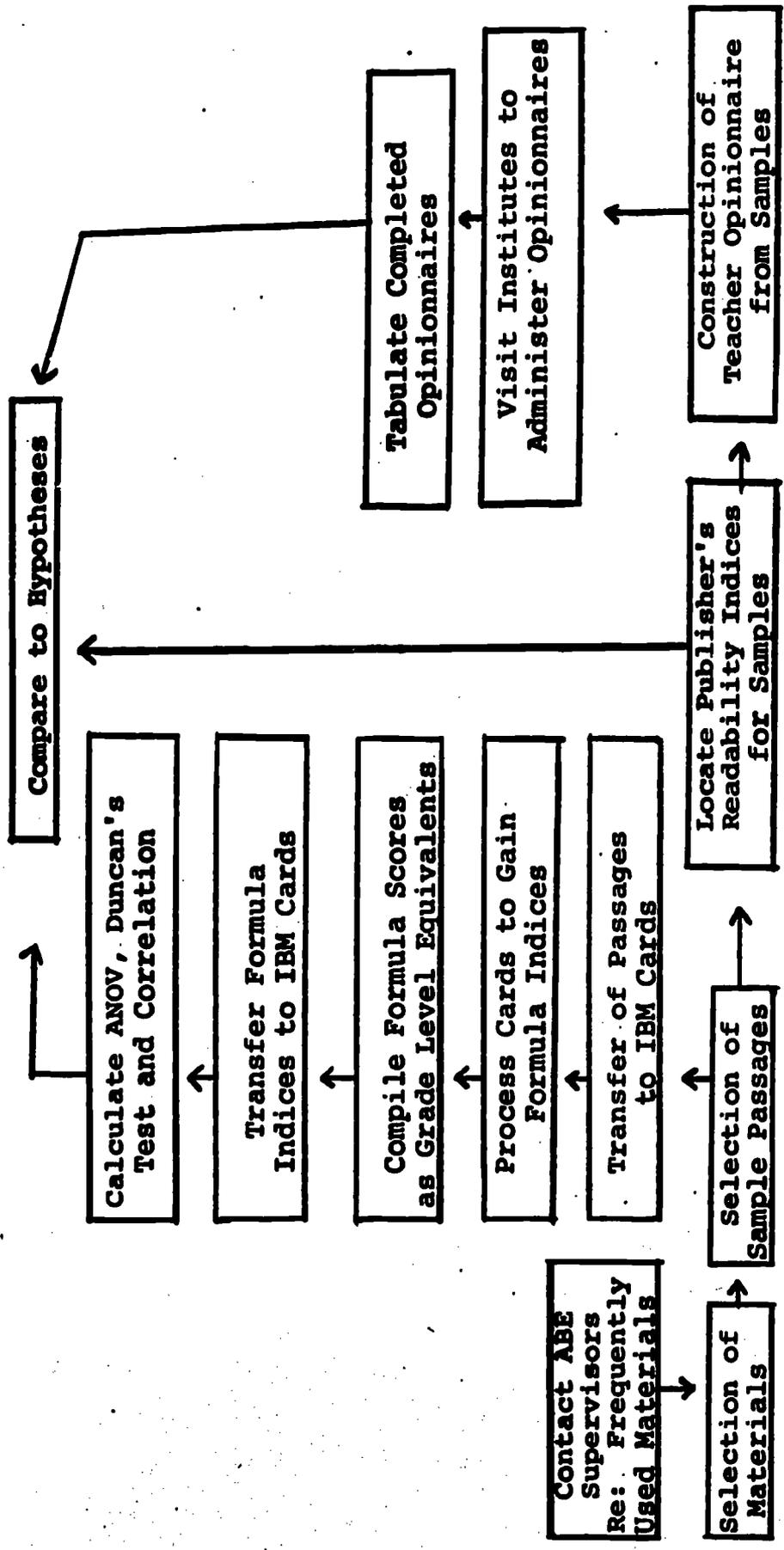


FIGURE I
ORGANIZATION OF THE STUDY

42

CHAPTER IV

PRESENTATION AND INTERPRETATION OF DATA

I. RESULTS

Beginning with Table II, the presentation of data follows each hypothesis investigated in the study. All scores are reported as grade level equivalents.*

Ho 1: There is no difference between teacher estimates of readability and publisher suggested readability levels. Hypothesis 1 was rejected.

The data in Table II show that publisher estimates of readability are higher than teacher ratings for twelve of twenty-nine materials with a range of from 2.44 grades to .04 years difference. Seventeen materials were judged from 2.83 to .12 grades higher by teacher appraisals than publisher estimates. The mean readability estimate by teachers was 1.11 grades greater than publisher ratings, as compared to a mean of .788 for those twelve materials sponsoring a higher level of difficulty by publisher ratings than teacher judgements.

Ho 2: There is no difference between publisher suggested readability levels and Dale-Chall Readability Formula scores. Hypothesis 2 was rejected.

*(See Appendix C for listing of materials as they are numbered in each table and Appendix D for all tables.)

Table III shows that Dale-Chall estimates of readability were on an average of .885 grades higher for seventeen of the twenty-seven materials analyzed (sixty-three percent). The high-low range of difference was from 2.89 to .17 grades. The remaining two materials were rated by the publisher as being more difficult to read and yielded a mean of .692 with a range of from 1.83 to .08 grades. Dale-Chall scores ranked below publisher grade levels for thirty-seven percent of the materials.

