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ABSTRACT

The primary purpose of this study was to provide empirical evidence for the assumption that if the essential subskills of word attack are mastered, then functional word attack ability will result. To obtain such evidence, the study was designed to test the functional word attack ability of 140 elementary school students who had been taught the subskills of word attack according to an objective-based, skill-oriented approach outlined in the Wisconsin Design of Reading Skill Development: Word Attack Element. Word lists were developed to test the subjects' ability to decode synthetic words which tested specific phonic and structural subskills of word attack, phonically and structurally regular words, and phonically and structurally irregular words. The results of the study showed that the subjects were able to decode the synthetic words at the suggested 80 percent mastery level. Not all of the subjects were able to decode all of the phonically and structurally regular words at an 80 percent mastery level. However, they did attain higher scores on the tests of regular words than they did on the tests of irregular words. (MKM)

Technical Report No. 289

# EVALUATION OF AN OBJECTIVE-BASED CURRICULUM IN WORD ATTACK

by

Ruth Justine Kurth

Report from the Project on
Conditions of School Learning
and Instructional Strategies

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# WISCONSIN RESEARCH AND DEVELOPMENT CENTER FOR COGNITIVE LEARNING

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- conducting research to discover more about how children learn
- developing improved instructional strategies, processes and materials for school administrators, teachers, and children, and
- offering assistance to educators and citizens which will help transfer the outcomes of research and development into practice

## PROGRAM

The activities of the Wisconsin R&D Center are organized around one unifying theme, Individually Guided Education.

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## ABSTRACT

The primary purpose of this study was to provide empirical evidence for the assumption that if the essential subskills of word attack are mastered, then functional word attack ability will result. To obtain such evidence, the study was designed to test the functional word attack ability of Subjects who had been taught the subskills of word attack according to an objective-based, skill-oriented approach.

The Subjects for this study had been taught the subskills of word attack according to the approach outlined in the Wisconsin Design of Reading Skill Development: Word Attack Element. The terminal objective of the Word Attack Element states that at its completion, students will be able to decode all phonically and structurally regular words. Therefore, the specific objective of this study was to determine to what extent Subjects who had completed the Word Attack Element attained this terminal objective. Word lists were developed to test the Subjects' ability to decode synthetic words which tested specific phonic and structural subskills of word attack, phonically and structurally regular words, and phonically and structurally irregular words.

The results of the study showed that the Subjects who had completed the Word Attack Element of the Wisconsin Design were able to decode the synthetic words at the suggested eighty per cent mastery level. Not all of the Subjects were able to decode all of the

phonically and structurally regular words at an eighty percent mastery level. However, they did attain higher scores on the tests of regular words than they did on the tests of irregular words.

The results of the synthetic word tests indicate that the Subjects had mastered those phonic and structural subskills tested in the study. The results on the regular and irregular word tests indicate that although the terminal objective of the Word Attack Element of the Wisconsin Design was not attained, using an objective-based, skill-oriented approach to word attack appears to have an effect on the student's ability to decode phonically and structurally regular words, since the Subjects' scores on the regular word lists were higher than their scores on the irregular word lists. If learning the skills taught in the Word Attack Element had no effect on the Subjects' ability to decode regular words, their scores on the regular and irregular word lists should have been relatively the same. Thus, while this study does not provide rigorous support for the assumption that if the basic subskills of word attack are mastered, then functional word attack ability will result, it does indicate that teaching such subskills has some value for the student faced with the task of decoding words.

# CHAPTER I.

## BACKGROUND AND SCOPE OF THE STUDY

### Introduction

The assumption that if the essential subskills necessary for word attack are mastered, then functional word attack ability will result is an assumption which has high face validity and is supported in the literature in the field of reading. However, there is little empirical evidence which substantiates this assumption. The primary purpose of this study was to attempt to provide such empirical evidence.

In order to obtain such an empirical evaluation, the study was designed to test the functional word attack ability of Subjects who had been taught the word attack subskills according to an objective-based, skill-oriented approach. The experimental Subjects for this study had been specifically taught the skills of word attack according to the approach outlined in the Wisconsin Design for Reading Skill Development: Word Attack Element.

The objective of this study was to determine to what extent children who were taught according to a skill-oriented, objective-based approach to word attack were able to decode synthetic words designed to test individual phonic and structural analysis subskills, phonically and structurally regular words, and phonically and structurally irregular words.



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## Review of the Literature

Teachers of reading have often stressed the importance of teaching word recognition skills, and most reading specialists would agree that the learning of such skills is the first step in the reading process. Gray (1960), for example, placed the skill of word perception at the center of his descriptive model for reading, for according to him, communication cannot take place without the basic skills of word perception. Schell (1973) similarly places word recognition at the beginning of his continuum of the components of the reading process. In a discussion of their work with remedial readers, Roswell and Chall (1957) claim that the first step toward building adequate reading ability is the teaching of accurate word recognition skills.

Frank Smith (1972) would agree that skill in word recognition is imperative if the beginning reader is ever to be successful in achieving his goal of functional reading ability. According to Smith, the information-processing capacities of the novice reader are taxed to a greater extent than are those of the mature reader. The beginner cannot identify words and meanings directly. Instead what Smith refers to as "mediated identification" is required. This mediated word identification involves the mapping of the word unto its sound pattern. Such word identification, says Smith, must occur if there is to be any basis for comprehension. Gagne (1970) would concur that the acquisition of word sounds and the mastery of verbal concepts

are basic to learning to read, and that if learning at the higher levels is to occur with facility, attention must be paid to these fundamental prerequisites. Staats (1970) also feels that learning to read is a complex cognitive task where additional skills are added to basic repertoires of skills in a cumulative-hierarical fashion and that these skills can be acquired by using elementary learning principles.

