Critical to the youthful user of the library is his comprehension of subject headings. This study undertook an investigation of two aspects of the subject headings for juvenile literature: first, an analysis of the vocabulary levels employed in the four systems of subject headings currently in use; second, a specific analysis of the Machine Readable Cataloging (MARC) system and a comparison of how its subject headings for 437 children's books compare with the readability levels for those texts. The four systems were found to be only slightly different. The Library of Congress system rated at grade level 7.7, the Sears system at 6.9, the MARC system at 6.4, and the Library of Congress—Juvenile system 6.0. The comparison between the MARC system subject headings and the readability level of the corresponding text revealed no relationship between the two. Combining these findings with data concerning the nationwide reading level, it was found that for children reading above the national norm, the subject catalog can provide access to 70 percent of juvenile reading material. Using nationwide comprehension scores, it was estimated that only 29 percent of children's reading material is accessible through the subject catalog. (EMH)
CHILDREN'S ACCESS TO INFORMATION IN PRINT: AN ANALYSIS OF THE VOCABULARY (READING) LEVELS, OF SUBJECT HEADINGS AND THEIR APPLICATION TO CHILDREN'S BOOKS

By JOY KAISER MOLL

A thesis submitted to The Graduate School of Rutgers University in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Written under the direction of Professor Henry Voos of the Graduate School of Library Service and approved by

[Signatures]

New Brunswick, New Jersey
January, 1979
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U.S. DEPARTMENT OF HEALTH,  
EDUCATION & WELFARE  
NATIONAL INSTITUTE OF  
EDUCATION  

New Brunswick, New Jersey  
January, 1975
ABSTRACT OF THE THESIS

Children's Access to Information in Print: An Analysis of the Vocabulary (Reading) Levels of Subject Headings and Their Application to Children's Books

by JOY KAISER MOLL, Ph.D.

Thesis director: Professor Henry Voos

Current educational emphasis on independent study and individualized instruction make ease of access to library materials important. This study investigated two aspects of children's access to information in a library. First, the vocabulary levels of four basic subject heading lists were analyzed to determine which provides easiest access to information by being most readable. Second, the access provided to children's books by MARC (Machine Readable Cataloging, U.S. Library of Congress) juvenile subject headings was investigated. The reading levels of the subject headings were compared to the reading levels of the books they described.

Analyzed for vocabulary level were 301 Library of Congress subject headings (LC); 284 Library of Congress headings for children's literature (LC Jr.); 300 Sears, 10th edition, headings (Sears); and 296 Library of Congress juvenile headings from MARC tapes (MARC). Analyzed for grade-level readability were 437 children's books published in 1970 and 1972 whose subject headings corresponded
Vocabulary levels of the four subject heading lists were measured by the Dale-Eichholz Words We Know (The Ohio State University) comprehension data and lognormal frequency data from the Carroll, Davies, and Richman Word Frequency Book (Houghton-Mifflin). A simplification of the Dale-Chall readability formula, developed and validated as part of the study, measured grade-level readability of the 437 books.

Analysis of the vocabulary level data for the four subject heading lists using means and standard deviations, relative and cumulative frequencies showed that the LC list has the highest vocabulary level (grade 7.7), followed, in descending order, by Sears (grade 6.9), MARC (grade 6.4), and LC Jr. (grade 6.0). Pearson correlation coefficients and the chi-square test indicated some relationship between a lognormal vocabulary frequency level and grade levels of vocabulary comprehension. However, interval relationships between the frequency and the comprehension measures were not determined.

The access to information provided by the comparison of MARC headings with the readability level of corresponding books was determined by the difference between the MARC heading vocabulary level and the corresponding book readability level, by chi-square, and by Pearson correlation coefficients. All three analyses indicated no apparent relationship between subject heading vocabulary level.
and book readability level. Mean grade level of book readability was 7.462 with a standard deviation of 2.329. The variation of the mean from 1970 to 1972 was less than 2%.

For a child reading at or above national norms, the subject catalog can provide access to 70% of juvenile books. Applying data from national studies of children's reading comprehension levels to these findings, only 28% of children's books are accessible through the subject catalog.

The study concluded that the subject catalog does not provide effective access to information for children. The utility of school library instruction in the subject catalog is questioned: The vocabulary levels of the subject heading lists were shown to be higher than the vocabulary levels of the average adult in the United States as determined by two national studies. Because of vocabulary difficulties with the catalog, because subject heading vocabulary levels are independent of book readability levels, and because the catalog user faces additional problems of structure and conceptualization not considered by this study, the subject catalog is considered a tool for trained librarians rather than children or the general public.
ACKNOWLEDGMENTS

Several persons have suggested that an index would be needed to acknowledge the help of the many people who have contributed to this study. Following the focus of the study, however, the acknowledgments are catalogued by subject area:

THE FAMILY
THE RUTGERS FACULTY
EMPLOYERS AND ASSOCIATES
THE AUTHORS OF THE TWO MEASURES USED
THE LIBRARY OF CONGRESS
OTHER LIBRARIES
PUBLISHERS
RESEARCH ASSISTANTS

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on an information problem of children. Andy's constant support and enthusiasm have always been appreciated. He has made significant contributions to the quantitative aspects of the study and, equally important, gently encouraged me to keep on working when my energies sagged.

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"A symbol cannot represent its meaning to someone who has no experience with the thing signified. The writer and his reader must see the world in the same way."

--Roger Brown
Words and Things: An Introduction to Language
CHAPTER I

BACKGROUND OF THE STUDY

Statement of the Problem

The major purpose of the study was to determine children's access to information in print through the library's subject catalog. Two aspects of access to information were investigated. The first aspect was an analysis of the vocabulary levels of four basic subject heading lists used by library catalogers. The second aspect was an investigation of the application of MARC subject headings to recently published (1970 and 1972) books for children. The purpose of the second aspect of the study was to determine if the reading level of the subject headings corresponded to the reading levels of the books they described.

Introduction to the Problem

Current educational emphasis on independent study and individualized instruction make ease of access to library materials increasingly important. The library has the responsibility for providing students with a wide variety of diverse materials to meet their individual curricular and recreational needs. The success or failure
the child meets in his early searches for information in the library may influence his attitudes about the library for years to come. This study investigated a basic tool providing access to information in libraries: the subject catalog.

The investigation was based on concepts from three separate but related disciplines. The first, in the broad field of education, is the measurement of readability. The second, in the field of traditional librarianship, is subject cataloging. The third, in the field of information science, is communication.

As the area of overlap of these three concepts increases, the probability of providing the user with easy access to information via the subject catalog also increases. This overlap can be represented by a Venn diagram as follows:
Information scientists would consider the subject catalog a data base. To communicate effectively with a data base and get information out of it, the user must formulate his questions using terms from the same thesaurus or subject heading list which the compiler of the data base used in the construction of the data base.

Educators in the area of readability measurement would consider the headings in the subject catalog as a list of vocabulary terms out-of-context. The user of the catalog must be able to read and comprehend these terms (subject headings) if the catalog is to be a useful tool for locating information.

Librarians have traditionally considered the subject catalog an access point or index to the library's collection. In compiling this index, the subject cataloger assigns subject headings to books and other materials using the vocabulary he has at his command. A cataloger's vocabulary is generally the vocabulary of an adult person with a graduate level education and a broad framework of knowledge. This broad framework includes a background of many concrete experiences as well as abstract concepts developed through the education of an academically oriented mind. Experiences and concepts are both reflected in the extent of a person's vocabulary.

Ludwig Wittgenstein has said: "The limits of my language are the limits of my world." ¹ The linguistic

limits of the world of subject catalogers as it overlaps with the linguistic limits of the world of school children are the basic interest of this study.

Assumption

The assumption was made that subject access through a library catalog is a useful key to information in the library's collections.

Definitions

1. **Subject headings** in library catalogs are terms and phrases intended to provide direct and specific approaches to definite areas of knowledge. They are not index entries dependent on the phraseology of individual titles. They preserve some traces of hierarchical classification in their frequent use of a subdivision or an inverted phrase instead of a more linguistically natural adjective before noun approach.  

2. **Readability** is a term which has come to be used in three ways:

   1) To indicate legibility of either handwriting or typography.
   2) To indicate ease of reading due to either the interest-value or the pleasantness of writing.
   3) To indicate ease of understanding or comprehension due to the style of writing. 


Readability in this study is used to indicate ease of understanding or comprehension.

3. Vocabulary is the "stock of words used by or known to a particular person or group of persons." This stock of words has the communicative function of giving expression to concepts and ideas.

4. Children, for the purposes of this study, are students generally between the ages of 10 and 14 whose vocabulary levels are within the averages determined by reading specialists for grades 5 through 8.

5. Communication has been defined as "the eliciting of a response" and as "all of the procedures by which one mind may affect another." Both definitions apply to the subject catalog as the medium used by its compilers to transmit information to library users about the contents of the library's collection.

Limitations

The study was limited to testing the vocabulary levels of subject headings used for children's books.

---


The study did not evaluate the degree of generality or specificity of a subject heading.

The study evaluated subject headings as terms, not phrases, because subject headings in a library catalog stand alone as indicative of the content of the material they describe. This treatment of subject headings as separate words or terms corresponds to the component of the reading process known as word perception. In reading, this is the ability to identify words accurately and to associate with each word the meaning that the author (cataloger) had in mind. This is considered a basic part of the reading process. Without this ability, subsequent steps (such as comprehension of ideas, reaction to these ideas, and combining new ideas with old) cannot take place. This ability to perceive accurately the meaning of the vocabulary terms assigned to a book by a subject cataloger also corresponds to the information scientist's concern with the semantic problems of communication and the library cataloger's concern with precision or specificity of a subject heading.

The study did not examine the form of subject headings such as the compound heading, the inverted heading, the subheading, the subdivision of a place, or the phrase.

The study did not examine the file structure of the subject catalog, its "see" and "see also" references, its hierarchical nature of preference for specificity to
generality in choosing descriptive headings, or its chronological division of the history of a country.
CHAPTER II

RELATED LITERATURE

Research in Readability

In the area of measurement of readability, studies are divided into two groups. One group measures vocabulary comprehension in the context of a paragraph or other meaningful piece of writing. A thorough survey of this area is the Master's thesis of Nancy Kelly.\(^1\) An older study by George Klare\(^2\) details the history of readability formulae, explains the basic considerations in determination of readability, and provides an extensive bibliography on the subject. Both these studies agree that the Dale-Chall formula\(^3\) to determine readability is a valid measure for predicting the school grade level of vocabulary in context. This formula will be used to measure the reading level of children's books in this study.

---

\(^1\)Nancy Leonard Kelly, "A Comparison of Readability Formula Ratings with Written Cloze Text Scores on Primary Level Reading Material" (unpublished Master's thesis, Graduate School of Education, Rutgers University, October, 1971).


Vocabulary comprehension can also be measured by testing or estimating knowledge of individual terms. Studies have directly tested children in various grades for recall and application of meaning of individual terms. Vocabulary testing of large groups of children has been the work of Edgar Dale. Seashore and Eckerson studied the vocabularies of college undergraduates to investigate the relation of vocabulary size to other intellectual abilities. The most recent, as yet unpublished, study is the work of Dale and Eichholz. This study tested groups of children throughout the United States to determine which words they could both read and use. A preliminary study was published as Children's Knowledge of Words. Data from the unpublished Dale-Eichholz study was used to measure the readability of individual subject headings.

A second school of thought on the readability of individual vocabulary terms argues that frequency of the

---

4 Edgar Dale, "Familiarity of 8000 Common Words to Pupils in the Fourth, Sixth, and Eighth Grades" (Columbus: Bureau of Educational Research, The Ohio State University, n.d.).


6 Edgar Dale and Gerhard Eichholz, Words We Know: A National Inventory (Columbus: The Ohio State University, to be published).

7 Edgar Dale and Gerhard Eichholz, Children's Knowledge of Words (Columbus: The Ohio State University, 1961).
term in print and knowledge of the term by children are closely correlated. This is the basis of the work by Thorndike and Lorge,8 E. W. Dolch,9 and, more recently, by Carroll, Davies, and Richman.10 Carroll, Davies, and Richman's work was investigated as part of this study as an alternative way of measuring knowledge of vocabulary.

Research in Subject Cataloging for Children

The library literature about subject cataloging for children is scant. Most of the material describes practices in particular libraries or provides opinions about children's usage of subject headings. There are only three brief studies and one piece of major research devoted to subject headings for children. Two of the brief studies compare subject headings for children's materials using different lists. Thera Cavender compared Rue's list with Sears' 7th edition and concluded: "Children's libraries, whether school or public, with a small open shelf collection and a librarian who knows her book stock well, have little need for the special subject


terminology or the expanded headings of research libraries.  A second study, by Florence DeHart, compared the subject headings of printed catalog cards commercially available from four sources. The results showed a great dissimilarity in the headings, no standardizations. DeHart concluded that policies for applying subject headings should be clearly established and carried out uniformly to assure standardization. A third study again promotes standardization of cataloging.

The one major piece of research devoted to subject headings for children is almost 30 years old: the Master's thesis of Eloise Rue written in 1946 on preferences of children for subject heading form. Rue outlines seven general patterns resulting from the analysis of questionnaires of children's subject heading preferences:

1. Simple concepts expressed in simple terms are chosen most frequently by younger children and children of low IQ's.
2. Conversely, complex terms and terms of fine distinctions are more frequently selected by older children.


and children of higher IQ's than they are by the younger children and those with low IQ's.  

3. Catalog usage of terms appears to be an influence in choice of terms only when practice in use of the catalog has been prevalent.  

4. Terms used in the course of study appear to have been a factor influencing the selections.  

5. Special group experiences or characteristics are evident as influences.  

6. There is evident preference for some forms rather than others.  

7. In the vexing problem of place versus subject, the children choose place names with much greater frequency. Possibly this is another evidence of the appeal of the simple, easily visualized concept rather than complex, abstract ideas, or possibly emphasis on place in the social studies, especially geography and history.  

The Concept of Communication  

in Information Science  

Information Science has often been called the discipline which provides the theoretical basis for the practice of librarianship. A key aspect of this theoretical basis and of the discipline itself is the concept of communication: the interaction between the source of information and the receiver (user) of the informational message. Shannon and Weaver's classic study in communication theory defines communication as "all of the procedures by which one mind may affect another." Shannon and Weaver divide  


15 Ibid., p. 171.  
communications problems into three levels: (1) the technical level, concerned with the accuracy of transmission of the symbols of communication; (2) the semantic level, concerned with the precision with which the transmitted symbols convey the desired meaning; and (3) the effectiveness level, concerned with how the received meaning affects behavior.18

Subject cataloging and librarianship are concerned with the semantic level. The field of education is concerned with the effectiveness level. If the library is to provide effective access to its collection by subject cataloging to enable education to accomplish its objectives of independent study and individualized instruction, then subject catalogers must look at the information scientist's studies of the application of vocabulary and language to particular groups of users.

Shannon and Weaver state that language must be designed [or developed] with a view to the totality of things that man may wish to say; but not being able to accomplish everything, it, too, should do as well as possible as often as possible.19

Information scientist Brian Vickery expresses this in terms of subject cataloging:

Subject description as it is done by humans is a three-stage operation. First, text is scanned to determine its meaning, its information content. Second, a decision is made as to which parts of the document content are to be recorded in view of the objectives of the

---

18 Ibid., p. 24.
19 Ibid., p. 27.
system. Third, the document content selected to be recorded is expressed in the language used in the system.\textsuperscript{20}

The area of overlap (see Venn diagram, p. 2) of all three disciplines focuses on the ability of the user to read, to understand, and to be able to manipulate the terms assigned to library materials by subject catalogers to provide access to needed information.