Ho 3: There is no difference between publisher suggested readability levels and Fry Readability Graph scores. Hypothesis 3 was rejected. Although the hypothesis was rejected, significant differences were found for three materials analyzed.

In Table IV it can be seen that publisher ratings were from .77 to 2.83 grades higher than Fry Readability Graph estimates for nineteen of the twenty-nine materials analyzed. The mean difference for the nineteen materials was 1.046 years. For the seven materials which the Fry Readability Graph rated as more difficult than did publisher estimates, a mean .62 was found with a range of from .5 to 1.67 grades. Fry Readability Graph scores fell below publisher estimates for seventy-six percent of the materials rated.

Ho 4: There is no difference between publisher suggested readability levels and Gunning Fog Readability scores. Hypothesis 4 was rejected.

Table V contains a total of twenty-six ratings by the Fog Index, with a mean difference of 1.569 and a range from 3.5 to .02 grades. For the three materials which the publisher's estimates were higher, a mean of .3967 was reported from differences of .24, .58, and .37 grades higher than Gunning Fog scores. Gunning Fog scores fell below publisher rating for only ten percent of the materials.

Ho 5: There is no difference between publisher suggested readability levels and overall readability formula scores. Hypothesis 5 was rejected.

In Table VI data are presented showing that nineteen materials were rated on an average of .858 higher by overall formula scores with a range of .07 to 1.22 grades. The remaining ten materials having higher publisher readability estimates were .518 higher than formula scores and ranged from .01 to 1.22 grades.

Ho 6: There is no difference between teacher estimates of readability and Dale-Chall Readability Formula scores. Hypothesis 6 was rejected.

In Table VII data shows that fifteen of twenty-seven materials analyzed were rated higher by the Dale-Chall formula and twelve materials were estimated more difficult to

read by teacher judgements. The mean difference for the Dale-Chall indices was .9086 grades as compared to a mean difference of .6733 grades for teacher estimates. Ranges for the differences within the high Dale-Chall scores were from a low of .05 to a high of 1.4 as compared to a range of .10 to 1.72 for high teacher readability estimates. Agreement within one grade level was found for sixty-seven percent of those materials analyzed.

Ho 7: There is no difference between teacher estimates of readability and Fry Readability Graph scores. Hypothesis 7 was rejected.

Results shown in Table VIII show that teacher readability estimates were higher for twenty of the materials rated. The remaining nine materials were rated higher by the Fry Graph. A comparison of mean differences for teacher ratings revealed more than one-half grade level differences between means of 1.463 and .6956. Fifty-one percent of the materials were rated within one grade level by the two measures.

Ho 8: There is no difference between teacher estimates of readability and Gunning Fog Index of Readability scores. Hypothesis 8 was rejected.

Presented in Table IX are data showing that twenty-one of the twenty-nine materials analyzed were estimated on an average of 1.834 grades more difficult by the Fog Index of

Readability than by teacher ratings. For the remaining eight materials, teacher estimates of readability averaged more than one year higher than Fog Index scores and revealed a mean of 1.12 grades. Ranges for the differences in Fog Index indices were from .02 to 5.58 grades as compared to a lesser range of from .11 to 2.64 grades between teacher means. Agreement within one grade level was found for thirty-four percent of the materials sampled.

Ho 9: There is no difference between teacher estimates of readability and overall readability formula scores. Hypothesis 9 was rejected.

Table X shows that the overall formula scores were higher for fifteen of the twenty-nine materials with a mean difference of 1.023 grades. Teacher estimates were higher than overall formula estimates for thirteen materials with a mean difference of 1.14 grades. The overall formula ranges were from .19 to 2.76 as compared with teacher estimates ranging from 1.46 to 3.32 grades. When all three formula scores were averaged, fifty-nine percent of the materials fell within one grade level of teacher ratings.

Ho 10: There is no significant correlation between Dale-Chall Readability Formula scores and Fry Readability Graph scores. Hypothesis 10 was accepted.

Table XI reports that the mean correlation was .577 with a significant correlation found for materials one, two,

three, sixteen, seventeen, nineteen, and twenty-nine. Table XI includes correlational data for each material analyzed.

Ho 11: There is no significant correlation between Dale-Chall Readability Formula scores and Gunning Fog Index of Readability scores. Hypothesis 11 was accepted.

The coefficient of correlation was .461 which falls short of the .8343 and .7067 which was needed to show significance at the .01 and .05 levels. See Table XI.

Ho 12: There is no significant correlation between Fry Readability scores and Gunning Fog Index of Readability scores. Hypothesis 12 was accepted.

A mean correlation .478 was reported with negative correlations found for three materials. See Table XI.

Ho 13: There is no significant difference between Dale-Chall Readability Formula scores, Fry Readability Graph scores, and Gunning Fog Index scores. Hypothesis 13 was accepted.

A mean F value of 3.374 was reported. Minimum values required for .01 and .05 levels of significance were 6.3589 and 3.6823. See Table XIV for more detailed data regarding each analysis of variance that attained a significant F value. Table XII presents F values by material.