The linguistic-based approach to reading of Roberts and Lunzer (1968) also focuses on word attack as an essential skill in acquiring functional reading ability. They believe that learning to read begins with the identification of sound values of letters and of the relationship between the written and spoken sequences. Roberts and Lunzer add that these very basic skills will probably be automatized in the mature reader, but that they are difficult skills which initially need more careful analysis and study.

While Bond and Tinker (1967, pp. 263-265) are careful to emphasize the need for a balance between the establishment of word recognition techniques and the development of comprehension strategies, they still stress the importance of such word recognition skills. They argue that the teacher who neglects to teach word recognition skills may cause the child to make random attempts to say any word that comes to mind when faced with a new word or else may make the child too dependent on the teacher. Weiner and Cromer (1967) corroborate this view when they comment on the "look-say"

method of teaching reading. According to Weiner and Cromer, if it were possible for a child to have a source for identifying words the first time he encountered them, e.g., via another person pronouncing them, and if he had the ability to store and recover the words as presented, then the "look-say" method would be sufficient. However, if new or novel words occur and there is not any external identifying source, then a skill for identifying words by himself is required by the child.

A. J. Harris (1970, p. 315) expresses a similar opinion when he states that most words must be recognized immediately at sight and that the reader must be able to work out the identification of words he cannot so recognize; and similarly Marjorie Johnson (1964) believes that the ability to react effortlessly to the majority of words should be accompanied by a reservoir of word analysis skills to unlock the few unfamiliar words that are met from time to time. Scrivner (1972, p. 63) contends that the problem of dealing with unfamiliar words necessitates ability in word recognition. She says that it is almost impossible to overemphasize the importance of ability in word attack. In order to be a successful reader, a child must be able to pronounce new words, associate those words with past exposure or experience, and relate them to the present reading situation.

DeBoer and Dallmann (1970, p. 115) also agree that most children can be aided by specific instruction in reading skills including

word attack. They argue that children can make more rapid improvement if they are shown how to recognize letters and phonic elements and how to discover familiar elements in longer, unfamiliar words. DeBoer and Dallmann's hypothesis seems to be supported by Benz and Rosemeir (1968) who found that success in certain specific phonic skills was related most closely to success in reading comprehension tasks in fourth grade readers. In a study of first grade readers, Hardy (1973) found that children who were most successful in a word recognition task employed processes of sound substitution, structural analysis, phonic analysis, and sight word recognition.

Teachers and researchers who agree on the importance of teaching word recognition skills also appear to agree that the general ability to attack words is composed of certain specific subskills. According to the literature (DeBoer & Dallmann, 1970, p. 115; Guszak, 1972, pp. 24-48; Harris & Smith, 1972, pp. 207-208; Karlin, 1971, pp. 141-178; Singer, 1969, pp. 50-59), these basic subskills of word attack include the acquisition of a sight vocabulary, phonic and structural word analysis techniques, meaning clues, and/or a combination of these.

Thus, the assumption that if the essential subskills necessary for word attack are mastered, then functional word attack ability will result has high face validity and is supported in the literature in the field of reading. However, little empirical evidence is available to substantiate it. The primary purpose of this study

was to provide empirical evidence in support of this assumption, i.e., to evaluate empirically a skill-oriented approach to teaching word attack. In order to obtain such an empirical evaluation, the study tested the functional word attack ability (operationally defined as the ability to attack words encountered in everyday reading tasks/both in and out of school) of Subjects who had been taught the word attack subskills according to an objective-based, skill-oriented approach. In order to obtain such an empirical evaluation, it was necessary to find a group of Subjects who had been instructed in a skill-oriented approach to word attack. The experimental Subjects chosen for this study had been taught the word attack skills with an approach to instruction presented by the Wisconsin Design for Reading Skill Development: Word Attack Element (Otto & Askov, 1973). The objective-based, skill-oriented approach to instruction in word attack presented by the Wisconsin Design is described below.

## The Wisconsin Design for Reading Skill Development
## Word Attack Element

The Wisconsin Design for Reading Skill Development focuses on reading skill development in kindergarten through grade six. The Word Attack Element of the Wisconsin Design focuses specifically on the development of word attack skills in these grades. The assumption on which the Wisconsin Design is based is that skill

development in word attack is best facilitated when teachers attempt to direct learning experiences according to individual characteristics and needs of pupils. Thus, the aim of the Word Attack Element of the Wisconsin Design is to provide an organized approach to individually guided instruction in word attack skills for elementary school children. According to the Wisconsin Design for Reading Skill Development: Rationale and Guidelines (Otto & Askov, 1973), the components which are necessary for such an approach to reading instruction are the identification of essential word attack skills, statements of specific behavioral objectives for each skill, the assessment of skill needs of each child, the identification of teaching/learning activities and evaluation. Therefore, the Word Attack Element of the Wisconsin Design represents a systematic attempt to (1) state explicitly an array of word attack skills that, by long-standing agreement, are necessary for competence in word attack, (2) assess individual pupil's skill development status by means of criterion referenced tests with respect to explicitly stated behaviors related to the word attack skills, (3) provide a comprehensive management system to guide grouping and planning of word attack skill development instruction, (4) and monitor each pupil's progress in the development of specific word attack skills.

The above goals have been translated into the following format for skill development:

1. Identification of Essential Word Attack Skills.- In order to develop a straightforward approach to instruction in any given

area, the content considered essential to success in that area must be identified. The authors of the Wisconsin Design assume that in the area of word attack the essential content amounts to the essential skills and that these skills can be identified given the present knowledge in the field of reading (Otto & Askov, 1971). The list of word attack skills included in the Wisconsin Design was originally drawn from a public school curriculum guide and then carefully revised. Assurance that the list was in line with practice and expectation in the field of reading was derived from feedback from teachers and reading specialists who worked with the skills, from extensive reviews of the literature and instructional materials, from opinions of authoritative reviewers, and from experience in pilot situations. The authors of the Wisconsin Design identify the essential word attack skills as follows:

Outline of Word Attack Skills

Level A

The child ...