CHAPTER III

RESEARCH DESIGN AND SAMPLE SELECTION

Summary of Research Design

The research in this study was divided into two parts. The first part examined three basic subject heading lists and one set of applied subject headings. The subject heading lists are the tools the subject cataloger uses to index a collection of materials. A stratified random sample of the subject headings (terms) in each list was analyzed for school grade level of vocabulary comprehension. Two measures were used to make this analysis. The first was Dale and Eichholz's *Words We Know.* This measure analyzed comprehension as actually demonstrated by groups of children nationwide.


2 Edgar Dale and Gerhard Eichholz, *Words We Know: A National Inventory* (Columbus: The Ohio State University, to be published).
Dale-Eichholz's measure is an indication of the vocabulary which the child commands as he attempts to use the subject catalog and elicit information from it. The second measure was the Carroll, Davies, and Richman list of word frequency. This list contains words to which the intermediate-grade-level child has been exposed through texts, trade books, and magazines. This measure reflects the attempts of adults to communicate with children through the written word. The comparison of these two measures applied to subject headings should be an indication of the effectiveness of the communication of the library catalog with children.

The second part of the study investigated the application of juvenile subject headings from the Library of Congress' MARC (Machine Readable Cataloging) tapes to children's books published in 1970 and 1972. The years 1970 and 1972 are recent ones reflecting current practice of the cataloging principles instituted by the Library of Congress' Children's Literature Cataloging Office in November, 1966. The selection of two recent years also provides a basis for comparing cataloging practice.

A sample of these books and their subject headings

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were selected from the MARC tapes. The MARC tapes were used because they are the most complete and up-to-date data base in the United States for the cataloging of juvenile books. In addition, Library of Congress cataloging is generally considered the national standard for children's cataloging in the United States. Library of Congress cataloging is used by most commercial forms processing books for libraries and providing catalog cards as part of their service. The reading levels of the books in the sample were determined by using the Dale-Chall formula for readability.

The vocabulary levels of the subject headings assigned to each book were compared to the reading level of the book itself. This compared the vocabulary level of the cataloging terms to the reading level of the book cataloged.

**Hypotheses**

Two of the subject heading lists, Sears and MARC, are subsets of the LC list used for different purposes. LC Jr. is a separate listing of simplified words developed to be used for juvenile materials. Sears is an abridgement of the LC list developed for small and medium-sized

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libraries. The MARC juvenile headings are a combination of some LC headings and some LC Jr. headings. MARC headings are subject headings which have actually been applied to specific materials.

The expectations of the study were that the LC headings would have the highest reading level, followed, in descending order, by Sears, MARC, and LC Jr. However, to facilitate measurement and statistical analysis, the hypothesis for vocabulary level measurement is stated in the null form. By stating that all four lists are equally readable, a common point of equality is established against which differences can be measured.

Hypothesis 1: The Sears List of Subject Headings, 10th edition; Subject Headings Used in the Dictionary Catalogs of the Library of Congress, 7th edition; Library of Congress Subject Headings for Children's Literature; and MARC Subject Headings for Juvenile Materials (see footnote 1) are all equally readable.

The expectations of the second part of the study were that the research would prove a relationship between subject heading vocabulary level and book readability levels. Again, to facilitate measurement and statistical analysis (especially in the chi-square test), the hypothesis is stated in the null form.

Hypothesis 2: The vocabulary level of the subject headings assigned by the Library of Congress to juvenile books published in 1970 and 1972 is independent of the
readability level of the books the subject headings describe.

Sample Selection: Subject Headings

The Universes. The 7th edition of the Subject Headings Used in the Dictionary Catalogs of the Library of Congress (hereafter referred to as LC) contains approximately 38,000 terms. This count does not include terms listed in the supplements. The Sears List of Subject Headings, 10th edition (hereafter referred to as Sears), has approximately 5,800 terms. Library of Congress Subject Headings for Children’s Literature (hereafter referred to as LC Jr.) has 288 terms. Because of the small size of this universe, the entire population was analyzed. The juvenile subject headings on the Library of Congress' MARC tapes (hereafter referred to as MARC) for 1970 and 1972 constituted a universe of 1,705 subject headings. A sample of 296 headings was selected from these tapes.

Method for Determining Sample Size. The method for determining the sample size was based on the four grade levels used in the definition of children (grades 5, 6, 7, and 8 [see p. 5]) and on a level of significance of 5%. (The level of significance is the probability of rejecting a true null hypothesis.)

Sears, LC, and MARC were each considered to be an

---

infinite universe for two reasons. First, each subject heading list is open-ended. That is, subject headings are both added to and dropped from the lists. Second, current statistical practice regards any population over 1,000 as infinite.  

Using a standard statistical formula

\[ n = z^2 \left( \frac{K - 1}{K^2 \cdot \sigma^2} \right) \]

where \( z^2 \) = the square of the number of standard deviations from the mean of the grade levels (\( z = 2.39 \))

\( K = \) number of grade levels (\( K = 4 \))

the sample size (\( n \)) equals 428.

From this, the following table can be set up for varying values of \( E \) and \( n \):

<table>
<thead>
<tr>
<th>( E )</th>
<th>( n )</th>
</tr>
</thead>
<tbody>
<tr>
<td>.01</td>
<td>10,710</td>
</tr>
<tr>
<td>.04</td>
<td>669</td>
</tr>
<tr>
<td>.05</td>
<td>428</td>
</tr>
<tr>
<td>.06</td>
<td>298</td>
</tr>
<tr>
<td>.10</td>
<td>107</td>
</tr>
</tbody>
</table>

Using this table, the sample size 298 was selected for the infinite populations of Sears, LC, and MARC. This sample size provides for an assumed error of ± 6% between

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the mean of the sample and the mean of the universe. The sample size, originally computed for a significance level of 5%, now has a significance level of 6%. However, this sample size (298) is numerically comparable to the quantity of subject headings in LC Jr. (288). The entire universe of LC Jr. was analyzed. The loss of 1% in significance was compensated for by a gain in ability to compare roughly equal quantities of data from each universe. Also, to raise the significance level by 1% would have meant increasing the sample size by 30%.

Stratification of Samples. Once the total sample size was determined for the subject heading lists, the sample was stratified to achieve a proportional distribution of headings representative of the size of each alphabetical category in the MARC lists.

To validate the stratification, the proportions were compared by rank order correlation (Kendall's tau) with the data in Bourne and Ford's\(^\text{10}\) and Ohlman's\(^\text{11}\) studies of frequency of occurrence of initial letters in English subject words. The frequency ranking of initial letters from the stratified sample of subject headings for juvenile literature extracted from the MARC tapes correlated


.76 with the Bourne and Ford list and .82 with the Ohlman list (Table 1).

Using the Rand Corporation's tables of random numbers, subject headings were selected from the subject heading lists according to the stratification. Because of the characteristics of the Dale-Chall measure (later described), proper names and geographical names generally were not included in the samples.

Sample Selection: Books

The subject heading sample drawn from the juvenile headings in the MARC tapes was used as the basis of selection for books for readability comparisons. All books having copyright dates of 1970 and 1972 and a juvenile subject heading in the MARC tapes were pulled.

The quantity of books described by each juvenile subject heading varied widely. Most subject headings described only one book. A few subject headings (science fiction, fantasy, folklore, etc.) described nearly 100 books each. Because of this variation in quantity of books per subject heading, one or two books were selected for readability analysis. For each subject heading in the MARC sample, a juvenile book having a 1970 publication date and/or a 1972 publication date was randomly selected from the MARC tapes.

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TABLE 1.--Comparative Ranking of Initial Letters of Subject Words in English by Frequency of Occurrence

<table>
<thead>
<tr>
<th>Bourne-Forda</th>
<th>MARC juveniles</th>
<th>Ohlmanb</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>P</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>C</td>
<td>A</td>
<td>P</td>
</tr>
<tr>
<td>T</td>
<td>M</td>
<td>A</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>D</td>
<td>F</td>
<td>T</td>
</tr>
<tr>
<td>M</td>
<td>E</td>
<td>R</td>
</tr>
<tr>
<td>R</td>
<td>D</td>
<td>F</td>
</tr>
<tr>
<td>B</td>
<td>U</td>
<td>G</td>
</tr>
<tr>
<td>I</td>
<td>W</td>
<td>H</td>
</tr>
<tr>
<td>E</td>
<td>G</td>
<td>I</td>
</tr>
<tr>
<td>F</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>H</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>L</td>
<td>G</td>
<td>W</td>
</tr>
<tr>
<td>G</td>
<td>R</td>
<td>O</td>
</tr>
<tr>
<td>W</td>
<td>I</td>
<td>K</td>
</tr>
<tr>
<td>N</td>
<td>J</td>
<td>V</td>
</tr>
<tr>
<td>O</td>
<td>K</td>
<td>J</td>
</tr>
<tr>
<td>V</td>
<td>Q</td>
<td>Q</td>
</tr>
<tr>
<td>J</td>
<td>Z</td>
<td>Y</td>
</tr>
<tr>
<td>K</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Kendall's Tau

a See footnote 10.
b See footnote 11.
Two frequently used subject headings were selected for an in-depth examination of the readability levels of the various books each heading described. The headings selected were DOGS-STORIES and FOLKLORE: the MARC print-outs for 1970 and 1972 listed 43 DOGS-STORIES and 93 books of FOLKLORE. These subject headings also represented an extreme of vocabulary level for frequently used headings drawn in the sample. Dale's analysis for DOGS-STORIES lists 97% of fourth-grade students comprehending the term. The Carroll, Davies, and Richman frequency index for DOGS-STORIES is high at 60.6 (in a range of 30.7-70.3; see p. 28 for an explanation of frequency index). Dale lists FOLKLORE as comprehended by only 67% of sixth-grade students (a 66% comprehension score would make this an eighth-grade word; see p. 31). The frequency index is also low at 37.9. Eleven DOGS-STORIES and 21 books of FOLKLORE, a proportional 25% sample of the total books listed in each category for 1970 and 1972, were randomly selected for readability analysis.

The sample of books analyzed for readability was 267 books published in 1970, 138 books published in 1972, 11 DOGS-STORIES, and 21 books of FOLKLORE. A total of 437 books were analyzed for readability.
CHAPTER IV

ANALYSIS OF VOCABULARY LEVELS
OF SUBJECT. HEADING LISTS

Description of Vocabulary Measures of
Word Comprehension and Word Frequency

When a child approaches the subject catalog seeking
information on a particular topic, he is beginning his
search for information from a point already familiar to
him. This point of familiarity may be no more than the
knowledge of a term he wishes to find in the catalog. The
term the child wishes to find may be associated with his
school work, may come from reading or exposure to some
other form of media. The term is in some way associated
with his background, his age, education, experience, and
personality. These factors contribute to a set of con-
cepts which influence the choice of term the child will
use to search the library's subject catalog. A child may
use simple terms of a general nature having a high fre-
quency of usage in the language. A high school or college
student may search for a term introduced as part of his
studies. A professional person may use a very specific
term having a low frequency of usage but familiar to him
from his training and background in a particular discipline.
Reading specialists disagree on the precise relationship of word comprehension to word frequency rankings of vocabulary in a language. There is almost universal agreement that a basic core of words of high frequency in a language is comprehended at a very early age by nearly all persons using the language. The disagreement arises in relating word frequency to word comprehension after the basic core of language begins to disperse into subject and discipline areas. This dispersion is best illustrated by a schematic diagram (Figure 1) by Gertrude Hildreth published in a paper on spelling lists and vocabulary studies. Hildreth's ideas were, perhaps unknowingly, followed by Carroll, Richman, and Davies in the construction of their Word Frequency Book as they list the dispersion into subject categories for each word type in the corpus.

One measure for frequency and one for comprehension were each investigated. The main reason for using a frequency measure as well as a comprehension measure is based on the focus of the study: the subject catalog as a point of access to information. Access to information involves communication. The relationship of comprehension (the child's point of access) to frequency (the adult-compiled data base) would indicate the amount of communication possible between the data base and the child.

Figure 1. Schematic diagram illustrating rapid expansion in vocabulary beyond the first two thousand words.
A secondary reason for using both measures was based on the hope that the study might find some useful relationships or areas of interchangeability between the two measures. The assumption that frequency is a measure of comprehension has never been thoroughly tested. This study, using two recently developed measures, seemed an opportunity for initial investigation which should not be missed.

Carroll, Davies, and Richman
Measure of Word Frequency

The word frequency list compiled by John B. Carroll, Peter Davies, and Barry Richman is the result of research to provide a basis for selection of entries in the American Heritage Intermediate Dictionary. The word frequency list (corpus) is referred to as the AHI list or the AHI corpus. Word frequency lists represent the vocabulary of the adult author as he communicates with the child. As Peter Davies has put it, "the Corpus is a reflection of the culture talking to its children." For years the frequency list compiled by Edward L. Thorndike and Irving Lorge has been used as a measure of vocabulary comprehension. The most recent edition of this list

3Ibid., p. vii.
is now over 30 years old and out-of-date. In addition, the assumption that frequency is a measure of comprehension has never been thoroughly tested. The assumption that frequency is a measure of comprehension was challenged by Edgar Dale over 40 years ago. Dale claimed that frequency lists only indicate the relative familiarity and unfamiliarity of a word within the corpus itself.\footnote{Edgar Dale, "Evaluating Thorndike's Word List," \textit{Educational Research Bulletin}, X (November 25, 1931), 451-457.} The AHI corpus is recent (1971). The list is extracted from 5,088,721 words (tokens) of running text drawn in 500-word samples from 1,045 published intermediate level juvenile trade, text, and reference books. The list contains 86,741 different words (types). The book gives the frequency for each word type by grade levels 3 through 9 plus an ungraded category. (In the analyses in this study, the ungraded category is labeled "x.") Grade levels for each book from which text was sampled were determined by the answers to questionnaires submitted by those school districts supplying books and texts for the frequency analyses. The reading levels were, therefore, subjectively, not objectively determined. This lack of objective determination of the reading levels of the books analyzed is a serious limitation of Carroll, Davies, and Richman's research. The frequency for each word type is also given for 17 different subject categories determined in a similar manner to the
grade levels for each word type.

The statistical analysis of the AHI corpus includes a lognormal model of word-frequency distribution called Standard Frequency Index (SFI). This SFI was developed by John B. Carroll to attempt to measure the true relative frequency of the word types in an infinite corpus. A variation of this index, suggested by Carroll, was used in this study to compare the Dale-Eichholz comprehension data with the frequencies in the AHI corpus.

In the AHI corpus, the first 1,000 word types, arranged in descending order of frequency, account for 74% of the whole corpus. The first 5,000 word types account for 89.4% of the whole corpus. The value of a lognormal model of word frequency such as Carroll's SFI is in the compression of a large quantity of data into more manageable figures which are more easily manipulated. "The usefulness and probable validity of the lognormal model are supported by the highly satisfactory agreement that can be obtained between empirical data and data predicted from the model."

The simplified formula suggested for use in this study is as follows:

\[ SFI = 10 \log_{10} p + 10 \]

6Ibid., p. xxviii.
7Ibid., p. xxvii.
where \( p \) = true probability of the occurrence of a word type.

The computer analyses of the Carroll, Davies, and Richman corpus gave separate frequencies for the singular, plural, and possessive form of each word type. Computer analyses also gave separate frequencies for varying forms of capitalization for each word type: one frequency for the number of times the word type had no capital letters, an additional frequency for the number of times the same word type had the initial letter capitalized, and yet another frequency for the number of times all letters in the same word were capitalized. The analyses in this study followed the Carroll, Davies, and Richman separate analysis of singular, plural, and possessive forms of the same word type. However, the separate analysis of the same word type on the basis of capitalization of letters was not considered relevant to comprehension. Therefore, the total frequency of the word type analyzed was the frequency of the word type with all its variant capitalizations.