Duncan's New Multiple Range Test was used as a follow-up to indicate where possible, the two formulas which are responsible for a significant difference. Occasionally,

significant differences or particularly strong interaction can be found between two means even when the overall F value does not reach significance. Significant interaction was found between fourteen pairs for seven materials in the study. All nine materials showing a significant F value were found to have strong interaction between certain formulas. See Table XIII for specific materials and formula pairs showing significant differences as measured by the Duncan's test.

II. SUMMARY

Comparisons between teacher estimates and formula scores revealed that the Dale-Chall and Fog Readability Index scores were generally higher than teacher estimates of readability. Teacher ratings were higher for a majority of the materials when compared to the Fry Readability Graph. Overall formula scores were higher for fifteen and lower for thirteen materials while one material was rated equally by both formula and teacher judgements.

The following represents the percent of agreement or disagreement between publisher ratings and formula estimates of readability.

Formula	Agreement of One Year or More	Disagreement of One Year or More
a. Dale-Chall	44%	31%
b. Fry Graph	31%	45%
c. Fog Index	28%	55%
d. Overall	52%	31%

The following represents the percent of agreement or disagreement between teacher judgements of readability and formula estimates.

Formula	Agreement of One Year or More	Disagreement of One Year or More
a. Dale-Chall	37%	33%
b. Fry Graph	41%	45%
c. Fog Index	21%	66%
d. Overall	28%	41%

Significant correlations were found between the Dale-Chall, Gunning Fog Index, and Fry Readability Graph and particularly for as many as nine materials comparing the Fry and Fog formulas. Comparative data for all formula pairs revealed that for over two-thirds of the materials analyzed, no significant correlation was found.

The analysis of variance shows nine materials in which significant F values were obtained. Results indicate that no significant difference exists between the mean scores

for over sixty-nine percent of those materials as measured by the Dale-Chall Readability Formula, Fry Readability Graph, and Gunning's Fog Index.

Data reported from Duncan's New Multiple Range Test is of note. All materials showing significant F values were found to also contain a significant interaction between certain formula comparisons. Specifically, the Fog/Fry, Fry/Dale-Chall, and Fog/Dale-Chall interactions were found in materials offering significant F scores.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter contains a summary of the preceding four chapters with final conclusions and recommendations.

I. SUMMARY

The Problem

The purposes of the study were: (1) to organize and conduct a readability appraisal of frequently used reading materials by a random sample of ABE teachers; (2) to locate the readability level provided by the application of the Dale-Chall Readability Formula, the Fry Readability Graph, and the Gunning Fog Readability Formula on reading materials used in ABE classes in Tennessee; (3) to compare ABE teacher readability appraisals with publisher readability estimates indices; (4) to ascertain the degree of correlation and degree of difference between the Dale-Chall Readability Formula, the Fry Readability Graph, and the Gunning Fog Readability Formula when applied to identical samples of reading materials used in ABE classes in Tennessee; and (5) to indicate, where possible, a direction for continued investigation or classroom application of the results of the study.

Importance of the Study

A major problem involved in selecting reading materials is determining the readability level of the material. Numerous investigations have dealt with comparative aspects of readability analysis for elementary, secondary, or college level students. Within the area of adult basic education, studies are few in number and usually oriented toward literacy materials. Since 1965 basic education classes have opened in over ninety-five percent of the school districts in Tennessee. The study seeks to indicate the possible consistency with which teacher ratings, publisher estimates and readability formula scores approximate a reading grade level for frequently used reading materials used in ABE classes in Tennessee.

A survey of comparative readability research has revealed that conclusive data concerning the degree of correlation between teacher readability estimates and readability formula scores for materials used in ABE classes is unavailable. Also, no comparative studies have been reported in published literature involving ABE reading materials and the validation of the Dale-Chall Formula, the Fry Readability Graph, and the Gunning Fog Index.

Procedures and Instruments Used

Ten adult basic education supervisors from across the state were contacted and from their responses, the eight

most frequently used reading materials were determined. The following eight most frequently used series of materials included a total of twenty-nine separate books or units of material.

- A. Activities for Reading Improvement, Books 1, 2, 3 Steck Vaughn, Inc.
- B. Be a Better Reader Series, Books A, B, C, 1, 2, 3 Prentice-Hall, Inc.
- C. How to Read Better, Books 1, 2 Steck Vaughan, Inc.
- D. Reader's Digest Skill Builders, Books 4, 5, 6, - Part one Reader's Digest Services, Inc.
- E. Reader's Digest Advanced Skill Builders, Books A, B, C, Reader's Digest Services, Inc.
- F. System for Success, Book 2 Follett Publishing Company.
- G. Science Research Associates Laboratory Kit IIIA SRA, Inc.

From each of the twenty-nine materials random samples of approximately one hundred words were selected in proportion to the total number of pages per material. Some variation existed between the sample analyzed by each formula due to differing passage length requirements. The Fry Readability Graph specified one hundred words exactly, while the Gunning

Fog Index requires approximately one hundred words ending at the nearest completed sentence.

Each of the twenty-nine materials were listed on an opinionnaire upon which ABE teachers entered their estimates of readability. In addition, there was a separate package containing the materials to be judged. The opinionnaires were administered to a random sample of forty-three volunteer participants on the opening day of three ABE training institutes held during the summer of 1971. The participants were all ABE teachers in Tennessee and represented a cross section of ABE programs in the state.