1. Listens for rhyming elements
    a. words
    b. phrases and verses
2. Notices likenesses and differences
    a. pictures (shapes)
    b. letters and numbers
    c. words and phrases

3. Distinguishes colors

4. Listens for initial consonant sounds

Level B

The child ...

1. Has a sight vocabulary of 50-100 words

2. Follows left to right sequence

3. Has phonic analysis skills

   a. consonant sounds
      i. beginning
      ii. ending
   b. consonant blends
   c. rhyming elements
   d. short vowels
   e. simple consonant digraphs

4. Has structural analysis skills

   a. compound words
   b. contractions
   c. base words and endings
   d. plurals
   e. possessive forms

Level C

The child ...

1. Has a sight vocabulary of 100-170 words

2. Has phonic analysis skills

   a. consonants and their variant sounds
   b. consonant blends
   c. vowel sounds
      i. long vowel sounds
      ii. vowel plus r
      iii. a plus l
      iv. a plus w

v. diphthongs oi, oy, ou, ow, ew
vi. long and short oo

d. vowel generalizations

i. short vowel generalization
ii. silent e generalization
iii. two vowels together generalization
iv. final vowel generalization

e. common consonant digraphs

3. Has structural analysis skills

a. base words with prefixes and suffixes
b. more difficult plural forms

4. Distinguishes among homonyms, synonyms, and antonyms

a. homonyms
b. synonyms and antonyms

5. Has independent and varied word attack skills

6. Chooses appropriate meaning of multiple meaning words

Level D

The child ...

1. Has a sight vocabulary of 170-240 words

2. Has phonic analysis skills

a. three-letter consonant blends
b. simple principles of silent letters

3. Has structural analysis skills

a. syllabication
b. accent
c. the schwa
d. possessive forms

2. Statement of Word Attack Objectives.- The Wisconsin Design also provides specific objectives stated behaviorally for each of the above skills. A meaningful objective identifies and describes behaviors which will indicate that the desired outcome has been achieved. The objective should also identify the conditions under which such behavior is expected to occur. Thus, the word attack objectives specify in terms of overt behavior the performance which will be accepted as evidence of specific word attack skill mastery. For example, the behavioral objective for the skill of listening for initial consonant sounds is, "Given two common words pronounced by the teacher (e.g., bird-ball; boy-take; banana-dog), the child is able to tell when the words do and do not begin alike." A complete list of the word attack objectives included in the Wisconsin Design is presented in Appendix A of this paper.

3. Assessment of Word Attack Skill Attainment.- In order to determine whether the word attack objectives of the Wisconsin Design have been mastered by individual students, a means of assessment which provides immediate and continuous information regarding each student's progress during instruction is required. Such instruments of assessment must be brief so that they do not take up inordinate amounts of instructional time. The instruments must also test the skills students must learn from a given instructional unit in word attack. To meet these assessment requirements, the Wisconsin Design provides criterion referenced tests specifically keyed to the word

attack objectives. The Wisconsin Tests of Reading Skill Development: Word Attack, (1972), are based on the behavioral objectives related to the reading skills essential for mastery of word attack. These group administered, machine scorable tests are available to assess 38 of the 45 specific skills included in the outline of essential word attack skills. Their use permits the teacher to assess pupil proficiency and/or deficiency in specific skills prior to instruction in those skills and to monitor his progress after instruction. Such paper and pencil tests, when combined with informal teacher observation of relevant student behavior, can be used to assess individual pupils' skill development status.

4. Identification of Teaching/Learning Activities for Word Attack Skills.- No one set of materials has been demonstrated to meet the needs of all children or any one group of children as they attempt to gain mastery of word attack skills. The responsibility for choosing the best materials and procedures for teaching word attack skills should rest primarily with the individual teacher who must decide which teaching and learning activities are best suited for the students in his classroom situations. However, to assist the teacher in providing effective teaching/learning activities, the Wisconsin Design includes a Teacher's Planning Guide: Word Attack (Otto & Askov, 1972), which gives helpful suggestions for implementing the Word Attack component of the Wisconsin Design. The Teacher's

Resource Files (Otto, et. al., 1972) provide a helpful listing of printed matter which might be used to help teach word attack skills. The resource files aid the teacher in selecting published materials best suited for specific skills and provide an example of how the teacher can compile his own resource files of teaching/learning materials.

5. Evaluation.- The ultimate evaluation of this approach to instruction in word attack must be done in terms of the terminal objective of the Word Attack Element of the Wisconsin Design. The terminal objective of the Word Attack Element is that the student, upon attainment of all skills outlined in the Word Attack Element of the Design, will be able to attack phonically and structurally regular words and will recognize on sight all words on the Dolch list (Otto, Chester, McNeil, & Myers, 1974, p. 122).

## Specific Purpose of the Study

The primary purpose of this study was to provide empirical evidence for the assumption that if the essential subskills of word attack are mastered, functional word attack ability will result. More specifically this study sought empirical support for a skill-centered approach to instruction in word attack such as that prescribed by the Wisconsin Design for Reading Skill Development. The terminal objective of the Word Attack Element of the Wisconsin Design is that the student, upon attainment of all skills outlined in the Word Attack Element of the Wisconsin Design, will be able to attack phonically and structurally

regular words and will recognize on sight all words on the Dolch list. Therefore, this study attempted to determine to what extent this terminal objective had been achieved.

It was also attempted in this study to determine how learning basic phonic and structural analysis skills effected the students' performance in attacking irregular words. Since the focus of the Word Attack Element of the Wisconsin Design is specifically oriented toward phonically and structurally regular words, it was expected that the students' performance on regular word lists would be better than their performance on tests of phonically and structurally irregular words. However, this study also attempted to determine whether learning basic phonic and structural analysis skills transfers to aid the students in attacking irregular words.