**Dale-Eichholz Measure of Word Comprehension**

Complementing the Carroll, Davies, and Richman measure of word frequency is the Dale-Eichholz measure of word comprehension. This measure, the result of years of national testing by Edgar Dale and Gerhard Eichholz at The Ohio State University, gives the grade levels of about 45,000 words and phrases known by children in grades 4, 6, 8, 10, 12, 13, and 16. Words were tested so that the
scores would range from 67% to 85% comprehension by the children at the grade level at which the word is considered to be known. If a word tested as comprehensible to only 60% of sixth-grade students, the word would be retested at the fourth-grade level. Similarly, if a word tested as comprehensible to 92% of the sixth-grade students, the word would be retested at the eighth-grade level. The grade level of word comprehension is that grade level at which a word is understood by a range of 67% to 85% of the children. The validity of this measure lies in the extensive testing of actual comprehension on a national scale. With a few exceptions, the Dale-Eichholz data does not include proper nouns or geographical place names.9

The Dale-Eichholz measure looks at vocabulary out-of-context in the same manner as a child approaching the subject catalog looks at subject headings. Subject headings can be considered to be vocabulary out-of-context. Children’s comprehension of this vocabulary out-of-context can be, within specified limits, predicted for particular grade levels. The limitations of any vocabulary measure yet devised are the inability of such measures to account for variations in a person’s conceptual framework, in educational and economic background, in intelligence, etc. These factors, in addition to vocabulary comprehension, also influence the child’s choice of a possible subject

heading in the library catalog.

The Dale-Eichholz comprehension measure was applied against the four lists of subject headings (LC, LC Jr., Sears, and MARC) at The Ohio State University. However, there were several inconsistencies in application of the measure to subject headings which resulted in inconsistent data. For example, geographic place names and proper nouns were, in general, not analyzed. In Dale's thinking, both are assumed to be familiar terms. Occasionally, plural forms were analyzed using scores for the singular term. In some cases where the subject term was not in the Dale-Eichholz data base, the comprehension level of a variant form of the word was given. In cases where two words were really a single concept, the Dale-Eichholz measure often gave a comprehension level for the concept instead of analyzing the individual words. Such a term was FIRE ENGINES. Some of the terms needing analysis were homographs for which Dale gave one or more meanings. Dale-Eichholz's measure considers semantics. Frequency counts do not. In some cases a word type in a subject heading had differing Dale scores because of the variation in its meaning from noun to adjective and/or adverb. For example, the word "world" has one comprehension level as an adjective and another when it is used as a noun. Finally, some of the data seemed inconsistent when a parenthetical expression, basically irrelevant to the meaning of a subject heading, had a higher vocabulary level than any word in the subject
heading itself. In the cases where the parenthetical expression was not completely germane to understanding the subject heading, the vocabulary level of the subject heading was considered to be the highest level word in the heading. For example, in BIGAMY (Canon law), "BIGAMY" (eighth grade) has a lower vocabulary level than "Canon law" (sixteenth grade). Because of the parenthetical expression, however, the vocabulary level of the heading is the eighth-grade word "bigamy."

The grade level assigned to a subject heading was determined by the term in the heading with the highest vocabulary level. The only exception to this was the parenthetical expressions described in the previous paragraph.

The subject headings containing inconsistent data were tagged. The vocabulary levels of subject headings were analyzed with and without the inconsistent (tagged) data to determine if the inclusion of the inconsistent (tagged) data would significantly affect the results of further analysis and comparison of the four subject heading lists (LC, LC Jr., Sears, and MARC). Table 2 shows the analysis of the subject heading samples using consistent and inconsistent (tagged) data. Table 3 shows the grade-level differences in relative frequencies between the consistent and the inconsistent (tagged) data. While differences within grade-level categories are significant, these differences vary so widely from one list to another
### TABLE 2. Four Subject Heading Lists Analyzed for Comprehension—Number of Cases of Consistent and Inconsistent Data

<table>
<thead>
<tr>
<th></th>
<th>LC</th>
<th>LC Jr.</th>
<th>Sears</th>
<th>MARC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistent data</td>
<td>228</td>
<td>238</td>
<td>261</td>
<td>246</td>
</tr>
<tr>
<td>Inconsistent data</td>
<td>73</td>
<td>46</td>
<td>39</td>
<td>50</td>
</tr>
<tr>
<td>Total number of cases</td>
<td>301</td>
<td>284</td>
<td>300</td>
<td>296</td>
</tr>
</tbody>
</table>

Variation of sample from number of LC cases: 0.000, 0.056, 0.003, 0.016

### TABLE 3. Grade Level Differences in Relative Frequency between Consistent and Inconsistent Data in Four Subject Heading Lists by Vocabulary Level of Subject Headings

<table>
<thead>
<tr>
<th>Grade levels</th>
<th>LC</th>
<th>LC Jr.</th>
<th>Sears</th>
<th>MARC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>-1.9</td>
<td>-2.1</td>
<td>-9.6</td>
<td>-7.3</td>
</tr>
<tr>
<td>Grade 6</td>
<td>-3.2</td>
<td>-0.7</td>
<td>+3.0</td>
<td>-9.8</td>
</tr>
<tr>
<td>Grade 8</td>
<td>-5.9</td>
<td>+2.6</td>
<td>+3.1</td>
<td>+1.7</td>
</tr>
<tr>
<td>Grade 10</td>
<td>+0.1</td>
<td>+4.5</td>
<td>+1.7</td>
<td>+5.5</td>
</tr>
<tr>
<td>Grades 12-16</td>
<td>+10.8</td>
<td>-4.2</td>
<td>+1.8</td>
<td>+5.0</td>
</tr>
</tbody>
</table>

Average grade level difference: +0.2, +0.2, 0.0, -0.2
within the same grade level as to indicate only the randomness of the vocabulary analyzed. In addition, when these differences are averaged out across a subject heading list, they are consistently insignificant. Because the inconsistent data did not contaminate the samples, and because, by using all the data, a statistically superior sample size is available for making inferences and for generalizing about the relationships between the four subject heading lists, the samples were tested and analyzed in their original form.

**Comparisons of Vocabulary Measure of Word Comprehension and Word Frequency**

Because the comprehension measure corresponds to the child approaching the catalog and the word frequency corresponds to the adult author/cataloger attempting to communicate with the child, the relationship of these two measures should be an indication of the effectiveness of the library's subject catalog as a communication system providing access to information.

Three comparisons were made between the comprehension measure and the frequency measure:

1. Comparison of the total sample for each subject heading list, grades 3 through 9, plus an ungraded category "x."
2. Comparison of the portion of each subject heading list analyzed by comprehension as grades 3 through 6.
3. Comparison of the portion of each subject
Pearson correlation coefficients ranging from -.13 to -.52 (Table 4) indicate an inverse relationship between word frequency and word comprehension. This finding contradicts the correlation of .47 determined by Kirkpatrick and Cureton when they compared the results of a multiple-choice test with the Thorndike-Lorge frequency. Chi-square tests for independence of word frequency and word comprehension (Table 5) also indicate a relationship between frequency and comprehension. These findings indicate that there is some form of communication between the adult cataloger and the child user of a subject catalog. The nature of this communication is statistically significant. However, the quality of the catalog as a medium of communication is open to question from an educational as well as from a pragmatic point of view. In any case, the amount of communication is weak and in need of more precise definition. The research in this study was not designed to investigate or to construct intervals in the frequency measure which would correspond to the grade-level intervals built into the comprehension measure. In light of the additional objectives of this study and the extensive further research needed to determine grade-level

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### TABLE 4. -- Correlations between Word Comprehension and Word Frequency Using Pearson Correlation Coefficients

<table>
<thead>
<tr>
<th></th>
<th>LC</th>
<th>LC Jr.</th>
<th>Sears</th>
<th>MARC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total file</strong></td>
<td>-0.52</td>
<td>-0.36</td>
<td>-0.43</td>
<td>-0.43</td>
</tr>
<tr>
<td>Level of significance</td>
<td>.001</td>
<td>.001</td>
<td>.001</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Grades 3-6</strong></td>
<td>-0.37</td>
<td>-0.19</td>
<td>-0.31</td>
<td>-0.49</td>
</tr>
<tr>
<td>Level of significance</td>
<td>.001</td>
<td>.003</td>
<td>.001</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Grades 7-x</strong></td>
<td>-0.31</td>
<td>-0.17</td>
<td>-0.30</td>
<td>-0.13</td>
</tr>
<tr>
<td>Level of significance</td>
<td>.001</td>
<td>.096</td>
<td>.001</td>
<td>.140</td>
</tr>
</tbody>
</table>

**Number of Cases Correlated**

<table>
<thead>
<tr>
<th></th>
<th>Total file</th>
<th>Grades 3-6</th>
<th>Grades 7-x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases Correlated</td>
<td>260</td>
<td>138</td>
<td>106</td>
</tr>
<tr>
<td></td>
<td>266</td>
<td>194</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>280</td>
<td>170</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>285</td>
<td>212</td>
<td>70</td>
</tr>
</tbody>
</table>

*Discrepancies between the total file and the divided subfiles are caused by Boolean programming logic.*
TABLE 5.--Chi-square Tests for Independence between Word Comprehension and Word Frequency

<table>
<thead>
<tr>
<th>Dale-Eichholz grade levels</th>
<th>CDR frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
</tr>
<tr>
<td><strong>LC Subject Headings</strong></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4 (14)</td>
</tr>
<tr>
<td>6</td>
<td>3 (10)</td>
</tr>
<tr>
<td>8</td>
<td>4 (6)</td>
</tr>
<tr>
<td>10 up</td>
<td>32 (13)</td>
</tr>
<tr>
<td><strong>Chi-square = 90.61 (p = .05) with 9 df</strong></td>
<td></td>
</tr>
<tr>
<td><strong>LC Jr. Subject Headings</strong></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9 (16)</td>
</tr>
<tr>
<td>6</td>
<td>3 (7)</td>
</tr>
<tr>
<td>8</td>
<td>7 (4)</td>
</tr>
<tr>
<td>10 up</td>
<td>11 (4)</td>
</tr>
<tr>
<td><strong>Chi-square = 40.17 (p = .05) with 9 df</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sears Subject Headings</strong></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>8 (13)</td>
</tr>
<tr>
<td>6</td>
<td>3 (11)</td>
</tr>
<tr>
<td>8</td>
<td>11 (7)</td>
</tr>
<tr>
<td>10 up</td>
<td>16 (7)</td>
</tr>
<tr>
<td><strong>Chi-square = 65.95 (p = .05) with 9 df</strong></td>
<td></td>
</tr>
<tr>
<td><strong>MARC Subject Headings</strong></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2 (8)</td>
</tr>
<tr>
<td>6</td>
<td>4 (9)</td>
</tr>
<tr>
<td>8</td>
<td>6 (3)</td>
</tr>
<tr>
<td>3</td>
<td>11 (3)</td>
</tr>
<tr>
<td><strong>Chi-square = 84.83 (p = .05) with 9 df</strong></td>
<td></td>
</tr>
</tbody>
</table>

Critical value for chi-square = 16.19.

CDR frequencies = Carroll, Davies, and Richman frequencies.
intervals within disciplines for a frequency list, the continued use of the Carroll, Davies, and Richman frequency list as a measure of vocabulary was abandoned.

The Dale-Eichholz comprehension measure with its grade-level intervals built in and validated was selected to analyze the vocabulary levels of the LC, LC Jr., Sears, and MARC subject heading lists. The Dale-Eichholz measure has the additional advantage of being conceptually related to the measure of readability. Therefore, the use of the Dale-Eichholz measure also made comparison of the vocabulary level of the subject headings with the reading levels of the books they described a valid comparison.

Analysis of Vocabulary Levels of Four Subject Heading Lists

Of the four subject heading lists, the Library of Congress list, as expected, had the highest vocabulary level as well as the largest standard deviation from the mean of this level (Table 6). The vocabulary levels are measured in grade-level intervals. Although the lowest combination of mean and standard deviation appears to be that of the LC Jr. list, this list is never used independently. Terms from this list plus terms from the Library of Congress list combine to form the MARC list. The MARC list is, therefore, not a listing of possible subject headings but of subject headings actually applied to juvenile books in two specified years (1970 and 1972). The mean difference between the MARC terms and the terms from the
TABLE 6.--Mean and Standard Deviation of the Vocabulary Levels of the Subject Heading Lists

<table>
<thead>
<tr>
<th>Dale-Eichholz comprehension, data</th>
<th>Grade level</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LC</td>
<td>LC Jr.</td>
<td>Sears</td>
<td>MARC</td>
</tr>
<tr>
<td>Mean</td>
<td>7.7</td>
<td>6.0</td>
<td>6.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>3.5</td>
<td>2.6</td>
<td>2.9</td>
<td>2.6</td>
</tr>
<tr>
<td>Standard error</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Number of cases</td>
<td>260</td>
<td>266</td>
<td>280</td>
<td>285</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>American Heritage frequency data</th>
<th>Frequency index</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LC</td>
<td>LC Jr.</td>
<td>Sears</td>
<td>MARC</td>
</tr>
<tr>
<td>Mean</td>
<td>45.8</td>
<td>48.5</td>
<td>47.1</td>
<td>49.5</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>8.3</td>
<td>8.9</td>
<td>8.1</td>
<td>7.7</td>
</tr>
<tr>
<td>Standard error</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Number of cases</td>
<td>260</td>
<td>266</td>
<td>280</td>
<td>285</td>
</tr>
</tbody>
</table>

\(a^\) A measure of the spread in a set of observations (Hamburg, 1973, p. 64).

\(b^\) Standard deviation of the sampling distribution (Siegel, 1956, p. 13).
Sears list is 7% with an 11% difference between the standard deviations. The MARC subject headings, therefore, have a vocabulary level which is, statistically, significantly lower than the headings in the other two lists. Educationally, however, the difference is less. Statistical measurement considers a difference to be significant if it is greater than or less than .05 or .01.\textsuperscript{11} Educationally, a difference is considered to be significant if it is greater than or less than one grade level. This difference in vocabulary level, however significant, has implication for the cataloger of juvenile books in that he must consider not only the user for whom he is cataloging materials but also, the vocabulary level of the subject heading list he is using. For example, for intermediate grade-level students, use of the adult Library of Congress subject heading list would provide less access to information than MARC cataloging.

The first hypothesis to be tested by the study was that LC, LC Jr., Sears, and MARC subject heading lists are all equally readable. This hypothesis is not supported. The four subject heading lists are not equally readable as a whole or at any grade level.

Looking at the relative and cumulative frequency of terms in the subject heading lists at each grade level,

one-third of the terms are at the lowest reading level (grade 4). The Library of Congress list has 32.7% of its subject headings in the lowest (fourth) grade-level category and 21.6% in the highest (twelfth-sixteenth) grade-level category. At a sixth-grade level only 55% of the terms in the LC list are understandable to a user. The user can understand 62% of the Sears list at the sixth-grade level and 75% of the MARC terms. Table 7 gives comparative figures by grade levels for the number of cases, the relative frequencies, and the cumulative frequencies of the four subject heading lists. Figure 2 shows graphically the comparisons between the vocabulary levels of the four subject heading lists. The graph shows far more clearly than words or numbers the increased access to information which is possible when lower vocabulary levels are used for subject headings.

At the fourth-grade level where library instruction formally begins in most schools, approximately one-third of the subject headings in each list can be understood by children. This assumes that all fourth-graders are actually reading at the levels considered as norms for the grade. The fact that so many students do not read at grade level norms\textsuperscript{12} means that the comprehension scores at any

\textsuperscript{12}\textit{National Assessment of Educational Progress: A Project of the Education Commission of the States, Report 02-R-09 Reading Rate and Comprehension (Denver: Education Commission of the States, December, 1972); New Jersey Educational Assessment Program, 1972-1973 Test Specifications and Questions, Grades 4 and 12 (Trenton: Office of}
### TABLE 7.--Grade Level Analysis of Subject Heading Lists by Number of Cases, Relative Frequency, and Cumulative Frequency

<table>
<thead>
<tr>
<th>Grade level</th>
<th>LC</th>
<th>LC Jr.</th>
<th>Sears</th>
<th>MARC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>% RF</td>
<td>% CF</td>
<td>No.</td>
</tr>
<tr>
<td>4</td>
<td>85</td>
<td>32.7</td>
<td>32.7</td>
<td>141</td>
</tr>
<tr>
<td>6</td>
<td>59</td>
<td>22.7</td>
<td>55.4</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>15.4</td>
<td>70.8</td>
<td>33</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>7.7</td>
<td>78.5</td>
<td>16</td>
</tr>
<tr>
<td>12 up</td>
<td>56</td>
<td>21.6</td>
<td>100.0</td>
<td>16</td>
</tr>
</tbody>
</table>
Figure 2. Grade level analysis of subject heading lists.
grade levels are an optimistic estimate of actual comprehension. Assuming that comprehension is essential to learning, then the amount of learning possible through use of the library's subject catalog is dubious.