The formulas used in the study were the Dale-Chall, the Fry Readability Graph, and the Gunning Fog Index. The Dale-Chall is generally considered the most accurate formula for adult materials and in this study, a computer was used to calculate the Dale-Chall formula. The Fry Graph and Fog Index were used due to their ease of application and also due to their recency of development. A very limited number of comparative investigations have been reported using the Fry Readability Graph or the Gunning Fog Index.

Analysis of Data

Formula derived readability indices and mean scores were tabulated for each of the twenty-nine materials sampled. Statistical analysis of coefficients of correlation, one way

analysis of variance, and Duncan's New Multiple Range test of interaction were used for comparing mean formula scores. In addition, teacher ratings and publisher estimates of readability were also used for comparative purposes.

Results

Ho 1, 2, 3, 4, 5: Among the materials analyzed, there was a difference between publisher suggested readability levels and (a) teacher ratings; (b) Dale-Chall Readability Formula indices; (c) Fry Readability Graph scores; and (d) Gunning Fog Index scores. In most cases, teacher ratings, Dale-Chall formula scores, Gunning Fog Index scores, and overall formula means exceeded the readability level suggested by the publisher. In contrast, scores obtained by the application of the Fry Readability Graph consistently underrated the materials when compared to publisher estimates.

Ho 6, 7, 8, 9: Among the materials analyzed, there was a difference between teacher estimates of readability and (a) Dale-Chall Readability Formula scores; (b) Fry Readability Graph scores; and (c) Gunning Fog Index scores. Estimates of readability obtained by using the Dale-Chall formula, Gunning Fog Index, and overall formula means were found, for slightly more than fifty percent, to yield higher grade level equivalents. The greatest percent of agreement within one year (forty-one percent) was found for the Fry

Graph and diminished further for the Dale-Chall (thirty-seven percent) and Fog Index (twenty-one percent). Results from the study indicated that ABE teacher readability judgments were not in frequent agreement with formula or publisher approximations of readability. Such disharmony was in contrast to many studies in which reading experts, writers, or librarians were used as professional raters.

Ho 10: Among the twenty-seven materials analyzed, seventy-four percent revealed low correlation coefficients between the Dale-Chall and the Fry Readability Graph scores.

Ho 11: Among the twenty-seven materials analyzed, eighty-five percent indicated low correlation coefficients between Dale-Chall Formula scores and Gunning Fog Index scores.

Ho 12: Among the twenty-nine materials analyzed, sixty-nine percent revealed low correlation coefficients between the Fry Readability Graph and the Gunning Fog Index. In comparison to previous research, the present study resulted in noticeably fewer high correlations between formula indices. It should be noted that no reported studies have previously compared the same three formulas that were used for the current investigation nor have ABE teachers been used to estimate readability levels.

Ho 13: Among the materials analyzed, thirty-one percent were found to indicate a significant difference

between formula indices. There was also indication from the data, that strong interaction exists between formula indices for all significant F values. The most frequent source of difference was found to be affected by differences between Gunning Fog Index scores and Fry Readability Graph scores or Fry Readability Graph scores and Dale-Chall scores.

While the study does not diminish the uncertainties that exist between formula-professional judgements of readability, it does indicate that consistently high correlations should not be assumed for reading materials used in ABE classes in Tennessee. Results also serve to contrast with Chall's¹ statement concerning a tendency of classroom teachers to underestimate the reading difficulty of children's reading materials. The ABE teachers sampled usually expressed readability estimates above those suggested by publishers.

II. CONCLUSIONS

As a result of the study it is concluded that:

1. There was no evidence to indicate that the use of a particular readability formula was preferable when publisher ratings were used as a base for comparison. It cannot be assumed that either of the three formulas used in the

¹J. S. Chall, "This Business of Readability: A Second Look," Educational Research Bulletin, 35: 99, April, 1956.

study will yield the most accurate readability level. The selection of a particular formula for use in the ABE learning situation may be considered a matter of personal preference rather than empirical justification.

2. There was no evidence to indicate that teacher estimates of readability were sufficient for readability assessment when publisher grade levels were used as a base for comparison. There was an indication that ABE teachers may obtain more useful readability estimates by using more than their own subjective appraisal. The use of a readability formula, reader preference, and teacher approximations should offer the most useful guide in selecting materials for ABE students.

3. There was an indication that the use of the Dale-Chall Readability Formula may be most closely compared to mean teacher estimates of readability (sixty-seven percent fell within \pm one grade level).

4. There was no evidence to indicate a consistently significant degree of correlation between any two formulas.

5. There was evidence to indicate that no significant difference exists between readability formula scores for sixty-nine percent of those materials rated.

6. There was evidence to indicate that significant interaction exists between specific formulas, particularly

when assessing samples from Science Research Associates Laboratory Kit III A. Such evidence implies that due to the high degree of difference between formula indices, the publisher's attempts to control the difficulty level of this particular material may be inadequate. The problem is particularly important considering that kit materials are based upon a sequential graduation of reading difficulty.