Because the ability of the students to attack irregular words is not related to the terminal objective of the Word Attack Element of the Wisconsin Design and therefore cannot be answered in terms of the criteria established by the Wisconsin Design authors, it was necessary to include a control group of Subjects who had not used the Word Attack Element of the Wisconsin Design in order to answer questions related to this portion of the study.

Answers to the following questions were sought in this study.

1. What per cent of a sample of synthetic words containing phonic and structural elements taught in the Word Attack Element of the Wisconsin Design can be decoded by the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design?

2. What per cent of a sample of phonically and/or structurally regular words can be decoded by the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design?

3. What per cent of a sample of words from the Dolch list can be recognized on sight by the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design?

4. What per cent of a sample of irregular words can be decoded by the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design?

5. How does the experimental Subjects' performance on the regular words compare to their performance on the irregular words?

6. What per cent of a sample of irregular words can be decoded by the control Subjects who have not used the Word Attack Element of the Wisconsin Design?

7. What, if any, relationship exists between the performance of the experimental Subjects on the synthetic word lists and the performance of the experimental Subjects on the real word lists?

## CHAPTER II

## PROCEDURE OF THE STUDY

The primary purpose of this study was to provide empirical evidence for the assumption that if the essential subskills of word attack are mastered, then functional word attack ability will result. Therefore, the study was designed so that Subjects who had completed a skill-oriented curriculum in word attack were tested on specific test lists of synthetic words, phonically and structurally regular words, and phonically and structurally irregular words. The selection of the Subjects, the development of the test lists, the testing procedures, the levels of evaluation, and the specific hypotheses tested are presented in this chapter.

### Subjects

The experimental Subjects were chosen from six public elementary schools in Duluth, Minnesota. Each of the schools from which the experimental Subjects were chosen had implemented the Wisconsin Design for Reading Skill Development at least one year prior to the study.

Since the concern of the study was to determine whether the terminal objective of the Word Attack Element of the Wisconsin Design was attained, it was essential that all of the 140 experimental Subjects had mastered the entire Word Attack Element of the Wisconsin Design before participating in the study. Mastery of the Word Attack

Element was assumed if the Subjects had passed at an 80 per cent mastery level all of the criterion tests related to the Word Attack Element of the Wisconsin Design in the Wisconsin Tests of Reading Skill Development. The 80 per cent mastery level is suggested by the authors of these tests.

The chronological age range of the experimental Subjects was restricted to 10.0 years (120 months) to 12.0 years (144 months). The average age of the experimental Subjects was 134 months. In those schools which do not use grade level designations, experimental Subjects were chosen from students beginning their sixth or seventh year in school (including kindergarten). Since the authors of the Design anticipate that children of average ability will master all of the Level D skills by the end of the fifth year in school (fourth grade), testing children from the above chronological age group and grade levels may have helped to eliminate the possibility that all of the experimental Subjects were of above average ability.

The control Subjects were chosen from three public elementary schools in Evansville, Indiana. Each school from which Subjects were chosen had two fifth and two sixth grade classes of approximately 30 students. Six control Subjects were chosen randomly from each fifth and sixth grade class in each school. All of the 36 randomly selected control Subjects were found to be within the chronological age range established for the experimental Subjects.

## Testing Materials

Reading researchers and teachers agree that phonic and structural word analysis skills are valuable techniques for identifying words in the language. As DeBoer and Dallmann state: "Probably few persons in the field of the teaching of reading would disagree with the point of view that no one becomes an efficient reader who has not learned . . . at least part of the code giving the relation between the written symbols and the sounds represented by them" (1970, p. 120). And Piekarz claims that structural and phonic analysis "correctly applied remains the most valuable single technique for identifying the written words of our language" (1964). Therefore, test lists of phonically and structurally regular words were developed for this study to test the phonic and structural analysis subskills of word attack. These regular words were chosen from a corpus of words which children may encounter in everyday reading tasks both in and out of school. In order to determine, however, that the experimental Subjects were using basic phonic and structural analysis word attack skills and were not identifying words by sight, a test composed of synthetic words was also used in the study. The synthetic words on the test list were constructed to test specific phonic and structural subskills of word attack, e.g., long and short vowel sounds, diphthongs, and consonant blends.

Valuable as they may be, however, structural and phonic analysis subskills cannot always be used to attack correctly all words in the

English language. To determine the extent to which learning basic phonic and structural analysis skills effects the students' performance in attacking irregular words, phonically and structurally irregular words were also included in the test words. Because the acquisition of a sight vocabulary is regarded by most researchers as a basic sub-skill of word attack, a test list of Dolch words (1936) was also included in the test. The construction of these test lists is described below.

The Synthetic Word Lists

Because it was not feasible to develop synthetic words to test all of the word attack skills included in the Word Attack Element of the Wisconsin Design, phonic and structural analysis skills concentrated at Levels B and C were selected since the majority of the basic word attack skills are clustered at these levels. It was assumed that the experimental Subjects who were able to demonstrate mastery of these more advanced level word attack skills would have already mastered the skills taught at the beginning level of the word attack program. The synthetic words were developed to test skills in recognizing long vowel sounds, short vowel sounds, consonant blends, consonant digraphs, diphthongs, vowel plus 'r', and base words and endings.