A child frustrated in his attempts to learn to use the library's subject catalog to find information is not likely as an adult to turn naturally to the library as his first source of needed information.

CHAPTER V

ANALYSIS OF RELATIONSHIP OF SUBJECT HEADINGS TO READING LEVEL OF BOOKS THEY DESCRIBE

The importance of reading level of subject headings in the library's subject catalog is only one aspect of access to library information. A second aspect of access is the relationship of the subject headings to the books or other materials they describe. For instance, FOLKLORE is a subject heading with a high sixth-grade reading level. The heading will provide access to information about folklore to most people reading at this level or higher. However, many children's picture books and some early "easy readers" are also books of folklore. The young readers for whom these books are intended are, by virtue of not knowing the access terminology, effectively denied the use of these books through the subject catalog.

For the purposes of this study, the determination of children's access to information in print is, therefore, a determination of the relationship of the vocabulary level of a subject heading to the reading level of the books which the heading describes. If there is a negative difference or no difference between the vocabulary level of
the subject heading and the reading level of the book, the subject heading can be said to provide access to the book. In terms of accessibility, the fact that the reading level of the book may be far above the vocabulary level of the subject heading is a secondary consideration. The important consideration is that access to the book is provided and the user given the option of deciding whether or not he can read the book or it is useful for his purposes.

The second part of the study investigated the relationship of the vocabulary level of MARC subject headings to the reading levels of juvenile books published in 1970 and 1972 which the subject headings described. To determine the relationship between the reading levels of subject headings and books, the measure of vocabulary level of subject headings had to be conceptually related to the measure used to determine the readability of the books.

Description of Dale-Chall Formula for Readability

The conceptual premises of the Dale-Eichholz comprehension measure are essentially similar to those in the Dale-Chall readability formula. In addition to relating conceptually to the vocabulary measure, the Dale-Chall formula has the added advantage of precision and validity as a research tool to predict grade level of words-in-
Formulae for predicting readability are generally based on two factors: sentence length of a sample of text, and vocabulary. The Dale-Chall formula uses a sample of 100 words selected from every tenth page of text. The average sentence length is computed. The number of words are computed which are not found on the list of basic words developed by Dale for use in the formula. This list does not contain the proper names of persons and places. Dale considers these to be familiar words. The Dale-Chall formula may be summarized as follows:

Select 100+ word samples from every tenth page of the material to be analyzed;

Compute the average sentence length in words (X);

Compute the percentage of words outside the Dale list of 3,000 familiar words (Y, or Dale score);

Apply in the formula:

$$FRS = 0.1579X + 0.0496Y + 3.6365.$$  

FRS is the "formula raw score." This FRS must be converted into a grade-level score using a table developed by Dale and Chall.³


Readability formulae have limitations as do tests of comprehension and word frequency lists. The formulae measure only one aspect of writing: difficulty of vocabulary. They do not consider format, reader appeal, or clarity of writing. However imperfect, readability formulae have been proven to be related to reading speed, acceptability, understanding, and learning. In addition, as predictors of difficulty, they are usually more accurate than individual writers. 4

Pretest to Simplify Dale-Chall Formula

The large quantity of books with 1970 and 1972 copyrights from the MARC subject heading sample to be analyzed for readability (405 books) and the time-consuming complexity of the Dale-Chall readability formula led to a decision to pretest sampling patterns in hopes of simplifying the process of readability analysis.

The books selected for the pretest were the 32 books of DOGS-STORIES and FOLKLORE previously chosen for in-depth subject-heading/readability analysis (see p. 24).

A pagination analysis was run for the entire universe of juvenile books on MARC tapes for 1970 and 1972. The size of this universe corresponded to the total 1970 and 1972 American book title outbook of 5,166 as indicated in the Bowker Annual. 5 Additional titles are the results

4Klare, Measurement of Readability, pp. 18-25.

of the Library of Congress' efforts to catalog additional juvenile titles from other years after institution of their children's cataloging program. The original universe of 5,186 books was cut 5% to 4,927 books by excluding the 259 books listed as having either more than 999 pages or less than one page (Table 8).

The sampling basis for the Dale-Chall formula is 100 words about every tenth page for books. This sample, according to the instructions, should never begin or end in the middle of a sentence. The sampling instructions are based on research by Bertha Leifeste who in 1944 tested 11 types of sampling in geographies, histories, and readers for fourth, sixth, and eighth grades.6

The sample of books related to the MARC subject headings includes many picture books. These picture books are characterized by large type face, generous (often full-page) use of illustrations, and, in general, pagination of less than 50 pages. A sampling basis was needed that could be used equally effectively with picture books as well as with books having a larger quantity of text.

Taking the square root of the number of paging units (a sequence of pages considered as one page) containing 100+ words instead of selecting 100 words on every tenth page fulfilled the requirements of sampling theory.

TABLE 8.--Pagination Analysis of Juvenile Books from MARC Tapes--1970 and 1972

<table>
<thead>
<tr>
<th>Observations</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Observations</td>
<td>5186</td>
<td>119.086</td>
<td>71.984</td>
</tr>
<tr>
<td>Observations &lt; 999 pp. and &gt; 1 p.</td>
<td>4927</td>
<td>104.103</td>
<td>79.830</td>
</tr>
</tbody>
</table>
That is, half of a book having only four pages of text would be sampled, one-third of a book having only nine pages would be sampled, while one-tenth of a book with 100 pages would be sampled. Taking the square root of the paging units containing 100+ words saves time (thereby increasing efficiency) by reducing the number of samples necessary for books having many pages and a large quantity of text. Because the mean and the median of the books ranged around 100 pages and the mode was constant at 32 pages (see Table 8), sampling by using the paging units of text containing 100+ words proved as accurate for picture books and easy readers as for books for older readers having a greater quantity of text and smaller type face. The revised sampling procedure, therefore, proved more accurate, more efficient, and is applicable to any textual material having at least 100 words.

There are at least two valid simplifications of the Dale-Chall readability formula. One by George R. Klare\(^7\) involves considerable computation. The Klare simplification requires computation of (1) the Dale score (the percentage of words outside the Dale list), and (2) the average sentence length of each sample of text. For a book requiring ten samples of text, Klare's simplification requires 20 computations. Reading this data into Klare's simplification requires considerable computation. The Klare simplification requires computation of (1) the Dale score (the percentage of words outside the Dale list), and (2) the average sentence length of each sample of text. For a book requiring ten samples of text, Klare's simplification requires 20 computations. Reading this data into Klare's simplification requires considerable computation.

---

table of raw scores for readability, a final computation is necessary to convert the raw scores to grade-level scores using the Dale-Chall correction table. Any samples having an average sentence length of less than six words or more than 38 words have to be computed for grade level of readability using the original Dale formula.

The second simplification has been developed by Charles R. Goltz. Goltz's simplification requires computation only of the Dale score. Direct grade-level equivalents are read from a table after determination of the number of sentences in a 100-word sample and the Dale score. Use of Goltz's table saves additional time since the Dale-Chall correction table is not necessary for conversion of raw scores to grade levels of readability.

The pretest examined 14 types of sampling in 32 books, and checked both the Klare and the Goltz simplification for validity. Nested samples of one sentence, 25 words, 50 words, 100 words, and 100+ words (to the end of the sentence) taken from every tenth page and also from the square root of the number of pages and/or paging units containing 100+ words were analyzed using Dale's, Klare's, and Goltz's computations. The most accurate method was


assumed to be Dale's original method computed for an augmented sample size. This size is every tenth page for books over 100 pages and every nth page for books under 100 pages where n equals the square root of the number of pages and/or paging units containing 100+ words. The other methods and sample sizes were compared with this standard by using root-means-squared. The results closest to those obtained by using the original Dale-Chall formula with the largest possible sample size came from (1) using the square root of the number of pages of text containing 100+ words, (2) using the full Dale sample of 100+ words, and (3) computing grade level using Goltz's table (Table 9).

The three most accurate results varied from the standard by only one-third of a grade level. Accepted error in readability prediction is plus or minus one grade level. The three most accurate results, therefore, also validated both Klare's and Goltz's simplifications.

Goltz's simplification (100-word sample) was easy to use and resulted in a considerable saving of time over Klare's and Dale's methods. Determining the number of samples necessary for each book using the square root of the number of paging units of text containing 100+ words resulted in increased predictive accuracy for books of few pages. This method of sampling was also more efficient with no significant loss of accuracy for books over 100 pages. Combining both these features did not impair the predictive accuracy of the original Dale-Chall formula.
TABLE 9.--Results of Pretest for Simplification of Readability Analysis. Grade-Level Differences from Dale Method with Augmented Sample Size

<table>
<thead>
<tr>
<th>Sample: Every Tenth Page</th>
<th>Full Dale (100 words +)</th>
<th>100 words</th>
<th>50 words</th>
<th>25 words</th>
<th>One sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goltz</td>
<td>.51</td>
<td>.51</td>
<td>.72</td>
<td>.87</td>
<td>-</td>
</tr>
<tr>
<td>Klare</td>
<td>.34</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.03</td>
</tr>
<tr>
<td>Dale</td>
<td>.34</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample: Square Root of Number of Pages</th>
<th>Goltz</th>
<th>Klare</th>
<th>Dale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.33</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td></td>
<td>.34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>.60</td>
<td>.86</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>.74</td>
<td>-</td>
<td>.86</td>
</tr>
</tbody>
</table>
The method selected for readability analysis for books for this study may be summarized as follows:

1. Take the square root of the number of paging units in the book having 100+ words. If the book is a picture book having 50 pages of text each averaging 50 words, take the square root of 25 (to achieve 100+ words per page). A paging unit in this book would consist of two pages.

2. Take a 100-word sample every nth page where n equals the square root of the number of pages.

3. Determine the number of sentences in the sample. When the last sentence is not complete at 100 words, count the number of words in the last sentence. If the fragment of a last sentence has half or more than half of the words in the whole sentence, count the fragment as a complete sentence.

4. Determine the number of words in the sample not on Dale's list of 3,000 words.

5. Apply Goltz's chart for direct grade equivalents.

6. Average the reading levels of the samples to determine the readability level of the book.

Reading Levels of Books Described by MARC Subject Headings in 1970 and 1972

The reading levels of the 437 books analyzed by the modified Dale-Chall formula are listed in Table 10. The books described by DOGS-STORIES and FOLKLORE were each analyzed as a separate group as part of the pretest to simplify
TABLE 10.--Number of 1970 and 1972 Juvenile Books by Grade Readability Levels

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>46</td>
<td>34</td>
<td>12</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>159</td>
<td>103</td>
<td>56</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>97</td>
<td>61</td>
<td>36</td>
<td>--</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>71</td>
<td>48</td>
<td>23</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>12</td>
<td>25</td>
<td>16</td>
<td>9</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td>405</td>
<td>267</td>
<td>138</td>
<td>11</td>
<td>21</td>
</tr>
</tbody>
</table>
the Dale-Chall formula for readability.

The pretest had an additional purpose of providing an in-depth examination of books described by one low-vocabulary subject heading (DOGS-STORIES) as well as books described by a high-vocabulary-level subject heading (FOLKLORE). DOGS-STORIES has a low fourth-grade vocabulary level and FOLKLORE has a high sixth-grade vocabulary level. These books as well as the others analyzed were published in 1970 and 1972. Because the sample sizes were relatively small (11 DOGS-STORIES and 21 FOLKLORE) and because analysis of the larger sample showed no significant differences when broken down into separate years, the analyses for these subject headings were not broken down into separate years.

Comparisons of Subject Heading Vocabulary Levels with Reading Levels of the Books They Describe

Comparison of Mean Levels of Readability. Table 11 compares the percentages of books in each grade level (determined by the MARC subject headings) over the two-year time period 1970 to 1972. The statistically significant increase (.15) in fourth-grade books might be accounted for by the increasing demand for lower-grade "easy readers." The contradiction in this possibility, however, is the high reading levels for books in this category. The seventh-grade mean readability level of the books in this category would not seem to support the possibility of more "easy readers" having low-vocabulary-level subject headings.

<table>
<thead>
<tr>
<th>Subject heading grade level</th>
<th>Combine 1970-1972</th>
<th>1970</th>
<th>1972</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% books</td>
<td>Mean</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>4</td>
<td>37.8</td>
<td>7.176</td>
<td>2.084</td>
</tr>
<tr>
<td>6</td>
<td>35.1</td>
<td>7.254</td>
<td>2.267</td>
</tr>
<tr>
<td>8</td>
<td>13.1</td>
<td>7.925</td>
<td>2.480</td>
</tr>
<tr>
<td>10</td>
<td>6.2</td>
<td>8.000</td>
<td>2.449</td>
</tr>
<tr>
<td>12</td>
<td>5.7</td>
<td>8.522</td>
<td>2.778</td>
</tr>
<tr>
<td>13</td>
<td>1.0</td>
<td>9.000</td>
<td>2.582</td>
</tr>
<tr>
<td>16</td>
<td>1.2</td>
<td>8.400</td>
<td>4.336</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>7.462</td>
<td>2.329</td>
</tr>
</tbody>
</table>
To compare the relationships between the vocabulary levels of the subject headings and the readability levels of the specific books the subject headings describe, three tests were used: DIFF, Chi-Square, and Pearson Correlation Coefficients.

Comparison by DIFF (Subject Heading Vocabulary Level Minus Book Reading Level). The first comparison was called DIFF. DIFF is the difference between the vocabulary level of the subject heading and the readability level of the book the heading describes. A zero DIFF or a negative DIFF indicates that the reading level of the book was equal to or higher than the reading level of the subject heading. Under these conditions, access to the book is provided to the user searching this term. A positive DIFF indicates that the reading level of the subject heading is higher than the reading level of the book it describes. In this case, access to the book is effectively denied to the user searching the subject catalog. Table 12 shows the number of cases, the relative frequencies, and the cumulative frequencies for DIFF calculated plus and minus six grade levels.

Using DIFF as an indicator of accessibility, 70% of the children's books published in 1970 and 1972 were assigned subject headings equal to or lower than the readability levels of the books they described. Thirty percent of the books published in those years were, in effect, hidden from children searching for them in a subject
TABLE 12.—DIFF (Subject Heading Vocabulary Level Minus Book Reading Level): Number of Cases, Relative and Cumulative Frequencies in Yearly Increments.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. cases</td>
<td>%RF</td>
<td>%CF</td>
</tr>
<tr>
<td>-6.0</td>
<td>26</td>
<td>6.4</td>
<td>6.4</td>
</tr>
<tr>
<td>-5.0</td>
<td>19</td>
<td>4.7</td>
<td>11.1</td>
</tr>
<tr>
<td>-4.0</td>
<td>40</td>
<td>9.9</td>
<td>21.0</td>
</tr>
<tr>
<td>-3.0</td>
<td>43</td>
<td>10.6</td>
<td>31.6</td>
</tr>
<tr>
<td>-2.0</td>
<td>57</td>
<td>14.1</td>
<td>45.7</td>
</tr>
<tr>
<td>-1.0</td>
<td>55</td>
<td>13.6</td>
<td>59.3</td>
</tr>
<tr>
<td>0.0</td>
<td>41</td>
<td>10.1</td>
<td>69.4</td>
</tr>
<tr>
<td>1.0</td>
<td>40</td>
<td>9.9</td>
<td>79.3</td>
</tr>
<tr>
<td>2.0</td>
<td>36</td>
<td>8.9</td>
<td>88.1</td>
</tr>
<tr>
<td>3.0</td>
<td>15</td>
<td>3.7</td>
<td>91.9</td>
</tr>
<tr>
<td>4.0</td>
<td>12</td>
<td>3.0</td>
<td>94.8</td>
</tr>
<tr>
<td>5.0</td>
<td>9</td>
<td>2.0</td>
<td>97.0</td>
</tr>
<tr>
<td>6.0</td>
<td>12</td>
<td>3.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
catalog by virtue of the child's lack of comprehension of the subject headings used to describe the books.