III. RECOMMENDATIONS

The historical perspective of the study implies that a core of research in the area of ABE reading materials and readability is lacking. The study has provided new information. Results indicate that formula estimates, teacher judgements, and publisher ratings cannot be relied upon to consistently support each other when measuring the reading difficulty of selected instructional materials. The data implies, generally, that the ABE teachers in the sample population and other teachers from similar backgrounds, may not obtain the most practical assessment of readability without considering a combination of assessment measures. Direct assessment of readability without consideration of such variables as author's style, readership characteristics and grammatical complexities will not necessarily afford a grade level estimate of consistently high utility for ABE teachers. If ABE teachers are to effectively evaluate and

select instructional materials, continued research in the area is needed. Specifically, field studies comparing the predicted reading difficulty of materials with adult reading performance and/or other reading habits would be representative of a new area of practical investigation.

Investigations may venture into new areas of comparison such as the above or continue as a process of refinement. Improvements in readability formulas could result from substituting an adult word list for the Dale list which was used as a portion of the Dale-Chall formula. Lists reported by Kucera and Francis² and Mitzel³ were both constructed by sampling adult reading materials and could, perhaps, offer greater validity for assessing the readability of instructional materials intended for use with adults.

²H. Kucera and W. N. Francis, Computational Analysis of Present-day American English (Providence: Brown University Press, 1967).

³A. M. Mitzel, "The Functional Word List for Adults," Adult Education, 16: 60-68, Winter, 1966.

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APPENDICES

APPENDIX A

OPINIONNAIRE

TEACHER READABILITY OPINIONNAIRE

Grade Level of Difficulty

ACTIVITIES FOR READING IMPROVEMENT

Book 1 _____
Book 2 _____
Book 3 _____

BE A BETTER READER -

Book A _____
Book B _____
Book C _____
Book I _____
Book II _____
Book III _____

HOW TO READ BETTER -

Book 1 _____
Book 2 _____

READER'S DIGEST READING SKILL BUILDER

Book 4 (Part 1) _____
Book 5 (Part 1) _____
Book 6 (Part 1) _____

READER'S DIGEST ADVANCED READING SKILL BUILDER

Book 1 _____
Book 2 _____
Book 3 _____
Book 4 _____

SRA READING LABORATORY KIT IIIa

<u>Color</u>	
Orange	_____
Silver	_____
Olive	_____
Blue	_____
Brown	_____
Green	_____
Red	_____
Tan	_____
Gold	_____
Aqua	_____