In determining the specific phonemes tested by the synthetic words, their frequency of occurrence in written English was one

important factor considered. The vowel sounds chosen to test the skill of long vowel recognition were long 'e', i.e., /i/, and long 'o', i.e., /o/, because in two different studies both Stone (1966) and Burmeister (1969) found that these long vowel sounds occurred most frequently of the long vowel sounds in common English words. The Stone and Burmeister studies also specify that of the short vowels, short 'i', i.e., /I/, and short 'a', i.e., /æ/, occurred most frequently in common English words. Therefore, these two vowel sounds were chosen to test short vowel recognition skills. In her discussion of consonant blends, Durkin (1970) indicates that blends formed with 'l' and 'r' are especially common; so the 'pl' and 'br' consonant blends were used in the synthetic words constructed to test blend recognition. The diphthongs 'oi' and 'ew' were chosen from the five diphthongs taught in the Word Attack Element of the Wisconsin Design on the basis of frequency of occurrence and phonemic regularity (Burmeister, 1968). Of the digraphs taught in the Wisconsin Design, 'ch' and 'sh' were chosen to be tested. These two digraphs were used both in the initial and final positions in the synthetic words. While 'ng' and 'th' occur perhaps just as frequently as 'ch' and 'sh', 'ng' was not tested since it cannot occur in an initial position in words, and 'th' was not tested in order to avoid the possible confusion between the voiced and voiceless 'th' sounds. The 'ph' digraph was not tested since it occurs only in English words that have been

adopted from foreign languages and therefore does not occur as frequently as the other digraphs.

Four specific items were constructed to test each of the seven skills. The items were designed to resemble real words both in sound and appearance, and the spelling patterns used were those of written English.

A trial study using the synthetic words was run in the public schools of West Bend and Plymouth, Wisconsin, in June, 1971. Forty third and fourth grade pupils were asked to read the list of synthetic words in order to determine whether any of the words were ambiguous, e.g., would cue more than one appropriate response, and should therefore be replaced in the actual study. The synthetic words were also shown to a sample of twenty college level readers in order to further check for ambiguity. After these two reviews of the synthetic words were considered, the following words were chosen for each skill.

Synthetic Word Lists

| | List 1 | List 2 |
|---|---|---|
| Long Vowel Sounds: | Long E | Long O |
| | spleed | plode |
| | drete | toke |
| | tefe | pote |
| | beel | boap |

| | List 1 | List 2 |
|---|---|---|
| Short Vowel Sounds: | Short A | Short I |
| | strat | splim |
| | zat | blit |
| | clab | mish |
| | jad | dit |
| Consonant Blends: | PL | BR |
| | plome | brame |
| | plute | broy |
| | plig | brish |
| | plang | brode |
| Consonant Digraphs: | SH | CH |
| | grash | chim |
| | shate | chark |
| | thrish | mouch |
| | shoker | murch |
| Vowel Diphthongs: | OI | EW |
| | foiter | prew |
| | toip | thew |
| | moil | sprewl |
| | coise | lewck |
| Vowel plus 'r': | OR | ER |
| | plor | lerse |
| | korm | verl |
| | lorp | blerk |
| | jork | jer |
| Base Words and Endings: | -ING | -ED |
| | yalting | garted |
| | flanging | caded |
| | gretting | druted |
| | murling | spletted |

When the synthetic lists were presented to the Subjects, they were presented in the following order:

| List 1 | List 2 |
|---|---|
| spleed | plode |
| plome | splim |
| strat | brame |
| grash | chim |
| foiter | prew |
| plor | lerse |
| yalting | garted |
| dreve | toke |
| zat | blit |
| plute | broy |
| shate | chark |
| toip | thew |
| korm | verl |
| flanging | cried |
| tefe | pote |
| clab | mish |
| plig | brish |
| thrish | mouch |
| moil | sprewl |
| lorp | blerk |
| gretting | druted |
| peel | boap |
| jad | dit |
| plang | brode |
| shoker | murch |
| coise | lewck |
| jork | jer |
| murling | spletted |

The Real Word Lists

The desired outcome for the implementation of the Wisconsin Design is functional reading ability, operationally defined by Otto and Askov as the ability to cope with reading tasks encountered in and out of school (Otto & Askov, 1971). The terminal objective for the Word Attack Element of the Wisconsin Design is that the student, upon attainment of all Level D skills, will be able to attack

independently phonically and/or structurally regular words and will recognize on sight all words on the Dolch list. The purpose of the real word list (regular words) was to determine to what extent the terminal objective of the Wisconsin Design had been achieved.

In order to determine whether the Subjects were able to attack phonically and structurally regular words which they would encounter in reading tasks, it was necessary to find a list of words which was reasonably representative of current printed American English. The rank-order list of 50,406 words found in Henry Kucera and W. Nelson Francis' Computational Analysis of Present Day American English (1967) fulfilled this need. This list was taken from a corpus of 1,014,232 words of natural language texts composed of 500 samples of approximately 2,000 words each. The idea that governed the selection and preparation of the text making up the corpus was that it should be synchronic, accurate and representative of a wide range of styles. Synchronicity was achieved by confining the data to texts first printed in the year 1961. Further restrictions on the corpus samples were that the material should be published in the United States, be written by Americans, and be written in prose with no more than 50 per cent of any selection to be written in dialogue. To insure representativeness, the 500 samples were distributed among 15 categories. These categories represented the full range of prose styles and subject matter; from the sports page of a newspaper to the abstruse philosophical discussion; from popular romantic fiction to scientific

journals. The number and content of the categories as well as the proportion of the 500 samples to be assigned to each category was determined at a conference held at Brown University. The participants in this conference included John B. Carroll, W. Nelson Francis, Philip B. Gove, Henry Kucera, Patricia O'Connor, and Randolph Quirk. The categories and numbers of selection assigned to each are as follows (Kucera & Francis, 1967):

| | |
|---|---|
| Press: Reportage | 44 |
| Press: Editorials | 27 |
| Press; Reviews | 17 |
| Religion | 17 |
| Skills and hobbies | 36 |
| Popular lore | 48 |
| Belles Lettres, Biography, etc. | 75 |
| Miscellaneous | 30 |
| Learned and Scientific writings | 80 |
| Fiction: General | 29 |
| Fiction: Mystery and Detective | 24 |
| Fiction: Science | 6 |
| Fiction: Adventure and Western | 29 |
| Fiction: Romance and Love Story | 29 |
| Humor | 9 |

The actual samples within each category were selected by a variety of random procedures. Most samples consisted of one continuous passage from a single source. After keypunching of the 1,014,232 "running words" computer processing was done in three stages: segmentation of the texts into words, sorting segmented words into alphabetical order, and merging of identical words and a count of their frequency of occurrence.