DIFF analyses of the relationships between vocabulary level of subject headings and readability level of books for DOGS-STORIES and FOLKLORE illustrate the accessibility problem. Because of the low vocabulary level of the subject heading, all 11 books about DOGS-STORIES are accessible (Table 13). With the high sixth-grade level of FOLKLORE, 61.9% of the books analyzed were not accessible to children. Because many of these books are designed in picture-book format for the younger child, the lack of accessibility is particularly unfortunate.

Table 14 shows the mean of DIFF between the grade levels of the subject headings and the book-readability levels. According to these tables, approximately 73% of the books are accessible when relating the subject heading level to the readability level of the books they describe. Looking at the data in Table 14, 37.8% of the books analyzed for readability had subject headings at the fourth-grade level. The subject headings of 72.9% of the books were at the sixth-grade level or below; 85.5% of the books had subject headings at the eighth-grade level or below. The mean reading level of the books analyzed was not less than seventh grade, even when subject headings were at the fourth-grade level. These figures look discouraging for the elementary school child (sixth grade and below) who wishes to learn from the library books he finds. Comparing
TABLE 13.--DIFF (Subject Heading Vocabulary Level Minus Book Reading Level) in Yearly Increments: Number of Cases, Relative and Cumulative Frequencies: DOGS-STORIES, FOLKLORE

<table>
<thead>
<tr>
<th>DIFF</th>
<th>No. of cases</th>
<th>% relative frequency</th>
<th>% cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>1</td>
<td>9.1</td>
<td>9.1</td>
</tr>
<tr>
<td>-2</td>
<td>4</td>
<td>36.4</td>
<td>45.5</td>
</tr>
<tr>
<td>-1</td>
<td>3</td>
<td>27.3</td>
<td>72.7</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
<td>27.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

DOGS-STORIES: Combined 1970-1972
Subject Heading Vocabulary Level = 4.0

<table>
<thead>
<tr>
<th>DIFF</th>
<th>No. of cases</th>
<th>% relative frequency</th>
<th>% cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>1</td>
<td>4.8</td>
<td>4.8</td>
</tr>
<tr>
<td>-2</td>
<td>1</td>
<td>4.8</td>
<td>9.5</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
<td>4.8</td>
<td>14.3</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
<td>23.8</td>
<td>38.1</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>47.6</td>
<td>85.7</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>14.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

FOLKLORE: Combined 1970-1972
Subject Heading Vocabulary Level = 6.0
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% books</td>
<td>Mean:</td>
<td>Mean:</td>
</tr>
<tr>
<td></td>
<td>Mean:</td>
<td>DIFF</td>
<td>Mean:</td>
</tr>
<tr>
<td>4</td>
<td>37.8</td>
<td>7.176</td>
<td>-2.908</td>
</tr>
<tr>
<td>6</td>
<td>35.1</td>
<td>7.254</td>
<td>-1.070</td>
</tr>
<tr>
<td>8</td>
<td>13.1</td>
<td>7.925</td>
<td>0.434</td>
</tr>
<tr>
<td>10</td>
<td>6.2</td>
<td>8.000</td>
<td>2.440</td>
</tr>
<tr>
<td>12</td>
<td>5.7</td>
<td>8.522</td>
<td>3.609</td>
</tr>
<tr>
<td>13</td>
<td>1.0</td>
<td>9.000</td>
<td>4.250</td>
</tr>
<tr>
<td>16</td>
<td>1.2</td>
<td>8.400</td>
<td>5.200</td>
</tr>
</tbody>
</table>
the figures in Table 11 with those in Table 14, the mean of the reading levels of those 1970 and 1972 books having fourth-grade vocabulary level subject headings is over seventh grade. If all fourth-graders read at a seventh-grade level or higher, there would be no problem. However, data from the National Assessment of Educational Progress studies indicate that on a passage graded for readability at the mid-fifth-grade level, only 40% of the population of 13-year-olds (eighth graders) comprehended the passage.10

In terms of library instruction in the use of the subject catalog to gain access to information, the reading level of the students becomes vital to the success of such instruction. If comprehension level is falling so much behind the reading level norms, then for most students library instruction at the elementary level in the use of the subject catalog is a waste of time. Expectations of independent use of the subject catalog by all but the most superior students are unreasonable as well.

Chi-Square Test for Independence between Subject Heading Vocabulary Levels and Book Readability Levels.

Another test of the relationship of the vocabulary levels of the subject headings to the readability levels of the books they describe was the chi-square test. This

statistical test was computed for the mean readability levels of (1) the 405 books published in 1970 and 1972, (2) the 267 books published in 1970, and (3) the 138 books published in 1972 (Table 15). With 9 degrees of freedom, the probability that chi-square is equal to or greater than 10.062 is 0.34547 for the combined 1970 and 1972 samples of books. For the 1970 books the probability that chi-square is equal to or greater than 10.854 is 0.28587. For the 1972 books, the probability that chi-square is equal to or greater than 3.799 is 0.92413. These figures tend to support the idea of independence (lack of relationship) between the vocabulary level of the subject headings and the readability level of the books they describe.

Test for Correlation of Subject Heading Vocabulary Levels and Readability Levels of Books They Described. Pearson correlation coefficients were calculated as a third statistical test to determine the relationships between the vocabulary level of the subject headings and the reading level of the books they describe (Table 16). The low correlation coefficients indicate a lack of relationship between the subject headings and their corresponding books.

Comparing the relationships between the vocabulary level of the subject headings and the readability levels of the books they describe, three different tests indicate that vocabulary levels of the MARC subject headings do not correspond to the readability levels of the books they describe. Therefore, for the second hypothesis of this
TABLE 15.--Chi-square Test for Independence between Subject Heading Vocabulary Levels and Book Readability Levels

<table>
<thead>
<tr>
<th>Subject heading grade level</th>
<th>Average reading level of books</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grades 4</td>
</tr>
<tr>
<td>Combined 1970-1972</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20 (17.4)</td>
</tr>
<tr>
<td>6</td>
<td>20 (16.1)</td>
</tr>
<tr>
<td>8</td>
<td>3 (6.0)</td>
</tr>
<tr>
<td>10 up</td>
<td>3 (6.5)</td>
</tr>
</tbody>
</table>

Chi-square = 10.062 (p = .03) with 9 df

1970

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10 up</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>14 (12.1)</td>
<td>38 (36.7)</td>
<td>23 (21.7)</td>
<td>20 (24.6)</td>
</tr>
<tr>
<td>6</td>
<td>16 (12.6)</td>
<td>39 (38.2)</td>
<td>23 (22.6)</td>
<td>21 (25.6)</td>
</tr>
<tr>
<td>8</td>
<td>2 (4.6)</td>
<td>13 (13.9)</td>
<td>7 (8.2)</td>
<td>14 (9.3)</td>
</tr>
<tr>
<td>10 up</td>
<td>2 (4.7)</td>
<td>13 (14.3)</td>
<td>8 (8.5)</td>
<td>14 (9.6)</td>
</tr>
</tbody>
</table>

Chi-square = 10.854 (p = .29) with 9 df

1972

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10 up</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>6 (5.0)</td>
<td>23 (23.5)</td>
<td>17 (15.1)</td>
<td>12 (14.3)</td>
</tr>
<tr>
<td>6</td>
<td>4 (3.7)</td>
<td>17 (17.5)</td>
<td>9 (11.2)</td>
<td>13 (10.6)</td>
</tr>
<tr>
<td>8</td>
<td>1 (1.5)</td>
<td>9 (6.9)</td>
<td>4 (4.4)</td>
<td>3 (4.2)</td>
</tr>
<tr>
<td>10 up</td>
<td>1 (1.7)</td>
<td>7 (8.1)</td>
<td>6 (5.2)</td>
<td>6 (4.9)</td>
</tr>
</tbody>
</table>

Chi-square = 3.799 (p = .92) with 9 df

\[ \text{Critical value for chi-square = 16.19.} \]

\[ \text{More than one-fifth of the expected frequencies are} \]

\[ \pm 5.0. \]
TABLE 16.--Pearson Correlation Coefficients between Vocabulary Level of Subject Headings and Readability Level of Books

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of cases</th>
<th>Correlation coefficient</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-1972</td>
<td>405</td>
<td>0.17</td>
<td>.001</td>
</tr>
<tr>
<td>1970</td>
<td>267</td>
<td>0.21</td>
<td>.001</td>
</tr>
<tr>
<td>1972</td>
<td>138</td>
<td>0.09</td>
<td>.001</td>
</tr>
</tbody>
</table>
study (that the vocabulary and readability levels are independent) there is insufficient evidence to reject the null hypothesis of independence. This implies that there is no apparent relationship between the vocabulary level of a subject heading and the readability level of the book it describes.
CHAPTER VI

FINDINGS AND CONCLUSIONS

The objective of the first part of the study was to analyze the vocabulary levels of the four most commonly used subject heading lists: LC, LC Jr., Sears, and MARC. The special headings for children were compiled to facilitate children's use of the subject catalog. Sears is an abridgment of the LC list. MARC headings are headings taken from LC and LC Jr. lists which are actually applied to juvenile books.

Using statistical calculations to determine the means and standard deviations of the subject heading lists, the relative and cumulative frequencies of grade levels within the lists, the subject heading lists were not found to be equally readable. The LC list had the highest level of vocabulary (grade 7.7, s.d. 3.5) followed, in descending order, by Sears (grade 6.9, s.d. 2.9), MARC (grade 6.4, s.d. 2.6), and LC Jr. (grade 6.0, s.d. 2.6). The standard error was the same for all four lists: \( \pm 0.2 \) (see Table 6). Statistically, the level of the MARC headings is significantly (.07) lower than Sears. However, this statistical significance is secondary to the educational significance which allows for an error of plus or minus one grade level
instead of an error of plus or minus .05. Educationally, therefore, the four lists are almost equally readable. While the null hypothesis of equal readability is statistically rejected because the differences in vocabulary level are greater than .05, the hypothesis is less easily rejected using the broader, educationally accepted ranges of error.

In terms of access to information, the average vocabulary level of subject headings (found to range from sixth- to seventh-grade levels) poses several problems. These problems affect the child user of the subject catalog, the student attempting to learn to use the subject catalog, and the average person attempting to obtain access to information in the library's collections through the subject catalog. The sixth- and seventh-grade-level average vocabulary level of subject headings represent measurements using national norms of reading levels. Most children do not read at the established national norms.

The National Assessment of Educational Progress study found that only 40% of eighth-grade students can answer comprehension questions about a passage of text at the fifth-grade level.1 In the light of these findings, expectations that any but the most superior students can read the library's subject catalog seem unreasonable. The

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1 National Assessment of Educational Progress: A Project of the Education Commission of the States, Report 02-R-09 Reading Rate and Comprehension (Denver: Education Commission of the States, December, 1972), p. 53.
National Assessment of Educational Progress study as well as a recent study by the New Jersey Educational Assessment program\(^2\) indicate that a significant number of students do not possess either the vocabulary to read or the study skills to use the library's subject catalog with any degree of success.

The curriculum in many United States schools today provides for library instruction. Part of this instruction includes the use of the subject catalog. This instruction is traditionally concentrated in grades 4, 5, and 6 with less concentrated instruction at the higher grade levels. As previously stated, the findings of this study indicate that the mean vocabulary levels of the subject catalog range from grade 6 to grade 7 with a standard deviation of plus or minus two grade levels. The elementary child is, therefore, being instructed to use a tool he cannot read.

A consistent lack of success in attempting to learn to use the subject catalog coupled with a teacher's unrealistic expectations of how much the student is able to comprehend may dissuade the student from using the library long after the period of unsuccessful instruction has passed.

The implications of the child's inability to comprehend the vocabulary in the subject catalog extend beyond the school library situation to affect the average adult patron of the public library. According to a recent research project, a substantial portion of the United States population does not read well enough to function in society:

Some 12 million people 14 years of age and older cannot read as well as the average fourth-grader, yet seventh-grade reading ability is required to perform such skilled or semi-skilled jobs as machinist or cook.

Approximately 60% of the Nation's 13-year-olds cannot follow directions in a relatively simple cook-book.

An estimated 18 million adults cannot read well enough to file applications for Medicaid, Social Security, bank loans, or drivers' licenses.

The National Assessment of Educational Progress Study indicates that only 34% of 17-year-olds could comprehend correctly a passage of text rated at a tenth-grade level by three different readability formulae (including Dale-Chall). This reading rate varies from community to community and from region to region. The rate drops in poor communities with a low educational level and rises in more affluent suburbs with a higher educational level. In general, however, the results of the National Assessment of Educational Progress study applied to the findings of this study.


4National Assessment of Educational Progress, p. 119.
study indicate that the average person is unable to read the library's subject catalog on his own, much less to use it to locate information in the library.

If vocabulary level were the only problem the child or average adult encountered in using the subject catalog, the difficulty of gaining access to information would be discouragingly serious. However, in addition to a high vocabulary level of subject headings, the user encounters two other difficult problems: (1) unsystematic and inconsistent form of subject headings, and (2) a mismatch of the conceptual patterns of the user and the conceptual patterns of the cataloger. The first problem was the subject of a dissertation by Jessica Harris. The second problem was examined in a dissertation by John M. Christ. Put together: the findings of this dissertation, the Harris dissertation, and the Christ dissertation lead to the conclusion that the subject catalog cannot be understood by the child and the average adult because of the combined problems of high vocabulary level, inconsistent form of headings, and the mismatch of conceptual patterns.

An additional conclusion of the present study is that, because of these problems, library instruction in the


subject catalog should be discontinued at the elementary grade levels.

A second aspect of the analysis of vocabulary level of the subject headings investigated by this study was an attempt to determine the relationship between word comprehension and word frequency in the measurement of vocabulary levels. The data (p. 38) shows that comprehension and frequency are statistically related using correlation coefficients and the chi-square test. However, the correlations are inverse and do not indicate any interval interrelationships between grade levels of comprehension and lognormal intervals of frequency. Determination of such interrelationships is necessary to convert from one approach to vocabulary level measurement to the other. While the determination of such conversion intervals was beyond the scope of this study, investigation of this relationship has been suggested as a topic for future research.

The attempt to measure the relationship of word comprehension to word frequency was also an attempt to determine the effectiveness of the subject catalog as a medium of communication. Word comprehension indicated the concepts understood by the child who would use them to address the subject catalog in a search for information. Word frequency indicated the vocabulary and concepts of the adult authors and catalogers attempting to communicate with the child by the headings they selected to include in the catalog. The statistical tests indicated a weak,
The relationship is sufficiently weak (p = -0.036 to -0.52) as to be pragmatically meaningless. Therefore, this finding of the study indicates that the catalog is not useful as a medium of communication. The fact that the subject catalog is such a weak medium of communication strengthens and adds weight to the previous conclusion that the subject catalog does not provide access to information.

The objective of the second part of the study was to investigate the subject catalog as a means of access to information by determining the relationship between the vocabulary levels of subject headings and the readability levels of the books these headings described. The data was analyzed using three tests: DIFF (see p. 61), chi-square, and Pearson correlation coefficients. Each test indicated no apparent relationship between the vocabulary level of a subject heading and the readability of the book it describes.