SYSTEM FOR SUCCESS - Book 2

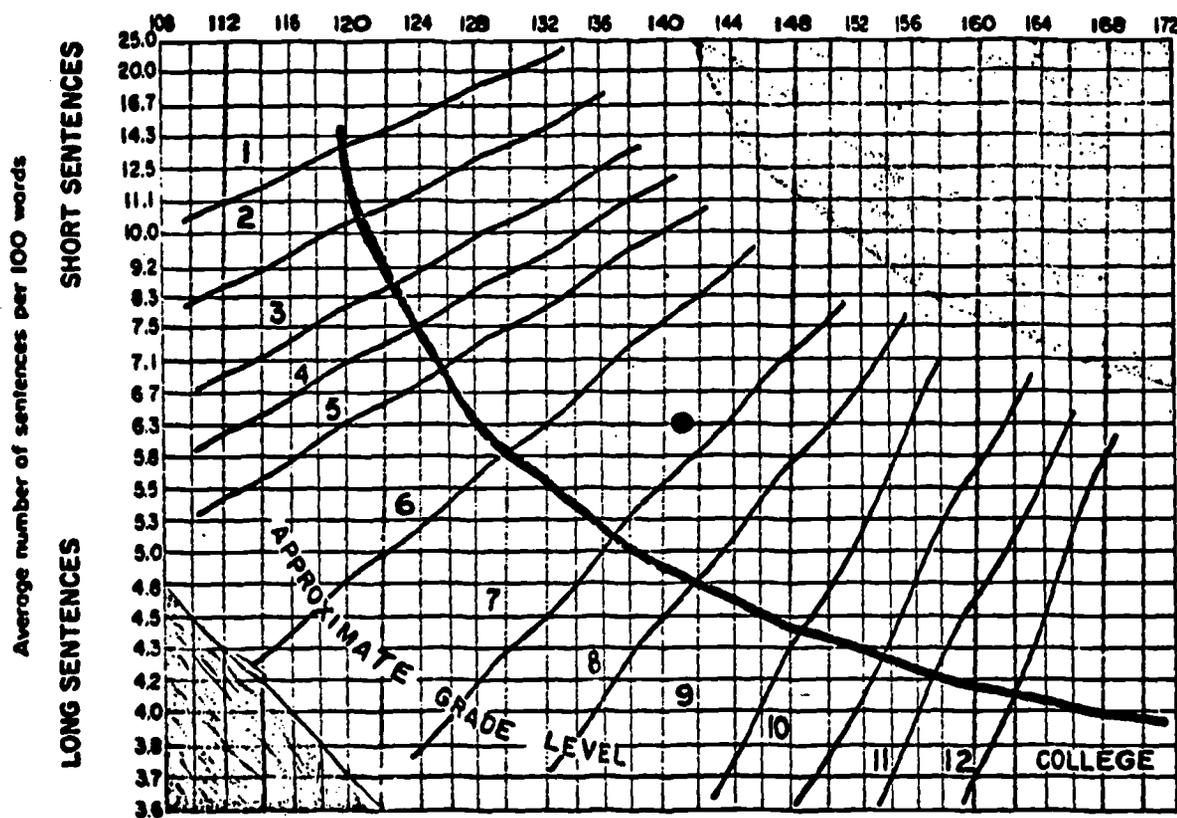
APPENDIX B

FRY READABILITY GRAPH

Average number of syllables per 100 words

SHORT WORDS

LONG WORDS



APPENDIX C

MATERIALS USED FOR THE STUDY

1.	Activities for Reading Improvement, Book 1	1
2.	Activities for Reading Improvement, Book 2	2
3.	Activities for Reading Improvement, Book 3	3
4.	Be a Better Reader, Book A	4
5.	Be a Better Reader, Book B	5
6.	Be a Better Reader, Book C	6
7.	Be a Better Reader, Book 1	7
8.	Be a Better Reader, Book 2	8
9.	Be a Better Reader, Book 3	9
10.	How to Read Better, Book 1	10
11.	How to Read Better, Book 2	11
12.	Readers Digest Skill Builder, Book 4	12
13.	Readers Digest Skill Builder, Book 5	13
14.	Readers Digest Skill Builder, Book 6	14
15.	Readers Digest Advanced Skill Builder, Book 1	15
16.	Readers Digest Advanced Skill Builder, Book 2	16
17.	Readers Digest Advanced Skill Builder, Book 3	17
18.	Readers Digest Advanced Skill Builder, Book 4	18
19.	System for Success, Book 2	19
20.	Science Research Associates Lab III A, Orange	20
21.	Science Research Associates Lab III A, Silver	21
22.	Science Research Associates Lab III A, Olive	22
23.	Science Research Associates Lab III A, Blue	23
24.	Science Research Associates Lab III A, Brown	24
25.	Science Research Associates Lab III A, Green	25
26.	Science Research Associates Lab III A, Red	26
27.	Science Research Associates Lab III A, Tan	27
28.	Science Research Associates Lab III A, Gold	28
29.	Science Research Associates Lab III A, Aqua	29

APPENDIX D

COMPARATIVE TABLES

TABLE II

MEAN TEACHER ESTIMATES AND PUBLISHER RATINGS

Material	Teacher	Publisher	Difference
1	4.56	7.0	2.44
2	6.34	8.0	1.66
3	7.80	9.0	1.20
4	5.91	4.0	1.91
5	5.60	5.0	.60
6	6.22	6.0	.22
7	7.35	7.0	.35
8	8.12	8.0	.12
9	7.53	9.0	1.47
10	5.31	5.0	.31
11	5.27	6.0	.73
12	3.80	4.0	.20
13	6.47	5.0	1.47
14	6.67	6.0	.67
15	6.72	7.0	.28
16	6.77	7.0	.33
17	7.96	8.0	.04
18	8.19	8.0	.19
19	6.28	6.5	.22
20	5.83	3.0	2.83
21	5.84	3.5	2.34
22	5.80	4.0	1.80
23	6.67	5.0	1.67
24	7.52	6.0	1.52
25	8.55	7.0	1.55
26	8.30	8.0	.30
27	9.94	9.0	.94
28	9.79	10.0	.21
29	10.52	11.0	.68

TABLE III
MEAN DALE-CHALL INDICES AND PUBLISHER RATINGS

Material	Dale-Chall	Publisher	Difference
1	6.58	7.0	.42
2	8.17	8.0	.17
3	7.58	9.0	1.42
4	6.89	4.0	2.89
5	7.00	5.0	2.00
6	5.67	6.0	.33
7	7.25	7.0	.25
8	8.17	8.0	.17
9	7.17	9.0	1.83
10	6.50	5.0	1.50
11	6.25	6.0	.25
12	4.58	4.0	.58
13	4.75	5.0	.75
14	5.83	6.0	.17
15	6.83	7.0	.34
16	7.58	7.0	.56
17	7.25	8.0	.75
18	8.25	8.0	.25
19	6.67	6.5	.17
20	*	3.0	
21	*	3.5	
22	5.25	4.0	1.25
23	6.00	5.0	1.00
24	8.17	6.0	1.17
25	7.83	7.0	.83
26	9.58	8.0	1.58
27	8.92	9.0	.08
28	9.17	10.0	.83
29	11.42	11.0	.42

TABLE IV
MEAN FRY READABILITY INDICES AND PUBLISHER RATINGS

Material	Fry	Publisher	Difference
1	7.33	7.0	.33
2	7.17	8.0	.83
3	8.33	9.0	.77
4	5.67	4.0	1.67
5	5.67	5.0	.67
6	4.33	6.0	1.67
7	6.33	7.0	.77
8	8.00	8.0	.0
9	7.33	9.0	1.67
10	5.83	5.0	.83
11	5.00	6.0	1.0
12	3.00	4.0	1.0
13	5.00	5.0	.0
14	6.00	6.0	.0
15	5.83	7.0	1.17
16	6.83	7.0	.17
17	5.67	8.0	2.33
18	6.83	8.0	1.17
19	6.67	6.5	.17
20	1.83	3.0	1.17
21	2.67	3.5	.83
22	3.17	4.0	.83
23	3.83	5.0	1.17
24	6.17	6.0	.17
25	6.67	7.0	.33
26	8.50	8.0	.5
27	8.00	9.0	1.0
28	9.00	10.0	1.0
29	10.00	11.0	1.0