Because the Kucera-Francis corpus appears to be representative of the words in print to which the adult literate reader is exposed, the sample of words used for testing in this study was taken from

this rank-order list. A stratified random sampling procedure was used to choose the test words. The first stratum of the sample consisting of 279 words was drawn from the words having a frequency of 69,971 to those having a frequency of 106, i.e., the first 1,004 words on the Kucera-Francis list. The second stratum of the sample consisting of 350 words was taken from those words having a frequency of 105 to those having a frequency of 19, i.e., the words from 1,005 to 5,182 on the Kucera-Francis list. The third stratum of the sample consisting of 384 words was drawn from those words having a frequency of 18 to those having a frequency of 1, i.e., the words from 5,183 to 48,397 on the Kucera-Francis list. Table 1 presents the frequencies, rank-orders, number of words, and sample size for each stratum.

TABLE 1

Frequencies, Rank-Order, Number of Words and Sample Size by Stratum

| Stratum | Frequencies | Rank-Orders | Words in Stratum | Sample Size |
|---|---|---|---|---|
| 1* | 69,971 - 106 | 1 - 1,004 | 1,004 | 279 |
| 2 | 105 - 19 | 1,005 - 5,182 | 4,177 | 350 |
| 3 | 18 - 1 | 5,183 - 48,395 | 43,214 | 384 |
| Total | | | 48,395 | 1,013 |

*Most frequent words

This stratified sampling procedure resulted in a total sample of 1,013 words with a greater proportion of words chosen from words of high frequency. This procedure was used so that the test words would be more representative of those words which the Subjects would encounter most often in their everyday reading tasks.

The original sample contained both regular and irregular words. The terminal objective of the Word Attack Element of the Wisconsin Design states that the student will be able to attack independently phonically and/or structurally regular words. Therefore, it was necessary to separate the sample words into regular and irregular word lists. Because there is no universally accepted definition of what constitutes a phonically and structurally regular word, and because "phonically and structurally regular" is not defined in the terminal objective of the Wisconsin Design, it was necessary to develop an operational definition for use in this study. This operational definition is: A word will be considered phonically and structurally regular if it can be decoded using the phonic and structural generalizations specifically taught in the Word Attack Element of the Wisconsin Design. For example, the word shout would be considered phonically regular because the 'sh' digraph, the 'ou' diphthong, and the final consonant 't' are all phonic elements specifically taught in the Word Attack Element of the Wisconsin Design. Since the designation of a word as regular or irregular was not always a clear-cut decision, a committee of four reading specialists all holding masters degrees in reading, and two students of linguistics,

was asked to review each word and classify it as regular or irregular using as their criterion the operational definition of regular words stated above.

The proportion of words classified as regular in Stratum 1 (the most frequent words) was .7813 or 218 regular words from a total sample of 279 words. The 95 per cent confidence interval assuming infinite degrees of freedom for this stratum is .7383 to .8244. The proportion of words classified as regular in Stratum 2 (the intermediate frequency words) was .6971 or 244 regular words from a total sample of 350 words. The 95 per cent confidence interval assuming infinite degrees of freedom for this stratum is .6497 to .7446. The proportion of words classified as regular in Stratum 3 (the most infrequent words) was .6354 or 244 regular words from a total sample of 384 words. The 95 per cent confidence interval assuming infinite degrees of freedom for this stratum is .5862 to .6846. The number of regular and irregular words in each of the samples by stratum is shown in Table 2.

TABLE 2

Number of Regular and Irregular Words in Samples by Stratums

| | Stratum 1* | Stratum 2 | Stratum 3 | Total |
|---|---|---|---|---|
| Sample Size | 279 | 350 | 384 | 1,013 |
| Regular Words | 218 | 244 | 244 | 706 |
| Irregular Words | 61 | 106 | 140 | 307 |

*Most frequent words

Of the total sample of 1,013 words, 706 words or .6962 of the total sample were classified as regular words. This proportion of regular words--almost seven/tenths of all words in the random sample--lends support to the assumption that the phonic and structural elements chosen to be included in the Word Attack Element of the Wisconsin Design do represent essential skills necessary for decoding words. (It might also be stated that if the suffix tion had been specifically taught in the Word Attack Element, the proportion of regular words would have been greater since 45 words containing this word pattern were included in the total sample of words.)

The words classified as regular were separated from the rest of the sample words. The Dolch words which were found in the sample of regular words were separated from these words and were considered as a separate category when developing the test lists. This was done because the words on the Dolch list are taught as sight words in the Wisconsin Design.

The regular words excluding the words from the Dolch list were placed in the sampling sequence order. These words were used to compile eight lists of regular words, with the first word in the sampling sequence order becoming the first word on the first list, the second word in the sampling sequence order becoming the first word on the second list, etc., until lists one through four contained 6 regular words from each frequency stratum, lists five and six contained 8 regular words from each frequency stratum, and lists seven and eight contained 10 regular words from each frequency stratum. These lists are shown below:

# Regular Word Lists

## Stratum I

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| forms | applied | level | coming |
| near | however | training | whole |
| trial | least | chance | inside |
| number | able | short | become |
| personal | running | part | economic |
| army | room | everything | university |

| List 5 | List 6 | List 7 | List 8 |
|---|---|---|---|
| known | knew | society | bad |
| numbers | income | greater | wide |
| wouldn't | court | alone | common |
| doubt | continue | town | sales |
| saying | held | property | board |
| basic | learned | student | market |
| concerned | life | couldn't | feed |
| voice | pool | members | doing |
| | | seems | mass |
| | | remember | short |