The original premise of the study had been that a positive relationship should exist between vocabulary level of a subject heading and the reading level of the book the heading described. This premise was stated as a null hypothesis that the vocabulary level of a subject heading and the readability level of a book with that heading would be independent of each other. The use of a null hypothesis of independence was dictated by the statistical analysis of
the chi-square test. There was no evidence to reject the null hypothesis using chi-square, correlation coefficients, or the DIFF (p. 61) statistic.

The fact that three different statistical tests found no apparent relationship between the vocabulary level of a subject heading and the readability level of the book it describes once again leads to the conclusion that the subject catalog is not effective as a means of access to information for the child or the average adult. The statistical correlations (0.09 to 0.21) show an almost completely independent relationship between subject heading vocabulary level and book readability level.

The 405 books in the sample were cross tabulated using the DIFF accessibility statistic and the grade level of the subject heading assigned to the book. The subject heading vocabulary level at the first point where DIFF indicated accessibility was grade 8. At this point, 70% of the books published in 1970 and 1972 were accessible. However, the mean grade level of readability of these books was 7.9. The National Assessment of Educational Progress finding was that only 40% of eighth-grade students could comprehend a passage graded for readability at the mid-fifth-grade level. If only 70% of the books are accessible at a subject heading vocabulary level of eighth grade and these books themselves have a mean grade level of readability of 7.9 (more than two grade levels higher than the passage tested by the NAEP study), then, optimistically,
only 28% of books are accessible to the eighth-grade child using the subject catalog.

Looking at DIFF in relation to a subject heading having a low fourth-grade vocabulary level, all books tested were accessible. Using DIFF with a subject heading having a high sixth-grade vocabulary level, only 32.1% of the books analyzed with that heading were accessible if the child's reading level equaled or was greater than national norms.

An additional finding of the second part of the study was the grade-level mean of readability for 405 children's books published in 1970 and 1972. This grade-level mean was found to be 7.4 with a standard deviation of 2.3 grade levels and a standard error of 0.1. The mean of the readability levels of books published in 1970 and of books published in 1972 did not vary significantly (< .02). The data, therefore, did not vary over time.

The fact that the mean grade level of readability of juvenile books is mid-seventh grade indicates that the publishers do not produce much material for the very young reader, the handicapped reader, the reader with learning disabilities, or the reader who is not capable of reading at grade-level norms. One unanswered question is whether publishers produce for a market of librarians who purchase books or for a market of ultimate users who have considerably lower reading levels than those indicated by the grade levels of books published.
Prior to determining readability levels for the 405 juvenile books, a simplified method for using the Dale-Chall readability test was developed and validated. In the process of validating the modification used in the study, the Goltz and the Klare simplifications of the Dale-Chall formula were validated as well. A more accurate, less time-consuming, and more widely applicable text-sampling procedure was also developed. This simple, accurate readability test might be used by publishers to determine objectively the grade levels of readability of the manuscripts they consider for publication.

Not long after the institution of the Library of Congress' program for cataloging children's materials, Miss Treva Turner (Head, Children's Cataloging Section, Subject Cataloging Division) of the Library of Congress asked for information from the field about the effectiveness of the program. The findings of this study answer two of her questions and partially answer a third.

Miss Turner's questions were (1) how effective have the new LC juvenile headings proven in children's libraries; (2) how do they compare, from the user point of view, with other existing schemes; and (3) would a user study indicate a serious problem due to lack of standardization? This study would conclude that LC juvenile headings taken

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from MARC tapes are no more effective than headings from any other subject heading list.

A user study might indicate that the problem of lack of comprehension of the headings is as great, if not greater, than the problem of standardization of form of the headings. A user study might look at the interactions of the problems of comprehension, form of headings, mismatch of concepts, and complexity of filing rules in terms of frustration levels for children and adults.

Several alternatives might be considered to provide the patron with easier access to the information in the library's collections than that presently provided by the subject catalog.

One alternative would be to lower the reading levels of the subject headings and to simplify and standardize their form. The difficulties inherent in lowering the reading level of subject headings are many. Rankings of words in English by frequency of use indicates that words of high frequency are often general, somewhat generic terms lacking the specificity necessary for the file structure of any but the smallest library. Lowering the reading level would not solve the problem of the patron who must, in addition to understanding the subject heading, linguistically match his concept of the information he seeks with the concepts of the cataloger who selected the subject heading. John Christ's study of concepts and subject

Christ, Concepts and Subject Headings.
headings suggests that such conceptual matching is not successfully managed by library catalogers. An additional problem relating to both reading level and conceptual matching is the difficulty library patrons frequently have with the variant forms of subject headings. For these reasons, lowering the reading level of the library's subject headings does not seem to be a viable alternative.

A second alternative would be to avoid the subject catalog altogether. Avoidance of the subject catalog might be accomplished in at least two ways. One simple approach used by libraries large and small is to divide the library catalog to separate the subject entries from the title and author ones. Another approach might be the use of a symbolic guide directly to broad subject areas on the shelves. This approach might be workable for small collections with easily accessible materials, but would be difficult in larger collections or in collections where the patron cannot go directly to the library's materials.

Another alternative in small collections might be to use KWIC or KWOC indexing for non-fiction titles. This alternative was investigated and found feasible in a study by Marilyn Crane and Joy Moll.9

A fourth alternative would be to consider the

subject catalog a tool for the librarian and to provide personnel to interface between the catalog and the patron seeking information. Depending on the person serving as the "interface," access might be improved. Access might also be further impeded. Left to his own devices, the library user might hope to combine luck and serendipity by using his own detective skills. Even when provided with the reference services of a professional librarian, the patron has no guarantee that the librarian will understand his query. Forced to use a librarian as an interface with the collection, the user no longer possesses the freedom to browse and discover unexpected but useful materials.

The possibility exists that, depending on the type of library and the user population, a combination or one or more of these alternatives might be a viable alternative to the problem of access to information through the subject catalog.

The findings and conclusions of this study show that when readability is used as an indicator of access to information, the subject catalog provides minimal access to information irregardless of grade or age level. This minimal access to information provided by the subject catalog holds whether the subject headings in the catalog are analyzed by themselves or in relation to the readability levels of the books they describe.
CHAPTER VII

TOPICS FOR FUTURE RESEARCH AND STUDY

In the course of the study many additional questions were raised which would, when answered, shed more light on children's access to information, provide more accurate measures of reading comprehension, and, perhaps, lessen the complexities of library subject headings.

The relationship between vocabulary comprehension and word frequency needs further investigation to determine the intervals in word frequency that might correspond to grade levels of comprehension. One approach to this might be a study of general and specific vocabulary terms by subject or discipline area. A second approach might be the study of the frequency of root or stem words and the comprehension levels of their variant forms. A third approach might be to study levels of concept formation as they relate to vocabulary comprehension. According to a study by Clinton I. Chase, "the measurement of concepts associated with verbal symbols has potential utility as a means of evaluating students' vocabularies."¹

Dale's list of 3,000 words needs updating as it is now over 25 years old.

More light on children's access to information might be shed after studying the subject headings assigned to picture books and "easy readers." A study of actual book reading levels and how these have changed over time would also be interesting. A similar study might be made of audiovisual or non-print materials for children with an analysis of the NICEM (National Information Center for Educational Media) subject headings. A study of book reading levels in elementary and intermediate school libraries might also prove fruitful.

An optimal file structure of the universe of juvenile materials might be developed for library catalogs. Using this optimal structure, standardized subject heading forms might be developed for juvenile materials.

Utilizing current practice and the data from this study, a determination could be made of the proportions of subject headings where the standard subdivision of the heading or the adjectival entry word in the heading determines its vocabulary level. Identification of these headings and subsequent adjustment of cataloging practice for juvenile materials might improve children's access to information.

In teaching reading, the concept of frustration level is often used to identify the reading levels at

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2Emmett Albert Betts, Foundations of Reading Instruction (New York: American Book Company, 1975.)
which a child functions independently, at which he can be taught, and at which he is frustrated by not being able to comprehend the material he is trying to read. Empirical testing of the results of this study in terms of frustration level would add validity to its conclusions.

Future research might also monitor change in both reading levels of juvenile books published as well as in the subject headings assigned to them. Such monitoring could determine if reading levels are indeed meeting the needs of all juvenile seekers of information. The monitoring could also determine if access to information were being achieved by attempting to match the level of a subject heading to the level of the material which the heading is providing access to.

Finally, in investigating subject headings and their application to children's books, the rules, conventions, structure, and application of subject headings suggest that subject headings may be a "language" of their own: the librarian's professional dialect. The varying forms of subject headings suggest a grammar. The subject headings are a self-contained group of concepts which embody a series of experiences (cataloging courses?) which are similar in one or more respects.\(^3\) The librarian's training may indeed be teaching him a unique professional language not easily understood by others.

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BIBLIOGRAPHY


Dale, Edgar, and Eichholz, Gerhard. Words We Know: A National Inventory. Columbus: The Ohio State University (to be published).


APPENDIX A.

SUBJECT HEADINGS ANALYZED
FOR VOCABULARY LEVEL
LC SAMPLE

AARDVARK
ABBREVIATIONS
ABSTRACTS
ABUSE OF ADMINISTRATIVE POWER (ROMAN LAW)
ACETAL RESINS
ADVERTISING LAWS
AEROPLANES
AEROPLANES ELECTRIC WIRING
ALE PUMP
ANEMOMETER
ANKLE
ARABESQUES
ARCHERS
ARMADA 1588
ART EXPERTISING
ART NOVEAU
ART PRIMITIVE
ASBESTOS FIBERS
AUDITORS
AUTHORITARIANISM
AUTOMOBILE ENGINEERING
BACTERIOLOGY AGRICULTURAL
BAIT CASTING
BANDSMEN
BASALT
BETROTHAL
BIBLE
BIBLIOGRAPHY INTERNATIONAL
BIGAMY (CANON LAW)
BINS
BIODIC (ANTISEPTICS)
BIRDS ORNAMENTAL
BIRTH (PHILOSOPHY)
BOILERS
BOLOMETER
BORDER PATROLS
BREEDING
CARROTS AS FEED
CATHOLIC CHURCH
CATHOLICS IN ENGLAND
CHANNEL CATFISH
CHEMISTRY PHYSICAL AND THEORETICAL
CHILD WELFARE
CHILDREN
CHILDREN IN AFRICA
CHLOROPHYLLIN
CHORUSES SECULAR (MENS VOICES 8 PTS) W/ORCHESTRA
CHORUSES SECULAR (MIXED VOICES 6 PTS) W/BAND
CHURCH HISTORY
CHURCH MUSIC
CIGARETTE TAX
LIGNIN
LITERATURE COMPARATIVE
LITERATURE AND SCIENCE
LITTERS
MACARONI
MANNLICHER RIFLE
MAPS STATISTICAL
MARRIAGE (CANON LAW ORTHODOX EASTERN)
MÀTE (TEA)
MEDALS
MEDIASTINUM
MEDICAL EMERGENCIES
MELANCHOLY
MELTING POINTS
METAL CURTAIN WALLS
METALS
METALS (IN RELIGION FOLKLORE ETC)
METAPHOR
MILITARY GOVERNMENT OF DEPENDENCIES
MILITARY RESEARCH
MINE ACCIDENTS
MINERALOGY
MORATORIUM (ROMAN LAW)
MUSICAL ABILITY
MUSICAL INVENTIONS AND PATENTS
MYNAHS
NATIONAL FLOWERS
NATURALISM
NAVAL RESERVES
NEAR EAST IN LITERATURE
NEWSPAPER COURT REPORTING
NUCLEAR MOMENTS
NUMISMATICS
OCEAN BOTTOM
OCTETS (PIANO 3 TROMBONES 4 TRUMPETS)
ODES
ORANGE JUICE FROZEN CONCENTRATED
ORIGINALITY (IN LITERATURE)
ORNITHOLOGICAL LITERATURE
PALATE
PARABLES CONFUCIAN
PARTNERSHIP (ROMAN-DUTCH LAW)
PARTY COMMITTEES
PASTORAL THEOLOGY
PEACH TWIG BORER
PEAR
PERSEVERANCE (THEOLOGY)
PERSONAL LIBERTY LAWS
PETROLEUM AS FUEL
PHILATELIC AGENCIES
PHOTOGRAPHIC EMULSIONS
PHYSICAL LABORATORIES
PIANO MUSIC (4 HANDS)
PLANTS EFFECT OF HUMIDITY ON
POLISH DRAMA
POLITICAL PURGES
POLKAS
POLKAS (2 PIANOS)
POLLEN EXTRACT
POSTAL SERVICE
POTATOES FROZEN
PROMOTIONS
PSYCHOLOGY IN LITERATURE
QUINTETS (PIANO 2 HORNS 2 VIOLINS)
QUOTATIONS JEWISH
RADIO STATIONS
RAILROAD LAND GRANTS
RAISINS
READING TEACHERS OF
REAL ESTATE SALES TAX
RECORDER WITH ORCHESTRA
RELIGION AND LITERATURE
RELIGION PRIMITIVE
RESERVOIRS
RESPECT
RETIREMENT PLACES OF
ROYAL SUPREMACY (CHURCH OF ENGLAND)
SAGRILEGEO (CANON LAW)
SALINITY
SARIS (INDIAN DRESS)
SCIATICA
SCOURING COMPOUNDS
SEA TURTLES
SEPARATORS MACHINES
SEPHARDIM
SHAPEIED CHARGES (EXPLOSIVES)
SHREWS FOSSIL
SIMMENTHAL CATTLE
SLEEP THERAPY
SOCIAL SCIENCES AND ETHICS
SODIUM BENZOATE
SONATAS (OBOE AND PIANO) ARRANGED
SPORTSMANSHIP
SPRAY PAINTING ELECTROSTATIC
STALL WARNING INDICATORS (AERONAUTICS)
STAPEDIUS MUSCLE
STARS VARIABLE
STATICS
STATION POINTER
STEEL WORDS
STUDENT TRAVEL
STUNT MEN
SUBURBAN HOMES
SUITEES (VIOLIN W/CHAMBER ORCHESTRA) ARRANGED
SUNDAY
SUN SPOTS
SUNNITES
SURVEYORS
SWABIAN LEAGUE 1488-1593
TELESCOPE
THERAPEUTICS OPHTHALMOLOGICAL
TIRES STEEL
TITLES OF BOOKS
TITLES OF POEMS
TOADS
TRADITION (JUDAISM)
TRANSFER (ROMAN LAW)
TRAY PAINTING
TRIADS (LITERATURE)
TROUT FISHING
TUBE BENDING
TUBES COPPER
TURKISH PERIODICALS
USM-1 COMPUTER
UNITED STATES COMMISSIONERS,
UNITED STATES MUSEUMS
UNITED STATES NAVAL EXPEDITION TO JAPAN 1852-
URINE DANCE
VALUABLES (RAILROAD LAW)
VEGETABLES
VELLUM PRINTED BOOKS
VINEGAR
VORTEX MOTION
WAGE SURVEYS
WAGES AND LABOR PRODUCTIVITY
WALTZES (GUITAR)
WINDS (IN RELIGION FOLKLORE ETC)
WITNESSES (MOHAMMEDAN LAW)
WOMEN AND PEACE
WORLD WAR 1939-1945
WORMS INTESTINAL AND PARASITIC
WRIST
YOUTH MOVEMENT
ZOOLOGY EXPERIMENTAL