TABLE V
MEAN GUNNING FOG INDICES AND PUBLISHER RATINGS

Material	Gunning Fog	Publisher	Difference
1	8.04	7.0	1.04
2	10.25	8.0	2.25
3	9.90	9.0	.90
4	7.50	4.0	3.5
5	6.95	5.0	1.95
6	6.24	6.0	.24
7	10.03	7.0	3.03
8	10.54	8.0	2.54
9	9.02	9.0	.02
10	6.39	5.0	1.39
11	7.08	6.0	1.08
12	4.40	4.0	.4
13	5.47	5.0	.47
14	6.81	6.0	.81
15	6.76	7.0	.24
16	9.31	7.0	2.31
17	7.42	8.0	.58
18	7.63	8.0	.37
19	9.01	6.5	2.51
20	3.19	3.0	.19
21	4.02	3.5	.52
22	4.87	4.0	.87
23	5.91	5.0	.91
24	7.43	6.0	1.43
25	8.95	7.0	1.95
26	10.00	8.0	2.0
27	11.41	9.0	2.41
28	11.19	10.0	1.19
29	15.90	11.0	4.9

TABLE VI
 OVERALL MEAN FORMULA INDICES AND PUBLISHER RATINGS

Material	Formula	Publisher	Difference
1	7.32	7.0	.32
2	8.53	8.0	.53
3	8.61	9.0	.39
4	6.67	4.0	2.67
5	6.54	5.0	1.54
6	5.41	6.0	.59
7	7.87	7.0	.87
8	8.9	8.0	.9
9	7.84	9.0	1.16
10	6.24	5.0	1.24
11	6.11	6.0	.11
12	3.99	4.0	.01
13	5.07	5.0	.07
14	6.21	6.0	.21
15	6.48	7.0	.52
16	7.91	7.0	.91
17	6.78	8.0	1.22
18	7.57	8.0	.43
19	7.45	6.5	.95
20	2.51	3.0	.49
21	3.34	3.5	.16
22	4.43	4.0	.43
23	5.25	5.0	.25
24	7.25	6.0	1.25
25	7.82	7.0	.82
26	9.36	8.0	1.36
27	9.44	9.0	.44
28	9.79	10.0	.21
29	12.44	11.0	1.44

TABLE VII
MEAN DALE-CHALL INDICES AND MEAN TEACHER RATINGS

Material	Dale-Chall	Teacher Ratings	Difference
1	6.58	4.56	2.02
2	8.17	6.34	1.83
3	7.58	7.8	.22
4	6.89	5.91	.98
5	7.0	5.6	1.4
6	5.67	6.22	.55
7	7.25	7.35	.10
8	8.17	8.12	.05
9	7.17	7.53	.36
10	6.5	5.31	1.19
11	6.25	5.27	.98
12	4.58	3.8	.78
13	4.75	6.47	1.72
14	5.83	6.67	.84
15	6.83	6.72	.11
16	7.58	6.77	.81
17	7.25	7.96	.71
18	8.25	8.19	.06
19	6.67	6.28	.39
20	*	5.83	
21	*	5.84	
22	5.25	5.8	.55
23	6.0	6.67	.67
24	8.17	7.52	.65
25	7.83	8.55	.72
26	9.58	8.3	1.28
27	8.92	9.94	1.02
28	9.17	9.79	.62
29	11.42	10.32	1.10

*Not notable by the Dale-Chall Formula.

TABLE IX
MEAN GUNNING FOG INDICES AND MEAN TEACHER RATINGS

Material	Gunning Fog	Teacher Ratings	Difference
1	8.04	4.56	3.48
2	10.25	6.34	3.91
3	9.90	7.8	2.1
4	7.5	5.91	1.59
5	6.95	5.6	1.35
6	6.24	6.22	.02
7	10.03	7.35	2.68
8	10.54	8.12	2.42
9	9.02	7.53	1.47
10	6.39	5.31	1.08
11	7.08	5.27	1.81
12	4.4	3.8	.6
13	5.47	6.47	1.6
14	6.81	6.67	.14
15	6.76	6.72	.04
16	9.31	6.77	2.54
17	7.42	7.96	.54
18	7.63	8.19	.56
19	9.01	6.28	2.73
20	3.19	5.83	2.64
21	4.02	5.84	1.82
22	4.87	5.8	.93
23	5.91	6.67	.76
24	7.43	7.52	.11
25	8.95	8.55	.40
26	10.0	8.3	1.7
27	11.41	9.94	1.47
28	11.19	9.79	1.4
29	15.9	10.32	5.58

TABLE X
 OVERALL MEAN FORMULA INDICES AND MEAN TEACHER RATINGS

Material	Formula	Teacher Ratings	Difference
1	7.32	4.56	2.76
2	8.53	6.34	2.19
3	8.61	7.8	.81
4	6.67	5.91	.76
5	6.54	5.6	.94
6	5.41	6.22	.81
7	7.87	7.35	.52
8	8.9	8.12	.78
9	7.84	7.53	.31
10	6.24	5.31	.93
11	6.11	5.27	.84
12	3.99	3.8	.19
13	5.07	6.47	1.4
14	6.21	6.67	.46
15	6.48	6.72	.24
16	7.91	6.77	1.14
17	6.78	7.96	1.18
18	7.57	8.19	.62
19	7.45	6.28	1.17
20	2.51	5.83	3.32
21	3.34	5.84	2.5
22	4.43	5.8	1.37
23	5.25	6.67	1.42
24	7.25	7.52	.27
25	7.82	8.55	.73
26	9.36	8.3	1.06
27	9.44	9.94	.50
28	9.79	9.79	.0
29	12.44	10.32	2.12