## Stratum II

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| butter | horses | tossed | lies |
| bringing | site | exposed | stick |
| wiped | cap | helping | studying |
| spite | hell | deeply | pike |
| apartment | pack | steadily | liberals |
| rendered | caused | sacred | buying |

| List 5 | List 6 | List 7 | List 8 |
|---|---|---|---|
| reverend | thin | bodily | bodies |
| spencer | contest | concentrated | performances |
| describe | drugs | harm | endless |
| alike | demonstrated | optimal | grand |
| pace | calling | sixties | reporters |
| reasonably | November | foams | contrast |
| finished | snakes | insisted | cooling |
| text | backed | weather | split |
| | | avenue | loss |
| | | source | maintained |

Stratum III

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| banking | marsh | dregs | unwilling |
| sterling | fearing | helplessness | sticky |
| impinge | showerhead | imitate | ninety-six |
| epithet | pumped | mistrial | shod |
| hearsay | lords | paid | fatty |
| gazes | cutthroat | thousand | cruise |

| List 5 | List 6 | List 7 | List 8 |
|---|---|---|---|
| extrovert | citrus | pinging | stabbed |
| caseworkers | letterman | disappointing | upswing |
| trenchant | loosening | metalworking | retrench |
| well-understood | picket | non-political | homes |
| desegregate | mobilize | unleash | multi-figure |
| drip | incompatibility | nearby | treadmill |
| villa | harvested | defiant | marshes |
| Leona | cattle | jazz | passerby |
| | | caving | bankruptcy |
| | | incorruptible | shank |

The sample words found on the Dolch list were placed in their sampling sequence order. These words were used to compile eight lists of Dolch words, with the first word in the sampling sequence order becoming the first word on the first list, the second word in the sampling sequence order becoming the first word on the second list, etc., until lists one through four contained 6 Dolch words, lists five and six contained 7 Dolch words and lists seven and eight contained 8 Dolch words. These eight lists are shown below.

Dolch Word Lists

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| saw | get | found | why |
| may | if | there | by |
| some | gave | now | your |
| you | an | big | well |
| away | small | of | first |
| him | she | want | always |

| List 5 | List 6 | List 7 | List 8 |
|---|---|---|---|
| going | bring | them | soon |
| here | ten | those | because |
| white | do | has | call |
| good | hold | think | yes |
| wish | does | this | or |
| every | out | tell | keep |
| before | only | can | own |
| | | four | make |

The words from the sample which were not classified as regular words were also included in the test list in order to determine whether competence in the word attack skills included in the Word Attack Element of the Wisconsin Design would aid students in attacking phonically and structurally irregular words they might encounter in daily reading tasks. The lists of irregular words were compiled using the same procedure used for compiling the regular word lists. Lists one through four contained 6 irregular words from each frequency stratum, lists five and six contained 7 irregular words from each frequency stratum, and lists seven and eight contained 8 irregular words from each frequency stratum. These irregular word lists are shown below.

## Irregular Word Lists

### Stratum I

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| imagination | beautiful | conditions | view |
| areas | followed | usually | volume |
| efforts | country | process | throughout |
| population | effort | industrial | physical |
| information | private | behind | production |
| education | picture | mother | nations |

| List 5 | List 6 | List 7 | List 8 |
|---|---|---|---|
| piece | island | hair | eyes |
| average | most | business | England |
| lower | religion | none | George |
| eye | various | gone | similar |
| hour | soviet | record | analysis |
| mind | administration | husband | often |
| determine | women | design | enough |
| | | question | section |

### Stratum II

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| opinions | alternative | guilty | allies |
| legislation | estimate | oxidation | objective |
| typical | marriages | naked | sufficiently |
| numerous | guy | exploration | traditions |
| London | delicate | session | honest |
| automobiles | vary | motive | editorial |

| List 5 | List 6 | List 7 | List 8 |
|---|---|---|---|
| initiative | explanation | politicians | relatively |
| rare | issues | Missouri | reflection |
| numerical | colonial | award | tour |
| Ohio | profession | warmth | reality |
| implications | relationships | corporations | palace |
| senate | share | criticism | identification |
| height | quarrel | washed | discrimination |
| | | July | transportation |

Stratum III

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| route | noncommissioned | initiator | aversion |
| photograph | sub-group | excursion | aligned |
| mechanized | premiums | dishonoured | pastor |
| modulation | nullify | wreckage | gestured |
| internationalist | lunar | memorize | word |
| polarities | mobilization | differentiated | Sunday-school |

| List 5 | List 6 | List 7 | List 8 |
|---|---|---|---|
| uncertainties | timbre | nationality | featured |
| folks | muscle | polled | baptism |
| world | influential | pamphlets | epoch |
| efficfently | basting | palaces | posterior |
| sanction | reassure | restrictive | medication |
| odyssey | liaison | taxation | barbarous |
| colloquium | choir | incredulous | faction |
| | | financially | parent |

The words designated for each specific list from each of the above categories were combined to form the eight lists used for testing. These eight lists included four lists of 42 words each, two lists of 52 words each, and two lists of 62 words each. Lists of different lengths were used in order to determine if the length of the word list would have any effect on the performances of the Subjects in the study. The schema for the word lists are presented in Table 3.

TABLE 3

Schema of Real Word Lists

| | Lists 1 through 4 | Lists 5 and 6 | Lists 7 and 8 |
|---|---|---|---|
| **Regular Words** | | | |
| Stratum I | 6 | 8 | 10 |
| Stratum II | 6 | 8 | 10 |
| Stratum III | 6 | 8 | 10 |
| Dolch | 6 | 7 | 8 |
| **Irregular Words** | | | |
| Stratum I | 6 | 7 | 8 |
| Stratum II | 6 | 7 | 8 |
| Stratum III | 6 | 7 | 8 |
| TOTAL | 42 | 52 | 62 |

The words on each list were placed in random order for testing purposes. The eight lists are shown below.