LC JR. SAMPLE

ADVENTURE STORIES
AIRPLANE RACING
AIRPLANES
AIRPLANES MILITARY
AIRSHIPS
ALPHABET
ALPHABET BOOKS
ALPHABET BOOKS (GERMAN SPANISH ETC)
ALPHABETS
AMERICAN (DANISH ENGLISH ETC) POETRY
ANIMALS
ANIMALS AGE
ANIMALS AIR TRANSPORTATION
ANIMALS COURTSHIP
ANIMALS EXTINCT
ANIMALS FOOD HABITS
ANIMALS HABITATIONS
ANIMALS INFANCY
ANIMALS MIGRATION
ANIMALS PREHISTORIC
ANIMALS RARE
ANIMALS TRAINING
ANIMALS TREATMENT
ANTEATERS
ART METALWORK
ATOMIC POWER PLANTS
AUTOMATA
BASEBALL
BEETLES
BEETLES COLLECTION AND PRESERVATION
BEHAVIOR
BELL FOUNDERS
BIBLE
BIBLE OT
BIBLE SELECTIONS
BICYCLES AND BICYCLING
BIRD SONG
BIRDHOUSES
BIRDS RARE
BIRTHDAY PARTIES
BIRTHSTONES
BLIND DEAF
BULLFIGHTS
BURGLAR ALARMS
BURIED TREASURE
BUSES
CABINETWORK
CADDIS FLIES
CALCULATING MACHINES
CAMPING
CARD TRICKS
CARDINALS (BIRDS)
CASSEROLE RECIPES
CATTAILS
CAVE DRAWINGS
CAVE DWELLERS
CHICKENS
CHIVALRY
CHRISTIAN LIFE
CHRISTMAS POETRY
CIRCULATORY SYSTEM
CIRCUS STORIES
CLAY MODELING
CLIFF DWELLERS
CLIFF DWELLINGS
CLIPPER SHIPS
COCKFIGHTING
COLOR VARIATION (BIOLOGY)
CONDUCT OF LIFE
CONJURING
COOKERY
COUNTING BOOKS
COUNTING GAMES
DETective STORIES
DIET
DIGESTIVE SYSTEM
DINOSAURS
DOLLHOUSES
DRAMA
EATING CUSTOMS
ELECTROMAGNETISM
ELECTRONIC COMPUTERS
ENGLISH LANGUAGE
ENTERTAINING
ESPIONAGE
ESSAYISTS AMERICAN (FRENCH GERMAN ETC)
ETIQUETTE
FAMILY
FAMILY LIFE
FIRE DEPARTMENTS
FIRE ENGINES
FISH CULTURE
FLY CASTING
FOLK SONGS
FOLKLORE
FOLKLORE AMERICAN (CZECH GERMANIC ETC)
FOLKLORE FRENCH CANADIAN
FOLKLORE GYPSY
FOLKLORE OF BIRDS
FOLKLORE OF CHILDREN
FOSSILS
FOX HUNTING
FRESHWATER BIOLOGY
FRESHWATER ECOLOGY
FRESHWATER FAUNA
GALLFLIES
GAME AND GAME BIRDS
GAMES
GROOMING
GUINEA PIGS
GYPSIES
HANDICRAFT
HERMIT CRABS
HORROR STORIES
HORSE RACING
HORSE SHOWS
HORSES
HORSES BREEDING
HORSES TRAINING
HORSESHOE CRAB
HUMMINGBIRDS
HUMOROUS POETRY
HUMOROUS STORIES
ICE SKATING
INDIANS
INDIANS OF NORTH AMERICA (SOUTH AMERICA ETC)
INDOOR GAMES
INTELLIGENCE SERVICE
JACKRABBITS
JELLYFISHES
JOKE BOOKS
JUNGLE STORIES
KINKAJOUS
KNIGHTS AND KNIGHTHOOD
LABOR UNIONS
LADYBUGS
LEARNING
LEFT AND RIGHT
LETTER WRITING
LIFE SAVING
LIGHTS
LIGHTSHIPS
LITERATURE (SELECTIONS EXTRACTS ETC)
LUMBER AND LUMBERING
LUMBERMEN
LUNA MOTH
MACHINE TOOLS
MAGIC
MAGIC TRICKS
MAKEUP THEATRICAL
MARMOTS
MARSUPIALS
MATHEMATICAL RECREATIONS
MAYFLIES
MEASURING
MENTAL ILLNESS
MENTALLY ILL
METALWORK
MODELING
MOLE CRICKETS
MONORAILS
MOON (IN RELIGION, FOLKLORE ETC)
MOTHS
MOTION PICTURE ACTORS AND ACTRESSES
MOTION PICTURE CARTOONS
MOTION PICTURES
MOTION PICTURES AS A PROFESSION
MOTORBOATS
MOUND BUILDERS
MOUTH ORGAN
MUSIC CAMPS
MUSIC POPULAR
MYSTERIES AND MIRACLE PLAYS
Mystery Stories
Nature Printing and Nature Prints
Negro Businessmen
Negro Cowboys
Negro Socialworkers
Negro Soldiers
Nonsense Verses
Number Games
Number Systems
Odonata
Operas
Orphans
Outboard Motorboats
Parades
Parakeets
Parties
Pearl Diving
Pearl Industry and Trade
Photography
Picture Books
Pigs
 Pipelines
Planetaryms
Plant Breeding
Play
Plays
Popcorn
Portrait Painters
Postage Stamps
Poultry
Prairie Dogs
Prayer Books and Devotions
Prejudices
Primers
Prisoners and Prisons
Puzzles
Race Problems
Rack Railroads
Radio Shortwave
Readers
Religious Life
Reproductive System Female
Reproductive System Male
Respiratory System
Right and Left (Political Science)
Roads Norman
Robbers and Outlaws
Robots
Rodents
Roe Deer
Roller Skating
ROOSTERS
RUNAWAYS
SALMON FISHING
SAND DUNES
SCHOOL STORIES
SCIENCE
SCIENCE FICTION
SEA HORSE
SEA OTTERS
SECRETARIES PRIVATE
SENSE ORGANS
SHELLS
SHIPBUILDING
SHIPS IN NUMISMATICS
SIZE AND SHAPE
SLAVE TRADE
SLIDE RULE
SNAKES
SONGS
SPACE AND TIME
SPEECH
SPIES
SPY STORIES
STEAM SHOVELS
STETHOSCOPE
STOCK EXCHANGE
STONECUTTERS
STORIES IN RHYME
STORIES WITHOUT WORDS
STORYTELLING
SUBMARINE BOATS
SUBMARINES
SUNDAY SCHOOLS
SUNDIALS
SURVIVAL
TEACHERS OF THE PHYSICALLY HANDICAPPED
TEENAGE MARRIAGE
 TORPEDO BOATS
TRACK AND FIELD
TRADE WINDS
TRANSPORTATION AUTOMOTIVE
TREES
TRUCKS
VERTICALLY RISING AIRPLANES
VIOLINISTS
WATER BEETLES
WATER-SUPPLY
WATERCOLOR PAINTING
WATERPOWER
WEIGHT CONTROL
THE WEST
WESTERN STORIES
WHISTLES
WIT AND HUMOR
WITCHCRAFT
WITCHES
WOMAN
WOOD CARVING
WOODCHUCKS
X-RAYS

SEARS SAMPLE

ABRASIVES
ACTORS AND ACTRESSES
AEROTHERMODYNAMICS
AFRICA HISTORY
AGED DWELLINGS
AGRICULTURAL LABORERS
AGRICULTURE ADDRESSES AND ESSAYS
AIRPLANE RACING
ALGAE
AMERICA DISCOVERY AND EXPLORATION
AMERICAN LITERATURE
ARABS IN ISRAEL
ARCHITECTURE BYZANTINE
ARCHITECTURE COLONIAL
ARCHITECTURE ORDERS
ART
ART METALWORK
ARTIFICIAL INSEMINATION
ASSESSMENT
ASTROLOGY
ASTRONAUTICS ACCIDENTS
ASTRONAUTICS INTERNATIONAL COOPERATION
AUTOGRAPHY
AUTOMOBILE ENGINES
AUTOMOBILES MODELS
AUTUMN
AVIATION MEDICINE
AZTECS
BABY SITTERS
BACKPACKING
BACTERIOLOGY AGRICULTURAL
BAHAISM
BAKING
BALANCE OF PAYMENTS
BALLISTIC MISSILES
BIBLE GEOGRAPHY
BIBLE STORIES
BIBLIOGRAPHY
BICULTURALISM
BIOLOGICAL WARFARE
BIRD HOUSES
BIRDS IN LITERATURE
BONES
BOOKS
BOW AND ARROW
CALCULATING MACHINES
CAMPS
CANOES AND CANOEING
CARBOLIC ACID
CATALOGING-MUSIC
CEMENT
CENTERS FOR THE PERFORMING ARTS
CEREBRAL PALSY
CHARITY ORGANIZATION
CHARMS
CHEMISTRY ORGANIC SYNTHESIS
CHESS
CHILD LABOR US
CHILDRENS POETRY
CHURCH FURNITURE
CHURCH HISTORY MIDDLE AGES
CITIES AND TOWNS
CITIES AND TOWNS RUINED EXTINCT ETC
CITY PLANNING US
CITY TRAFFIC
CIVILIZATION ARAB
CLOTHING AND DRESS
COLOR
COMMONWEALTH OF NATIONS
COMMUNICABLE DISEASES
COMMUNICATION
COMMUNISM RUSSIA
CONFECTIONERY
CONSTITUTIONS STATE
CONSUMER CREDIT
CONSUMPTION (ECONOMICS)
COPYING PROCESSES AND MACHINES
CORALS
CRIME AND CRIMINALS
DANGERS
DENTISTRY
DICTATORS
DIPLOMACY
DIPLOMATIC AND CONSULAR SERVICE
DISCRIMINATION IN EMPLOYMENT
DISTILLATION
DOCUMENTATION
DRAINAGE HOUSE
DRY FARMING
DYES AND DYEING
ECONOMIC POLICY
ECONOMICS
EDUCATION STATISTICS
EGGS
EGYPT ANTIQUITIES
ELECTRIC CURRENTS ALTERNATING
INTERNAL REVENUE
INTERNATIONAL EDUCATION
INTERSTELLAR COMMUNICATION
JAZZ MUSIC
JEWELRY REPAIRING
JEWISH QUESTION
JEWS PERSECUTION
JOURNALISTS
JUDO
KINDERGARTEN
LABOR AND LABORING CLASSES
LAND TENURE
LANGUAGE AND LANGUAGES
LANGUAGE UNIVERSAL
LEATHER GARMENTS
LIBRARIES COUNTY
LIBRARIES STATISTICS
LIGHTNING
LIGHTSHIPS
LIQUORS
LOBSTERS
LOCOMOTIVES MODELS
MAILORDER BUSINESS
MAKEUP THEATRICAL
MAPLE SUGAR
MARINE POLLUTION
MARRIAGE
MARSHES
MECHANICS (PERSONS)
MEDICINE BIOGRAPHY
MEDICINE RESEARCH
MEDICINE AND RELIGION
MENOPAUSE
MENTAL HEALING
METROPOLITAN FINANCE
MILITARY OCCUPATION
MILITARY TRAINING CAMPS
MINING ENGINEERING
MONOGRAMS
MOON SURFACE
MOVING PICTURES BIOGRAPHY
MUSIC POPULAR SONGS ETC
MYTHOLOGY
NAMES
NATIONAL SOCIALISM
NATURAL SELECTION
NATURE STUDY
NAUTICAL ALMANACS
NEUTRALITY
NICKNAMES
OCEANOGRAPHY COMPUTER PROGRAMS
OFFENSES AGAINST PUBLIC SAFETY
ON LINE DATA PROCESSING
ORDNANCE
PARACHUTE TROOPS
PARACHUTES
PARENT AND CHILD
PASSION PLAYS
PASTELS DRAWINGS
PASTORAL WORK
PEACE
PEDDLERS AND PEDDLING
PESTICIDES
PHEASANTS
PHILOSOPHY
PHYSICIANS
PILGRIM FATHERS
PIPES TOBACCO
POETS AMERICAN
POLICE US
POLITICS PRACTICAL
PRAYER MEETING
PRESEVERATION OF ORGANS TISSUES ETC
PRESIDENTS
PRESIDENTS US
PRESIDENTS US CHILDREN
PROBLEM CHILDREN
PROGRESS
PROJECTORS
PSYCHOLOGY COMPARATIVE
QUEENS
RADIO THERAPY
RAYON
REAL ESTATE
REAL ESTATE BUSINESS
RECONSTRUCTION 1914 1939
REFORMERS
REFUSE AND REFUSE DISPOSAL
RELIGIOUS POETRY
RENAISSANCE
REVOLUTIONS
RODEOS
ROMANCES
ROOFS
SAGAS
SAINTS
SALMON
SALVAGE
SANITARY ENGINEERING
SCHOOL BOARDS
SCHOOL SHOPS
SCIENCE AND STATE
SEA SONGS
SEASHORE
SECRET SOCIETIES
SERMONS
SHADES AND SHADOWS
SHADOW PANTOMIMES AND PLAYS
SILVER MINES AND MINING
SMALL BUSINESS
SMELTING
SOCIAL CHANGE
SOCIAL CLASSES
SOCIAL ETHICS
SOCIOLOGY
SOFTBALL
SOUND RECORDING AND REPRODUCING
SPACE VEHICLES PILOTING
STARS
STARS ATLASES
TECHNICAL ASSISTANCE
TECHNICAL EDUCATION
TELEVISION
THEOLOGY
THEOSOPHY
THUNDERSTORMS
TIDES
TRANSPLANTATION OF ORGANS, TISSUES ETC
TREASON
TREATIES
TREES US
TUMORS
UNIFORMS MILITARY
US FOREIGN OPINION
US GAZETTEERS
US MILITARY ACADEMY WEST POINT REGISTERS
US MORAL CONDITIONS
US SOCIAL POLICY
US STATISTICS
VACATIONS
VEGETABLE GARDENING
VOCABULARY
WALLPAPER
WASTE (ECONOMICS)
WATER SPORTS
WEALTH
WELDING
WOMAN BIOGRAPHY
WORLD POLITICS
WORMS
ZINC