TABLE XI
CORRELATION BETWEEN FORMULA INDICES

Material	Dale-Chall Fry	Dale-Chall Fog	Fry Fog
1	.781*	.567	.061
2	.998**	.911**	.914**
3	.836*	.324	.737*
4	.516	.686	.515
5	.596	.496	.795*
6	.555	.599	.286
7	.331	.554	.335
8	.555	.223	.543
9	.240	.545	.513
10	.662	.028	.423
11	.546	.414	.673
12	.553	.388	.644
13	.435	.829**	.471
14	.629	.922**	.841**
15	.449	.359	.659
16	.924**	.705*	.844**
17	.774*	.582	.784*
18	.616	.631	.560
19	.878**	.426	.752*
20	--	--	.919**
21	--	--	.874**
22	.209	.004	-.726
23	.086	.437	.341
24	.452	.736	.265
25	.661	.254	.511
26	.609	.397	.319
27	.427	.194	-.111
28	.385	.434	-.163
29	.828**	-.189	.286
Mean	.577	.461	.478

* - .05 level of significance.

** - .01 level of significance.

TABLE XII
F VALUES FOR FORMULA INDICES

Material	F Values
1	.855
2	.629
3	1.638
4	1.564
5	1.296
6	1.848
7	13.501**
8	1.513
9	1.911
10	.366
11	1.106
12	2.937
13	.606
14	.819
15	.415
16	1.409
17	1.046
18	.576
19	.989
20	6.512*
21	7.674**
22	14.598**
23	6.143*
24	7.798**
25	2.872
26	1.365
27	6.171*
28	4.493*
29	4.757*
Mean	3.374

* - .05 level of significance.

** - .01 level of significance.

TABLE XIII
MATERIALS SHOWING SIGNIFICANT INTERACTION BETWEEN FORMULA AS
MEASURED BY DUNCAN'S NEW MULTIPLE RANGE TEST

Material				
Be a Better Reader, Book 1 (7)	Fog - Fry	Fog - Dale-Chall		
Science Research Associates Lab - Aqua (29)	Fog - Fry	Fog - Dale-Chall		
Science Research Associates Lab - Blue (23)	Fog - Fry	Fry - Dale-Chall		
Science Research Associates Lab - Brown (24)	Fog - Fry	Fry - Dale-Chall		
Science Research Associates Lab - Gold (28)	Fog - Fry	Fry - Dale-Chall		
Science Research Associates Lab - Olive (22)	Fog - Fry	Fry - Dale-Chall		
Science Research Associates Lab - Orange (20)	Fog - Fry	Fry - Dale-Chall		
Science Research Associates Lab - Silver (21)	Fog - Fry	Fry - Dale-Chall		
Science Research Associates Lab - Tan (27)	Fry - Fog	Fry - Dale-Chall		

TABLE XIV
ANALYSIS OF VARIANCE (SIGNIFICANT)

Material Used	DF	Sum of Squares	Mean Square	F Value	Prob >F
Be A Better Reader					
Book I	2	44.51	22.26	13.50	.0007
	15	24.73	1.65	13.50	.0007
	17	69.24	4.07	13.50	.0007
Mean	7.87				
SRA Aqua					
	2	113.90	56.95	4.76	.0246
	15	179.59	11.97	4.76	.0246
	17	293.49	17.26	4.76	.0246
Mean	12.44				
SRA Brown					
	2	12.27	6.14	7.80	.0050
	15	11.80	0.79	7.80	.0050
	17	24.97	1.42	7.80	.0050
Mean	7.25				
SRA Blue					
	2	18.04	9.02	6.14	.0112
	15	22.03	1.47	6.14	.0112
	17	40.07	2.36	6.14	.0112
Mean	5.25				
SRA Orange					
	1	5.27	5.27	6.51	.0275
	10	8.08	0.80	6.51	.0275
	11	13.35	1.21	6.51	.0275
Mean	2.50				

TABLE XIII (continued)

Material Used	DF	Sum of Squares	Mean Square	F Value	Prob >F
SRA Silver	1	5.45	5.45	7.67	.0190
	10	7.11	0.71	7.67	.0190
	11	12.56	1.14	7.67	.0190
Mean	3.34				
SRA Tan	2	37.37	18.69	6.17	.0110
	15	45.41	3.03	6.17	.0110
	17	82.78	4.87	6.17	.0110
Mean	9.44				
SRA Gold	2	17.81	8.90	4.49	.0289
	15	29.73	1.98	4.49	.0289
	17	47.53	2.80	4.49	.0289
Mean	9.79				
SRA Olive	2	14.79	7.39	14.60	.0005
	15	7.60	0.51	14.60	.0005
	17	22.39	1.32	14.60	.0005
Mean	4.43				