MARC SAMPLE

ACCIDENTS PREVENTION
ADOLESCENT GIRLS FICTION
AEROPLANES JET PROPULSION
AIR TRAFFIC CONTROL
AIR TRAFFIC CONTROL VOCATIONAL GUIDANCE
CHILDRENS WRITINGS
CHILDREN PRAYER BOOKS AND DEVOTIONS 1961
CHILDREN PREPARATION FOR MEDICAL CARE
CHRISTMAS STORIES
CINEMATOGRAPHY
CIPHERS
CIRCUS RUSSIA
CIRCUS STORIES
COAL MINES AND MINING FICTION
COLLAGE
COLLECTORS AND COLLECTING
COLLEGE STORIES
COMMUNICATION AND TRAFFIC
COMPOSERS
COOKERY
COWBOYS
CREATION
CRIME AND CRIMINALS THE WEST
CRUSADES FICTION
DEPRESSION 1929 US
DESERT BIOLOGY
DESERTS
DOGS POETRY
DOGS STORIES
DOLLMAKING
DOMESTIC ANIMALS US HISTORY
DRAGONS STORIES
DRUGS AND YOUTH
DRUGS FICTION
DRUM FICTION
DWARFS FICTION
EAGLES STORIES
EASTERN QUESTION (FAR EAST)
EDUCATION OF WOMEN
EGGS
ELECTRONIC DATA PROCESSING VOCATIONAL GUIDANCE
ELEPHANTS
EMOTIONS
EMOTIONS FICTION
ESTIMATION THEORY
ETIQUETTE FOR CHILDREN AND YOUTH
EXPLORERS
FAIRIES POETRY
FARM LIFE FICTION
FISHERIES NOVA SCOTIA
FISHES
FLAGS US
FLIES
FLOWER ARRANGEMENT
FOLKLORE
FOLKLORE AMERICAN
FOLKLORE CHINA
FOLKLORE ENGLAND
FOLKLORE KOREA
FOLKLORE TURKEY
FOOD
FOOTBALL BIOGRAPHY
FOOTBALL STORIES
FOXES STORIES
FREIGHTERS
FROGS
FROGS STORIES
GANNETS
GENERALS DT BRIT
GERMAN GRAND PRIX RACE STORIES
GIBBONS
GOATS STORIES
GOLD
GOLD MINES AND MINING BRITISH COLUMBIA
GOLF BIOGRAPHY
GORILLAS
GULLS STORIES
HALLOWEEN STORIES
HATS
HELICOPTERS
HEN'S STORIES
HEREDITY HUMAN
HOCKEY
HORROR TALES
HORSES MEXICO
HORSES STORIES
HYGIENE
ICE BREAKING VESSELS
INDIANS OF CENTRAL AMERICA FICTION
INDIANS OF NORTH AMERICA WARS
INFANTS
INSECT SOCIETIES
INSECTS
INSECTS STORIES
JAGUARS STORIES
JEWS IN LITHUANIA
JEWS IN THE UNITED STATES
KILLDEER
KINETIC ART
KNIGHTS AND KNIGHTHOOD
LABOR AND LABORING CLASSES US HISTORY
LADYBUGS STORIES
LASERS
LIBRARY SCIENCE AS A PROFESSION
LIFE ORIGIN
LIGHT
LOVE
MACARONI
MAGNETS
MAMMOTH
MATHEMATICAL RECREATIONS
MATHEMATICS FICTION
MEDICAL EMERGENCIES
MEDICINE AND ART
MIDDLE AGES FICTION
MIDDLE STATES INDUSTRIES
MODEL AIRPLANE RACING
MONARCH BUTTERFLY STORIES
MONKEYS
MONSTERS STORIES
MOON EXPLORATION
MOSQUITOES
MOTOR TRUCKS
MOTOR VEHICLES
MOUND BUILDERS
MOUNTAINEERING STORIES
MOVING PICTURES PLOTS THEMES ETC HORROR
MYTHOLOGY GREEK
NATURE
NATURE STUDY
NEGROES BIOGRAPHY
NEGROES FLORIDA
NEGROES HISTORY
NEGROES SOCIAL CONDITIONS
NIGHT FICTION
NONVIOLENCE
NURSERY SCHOOLS FICTION
NURSING AS A PROFESSION
OCEAN POETRY
OCEANOGRAPHY
OCEANOGRAPHY AS A PROFESSION
OCEANOGRAPHY AS A PROFESSION FICTION
OCEANOGRAPHY EXPERIMENTS
ORAL INTERPRETATION
PAINTERS AMERICAN
PANTHERS STORIES
PANTOMIME FICTION
PARADES FICTION
PELICANS STORIES
PHYSICAL RESEARCH
PHYSICALLY HANDICAPPED FICTION
PHYSICS EXPERIMENTS
PICNICKING FICTION
PIGS STORIES
PLANETS
PLANT PROPAGATION
PLAY FICTION
POETRY
POLICE
POND FLORA
POPULATION
PREJUDICES FICTION
PRESIDENTS
PRIMATES
PRISONS FICTION
QUESTIONS AND ANSWERS
RACE PROBLEM
RADIATION
RAILROADS POPULAR WORKS
RELIGION
REPRODUCTION
REPTILES
RIVERS
ROBINS
ROCKETS (AERONAUTICS)
SCIENCE
SCIENCE FICTION
SCULPTURE
SEALS ANIMALS STORIES
SENSES AND SENSATION
SET THEORY
SEVEN WONDERS OF THE WORLD
SEXUAL ETHICS
SHEEP NEW SOUTH WALES
SHELLS
SHETLAND PONY STORIES
SHOE Makers FICTION
SIGNS AND SYMBOLS
SLAVERY FICTION
SLEEP FICTION
SMOKING AND YOUTH ADDRESSES ESSAYS LECTURES
SMUGGLING GT BRIT HISTORY
SOCIAL WORK AS A PROFESSION US
SOUTH AMERICA DESCRIPTION AND TRAVEL
SOUTHERN STATES FICTION
SOUTHWEST OLD FICTION
SPORTS
SQUIRRELS STORIES
STEEL INDUSTRY AND TRADE
STOCK EXCHANGE US
SUN
TALES AFRICAN AFRICA WEST
TALES BANTU
TALES JEWISH
TALES PORTUGUESE
TALES VIETNAMESE
TECHNOLOGY
TELEVISION BROADCASTING
THEATER AS A PROFESSION
TOADS STORIES
TRADE UNIONS
TRANSPORTATION
TRAP DOOR SPIDERS
TREES STORIES
US AIR DEFENSES MILITARY
US ECONOMIC CONDITIONS
US EMIGRATION AND IMMIGRATION
US FOREIGN RELATIONS JAPAN
US HISTORY CIVIL WAR BIOGRAPHY
US HISTORY CIVIL WAR NEGRO TROOPS
US HISTORY COLONIAL PERIOD BIOGRAPHY
US HISTORY COLONIAL PERIOD FICTION
US HISTORY CONSTITUTIONAL PERIOD 1789-1809
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UNDERGROUND RAILROAD FICTION
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WITCHCRAFT
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WOMAN RIGHTS OF FICTION
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AEROPLANES--JET PROPULSION

AIR TRAFFIC CONTROL


AIR TRAFFIC CONTROL--VOCATIONAL GUIDANCE

AIRPLANES--HISTORY--FICTION

ALPHABET

ALPHABET BOOKS

AMATEUR THEATRICALS


AMERICA--DISCOVERY AND EXPLORATION


AMERICA--DISCOVERY AND EXPLORATION--FRENCH
AMERICA--DISCOVERY AND EXPLORATION--SPANISH

AMERICAN NEWSPAPERS

ANIMAL DEALERS

ANIMAL MIGRATION

ANIMALS, FOOD HABITS OF


ANIMALS, MYTHICAL--STORIES
Freeman, Barbara C. Timi, the Tale of a Griffin. Grosset and Dunlap, 1970.

ANIMALS--POETRY


AQUATIC ANIMALS

ARCHEOLOGY AS A PROFESSION

ARCTIC REGIONS
Northern Regions; Bor, a Relation of Uncle Richard's Voyages for the Discovery of a North-West Passage, with a new preface. Johnson Reprint Corp., 1970.


ART, AMERICAN--HISTORY
ATHLETES, AMERICAN--BIOGRAPHY


ATOMIC POWER PLANTS

AUTHORS, ENGLISH


AUTOMOBILE INDUSTRY AND TRADE--FICTION

BALLET--FICTION

BASEBALL MANAGING

BASKETBALL


BASKETBALL--STORIES


BEARS--STORIES


BEAUTY, PERSONAL

BEAVERS

BEE CULTURE

BEHAVIOR--FICTION

BIBLE PLAYS

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BIOGRAPHY

BIOGRAPHY--DICTIONARIES

BIRDS--MIGRATION

BIRTHDAYS--POETRY
BOTANY--EXPERIMENTS


BRIDGES

BUILDING INSPECTORS

BUILDING TRADES--VOCATIONAL GUIDANCE

BUSHMEN

CAMELS--STORIES

CAMPING--STORIES


CANALS


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CHEMISTS

CHILDREN IN POLAND

CHILDREN IN PORTUGAL
CHILDREN--PRAYER-BOOKS AND DEVOTIONS

CHILDREN--PREPARATION FOR MEDICAL CARE


CHILDREN'S ENCYCLOPEDIAS AND DICTIONARIES


CHILDREN'S LITERATURE (SELECTIONS: EXTRACTS, ETC.)


CHILDREN'S PLAYS


CHILDREN'S STORIES


CHILDREN'S WRITINGS

CHRISTMAS STORIES

**CINEMATOGRAPHY**

**CIPHERS**


**CIRCUS STORIES**


**CIRCUS--RUSSIA**

**COAL MINES AND MINING--FICTION**

**COLLAGE**


**COLLECTORS AND COLLECTING--FICTION**

**COLLEGE STORIES**

**COMMUNICATION AND TRAFFIC**

**COMPOSERS**

COOKERY

COWBOYS

CREATION

CRIME AND CRIMINALS--THE WEST
Johnson, Dorothy M. *Western Badmen*. Dodd, Mead, 1970.

CRUSADES--FICTION

DEPRESSION--1929--U.S.

DESSERT BIOLOGY

DESERTS

DOGS--POETRY

DOGS--STORIES


DOLLMAKING


DOMESTIC ANIMALS--U.S.--HISTORY


DRAGONS--STORIES


DRUGS AND YOUTH


DRUGS--FICTION


DRUM--FICTION

DWARFS--FICTION

EAGLES--STORIES

EASTERN QUESTION (FAR EAST)

EDUCATION OF WOMEN

EGGS

ELECTRONIC DATA PROCESSING--VOCATIONAL GUIDANCE


ELEPHANTS

EMOTIONS

EMOTIONS--FICTION

ESTIMATION THEORY

ETIQUETTE FOR CHILDREN AND YOUTH


EXPLORERS

FAIRIES--POETRY

FARM LIFE--FICTION.


FISHERIES--NOVA SCOTIA

FISHES


FLAGS--U.S.


FLIES

FLOWER ARRANGEMENT

FOLKLORE


FOLKLORE--AFRICA

FOLKLORE, AMERICAN

FOLKLORE--ARABIA
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FOLKLORE--CHINA

FOLKLORE--ENGLAND


FOLKLORE--ESTONIA

FOLKLORE--FRANCE

FOLKLORE--GERMANY

FOLKLORE--IRELAND


FOLKLORE--JAPAN


FOLKLORE--LATVIA

FOLKLORE--PUERTO RICO

FOLKLORE--RUSSIA

FOOD

Cronan, Marion Louise, and Atwood, June C. *Foods in Homemaking.* C. A. Bennett, 1972.

FOOTBALL--BIOGRAPHY


FOOTBALL--STORIES


FOXES

FOXES--STORIES


FREIGHTERS

FROGS

FROGS--STORIES


GANNETS

GENERALS--GREAT BRITAIN
GERMAN GRAND PRIX RACE--STORIES

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GOLD MINES AND MINING--BRITISH COLUMBIA

GOLF--BIOGRAPHY

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GULLS--STORIES

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HELICOPTERS
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HEREDITY, HUMAN

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HORROR TALES

HORSES—MEXICO

HORSES—STORIES


HYGIENE

ICE-BREAKING VESSELS

INDIANS OF CENTRAL AMERICA—FICTION

INDIANS OF NORTH AMERICA—WARS

INFANTS
INSECT SOCIETIES

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JAGUARS--STORIES

JEWS IN LITHUANIA

JEWS IN THE UNITED STATES


KILLDEER

KINETIC ART

KNIGHTS AND KNIGHTHOOD


LABOR AND LABORING CLASSES--U.S.--HISTORY

LADYBUGS--STORIES
LASERS

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LIFE--ORIGIN

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MAGNETS

MAMMOTH

MATHEMATICAL RECREATIONS

MATHEMATICS--FICTION

MEDICAL EMERGENCIES

MEDICINE AND ART
MIDDLE AGES--FICTION

MIDDLE STATES--INDUSTRIES

MODEL AIRPLANE RACING

MONARCH BUTTERFLY--STORIES
Young, Miriam (Burt). *Slow as a Snail, Quick as a Bird*. Lothrop, Lee and Shepard Co., 1970.

MONKEYS


MONSTERS--STORIES


MOON--EXPLORATION

MOSQUITOES

MOTOR-TRUCKS

MOTOR VEHICLES

MOUND-BUILDERS

MOUNTAINEERING--STORIES
MOVING-PICTURES--PLOTS, THEMES, ETC.--HORROR


MYTHOLOGY, GREEK


NATURE


NATURE STUDY


NEGROES--BIOGRAPHY


NEGROES--HISTORY


NEGROES--SOCIAL CONDITIONS--FICTION


NIGHT--FICTION


NONVIOLENCE

NURSERY SCHOOLS--FICTION

NURSING AS A PROFESSION


OCEAN--POETRY

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OCEANOGRAPHY AS A PROFESSION

OCEANOGRAPHY AS A PROFESSION--FICTION

OCEANOGRAPHY--EXPERIMENTS

ORAL INTERPRETATION

PAINTERS, AMERICAN


PANTHERS--STORIES

PANTOMIME--FICTION

PARADES--FICTION
PELICANS--STORIES

PHYSICALLY HANDICAPPED--FICTION

PHYSICS--EXPERIMENTS

PICNICKING--FICTION

PIGS--STORIES
Clapman, Arnold. Angel the Pig. Ginn, 1972.

PLANETS

PLANT PROPAGATION

PLAY--FICTION

POETRY

POLICE
POND FLORA

POPULATION

PREJUDICES--FICTION

PRESIDENTS

PRIMATES

PRISONS--FICTION

PSYCHICAL RESEARCH

QUESTIONS AND ANSWERS
Brandt, Sue R. Facts About the 50 States. Watts, 1970.

RACE PROBLEM

RADIATION

RAILROADS--POPULAR WORKS
RELIGION

REPRODUCTION
Jenkins, Marie M. *Animals without Parents.* Holiday House, 1970.

REPTILES

RIVERS

ROBINS

ROCKETS, (AERONAUTICS)


ROCKETS (AERONAUTICS)--MODELS

SCIENCE


SCIENCE FICTION


SCULPTURE


SEALS (ANIMALS)--STORIES
Lane, Carolyn. *Uncle Max and the Sea Lion.* Bobbs-Merrill, 1970.
SENSES AND SENSATION

SET THEORY

SEVEN WONDERS OF THE WORLD

SEXUAL ETHICS

SHEEP--NEW SOUTH WALES

SHELLS

SHETLAND PONY--STORIES

SHOEMAKERS--FICTION

SIGNS AND SYMBOLS

SLAVERY--FICTION

SLEEP

SLEEP--FICTION

SMOKING AND YOUTH--ADDRESSES, ESSAYS, LECTURES
SMUGGLING--GREAT BRITAIN--HISTORY

SOCIAL WORK AS A PROFESSION

SOUTH AMERICA--DESCRIPTION AND TRAVEL

SOUTHERN STATES--FICTION


SOUTHWEST, OLD--FICTION

SPORTS

SQUIRRELS--STORIES


STEEL INDUSTRY AND TRADE

STOCK-EXCHANGE--U.S.


SUN


TALES, AFRICAN--AFRICA, WEST

TALES, BANTU

TALES, JEWISH
Serwer, Blanche Luria. Let's Steal the Moon: Jewish Tales, Ancient and Recent. Little Brown, 1970.

TALES, PORTUGUESE
Lowe, Patricia Tracy. The Little Horse of Seven Colors, and Other Portuguese Folktales. World Publishing Co., 1970.

Feinstein, Alan S. Folk Tales from Portugal. A. S. Barnes, 1972.

TALES, VIETNAMESE

TECHNOLOGY


THEATER AS A PROFESSION

TOADS--STORIES
Steele, Mary O. Mike's Toads. World, 1970.


TRADE UNIONS

TRANSPORTATION


TRAP-DOOR SPIDERS
TREES--STORIES

U.S.--AIR DEFENSES, MILITARY

U.S.--ECONOMIC CONDITIONS

U.S.--FOREIGN RELATIONS--JAPAN

U.S.--HISTORY--CIVIL WAR--BIOGRAPHY

U.S.--HISTORY--CIVIL WAR--CAUSES

U.S.--HISTORY--CIVIL WAR--NEGRO TROOPS

U.S.--HISTORY--COLONIAL PERIOD--BIOGRAPHY

U.S.--HISTORY--COLONIAL PERIOD--FICTION

U.S.--HISTORY--CONSTITUTIONAL PERIOD, 1789-1809

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UNMARRIED MOTHERS--FICTION
VENereal Diseases

Voyages and Travels

War--Fiction

Weather

Wheat

Wheels

Witchcraft

Witches--Fiction

Wolves

Woman--Rights of Women

Woman--Rights of Women--Fiction
WOMAN--SUFFRAGE--FICTION

WOMEN IN THE BIBLE

WORLD POLITICS--1900-1945

WORLD SERIES (BASEBALL)

YOUTH--FICTION

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ZOOLOGY--AFRICA

ZOOLOGY--AUSTRALIA
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