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| butter | beautiful | level | aversion |
| near | noncommissioned | there | inside |
| bringing | alternative | training | allies |
| imagination | horses | guilty | lies |
| areas | estimate | initiator | become |
| route | sub-group | now | why |
| efforts | least | usually | by |
| banking | site | tossed | stick |
| wiped | caused | oxidation | aligned |
| opinions | followed | dregs | view |
| saw | marsh | process | volume |
| legislation | able | exposed | objective |
| may | get | chance | sufficiently |
| some | running | helplessness | throughout |
| spite | country | imitate | studying |
| typical | if | big | pastor |
| numerous | marriages | excursion | unwilling |
| information | cutthroat | naked | production |
| gazes | cap | dishonoured | your |
| photograph | gave | wreckage | traditions |
| mechanized | guy | helping | sticky |
| sterling | an | sacred | gestured |
| trial | premiums | mistrial | well |
| away | delicate | memorize | always |
| number | hell | exploration | ninety-six |
| personal | effort | short | pike |
| London | fearing | industrial | whole |
| apartment | small | part | liberals |
| education | room | paid | cruise |
| army | showerhead | differentiated | first |
| impinge | pumped | everything | coming |
| him | private | deeply | honest |
| automobiles | lords | of | economic |
| you | she | behind | word |
| modulation | nullify | steadily | physical |
| internationalist | pack | want | editorial |
| epithet | mobilization | mother | shod |
| hearsay | picture | found | fatty |
| population | applied | thousand | nations |
| polarities | vary | session | university |
| forms | lunar | conditions | Sunday-school |
| rendered | however | motive | buying |

## List 5

extrovert
initiative
piece
numbers
going
average
here
uncertainties
folks
rare
lower
numerical
Leona
world
reasonably
Ohio
reverend
caseworkers
eye
spencer
efficiently
sanction
wouldn't
trenchant
white
doubt
finished
well-understood
odyssey
describe
good
wish
hour
desegregate
mind
alike
senate
implications
every
voice
known
saying
determine
drip
basic
pace
before
concerned
height
colloquium
villa
text

## List 6

citrus
thin
only
bring
knew
income
explanation
letterman
ten
timbre
contest
loosening
muscle
picket
court
drugs
island
do
most
incompatibility
continue
calling
hold
issues
influential
basting
does
administration
women
mobilize
colonial
reassure
liaison
based
religion
held
profession
various
share
learned
relationships
demonstrated
quarrel
life
pool
out
choir
November
shakes
cattle
soviet
harvested

List 7

them
politicians
financially
alone
defiant
question
those
Missouri
incorruptible
award
warmth
concentrated
hair
pinging
source
nationality
business
polled
pamphlets
palaces
has
town
harm
disappointing
criticism
restrictive
caving
optimal
sixties
think
corporations
property
insisted
this
couldn't
student
society
none
tell
metalworking
gone
record

non-political
foams
bodily
greater
washed
remember
jazz
husband
can
taxation
weather
four
unleash
avenue
members
design
nearby
seems
incredulous
July

List 8

stabbed
bad
relatively
multi-figure
performances
featured
reflection
make
soon
because
call
tour
endless
baptism
upswing
section
wide
eyes
yes
epoch
common
sales
England
retrench
shank
own
grand
reporters
posterior
reality
George
similar
medication
analysis
bankruptcy
cooling
identification
barbarous
contrast
board
market
palace

loss
feed
or
faction
discrimination
treadmill
split
passe-by
often
doing
mass
keep
homes
maintained
parent
enough
bodies
transportation
marsh
short

## Testing Procedure

Each of the Subjects was tested individually by one of two examiners. Each experimental Subject was tested with one synthetic word list and one real word list. The synthetic word list presented was randomly selected from two synthetic word lists and the real word list presented was randomly selected from eight real word lists. The synthetic word list was always presented before the real word list. The testing design is presented in Table 4.

TABLE 4

Word List Study Design:

Number of Subjects by Real Word List by Synthetic List by Sex

| | Real Word Lists | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total |
| Synthetic Lists | | | | | | | | | |
| Boys 1 | 1 | 1 | 5 | 6 | 3 | 2 | 4 | 5 | 27 |
| Boys 2 | 6 | 7 | 6 | 3 | 5 | 7 | 1 | 7 | 42 |
| Total Boys | 7 | 8 | 11 | 9 | 8 | 9 | 5 | 12 | 69 |
| Girls 1 | 7 | 6 | 4 | 7 | 6 | 6 | 8 | 1 | 45 |
| Girls 2 | 3 | 5 | 2 | 2 | 2 | 5 | 3 | 4 | 26 |
| Total Girls | 10 | 11 | 6 | 9 | 8 | 11 | 11 | 5 | 71 |
| Total | 17 | 19 | 17 | 18 | 16 | 20 | 16 | 17 | 140 |

The test words were printed on small flash cards in lower case letters. Only the proper nouns included in the real word list were capitalized. When administering the synthetic word list the examiner told each Subject:

> On each of these cards is a word which is not a real word and which does not make sense. When I show you the card, I want you to tell me aloud what you think the word is. If you do not know the word, make the best guess that you can. Do you understand?

When administering the real word list the examiner told each Subject:

> On each of these cards is a word which I want you to read aloud to me. If you do not know the word make the best guess that you can. Do you understand?

The examiner gave two example items for each list.

After the Subject had ten seconds to respond to an item on the test, his answer was recorded as either correct or incorrect. Any incorrect response which was corrected within ten seconds was scored as correct. If the word on the real word list was multi-syllabic, the accent had to be placed on the accented syllable in order to be considered correct. The raw score for each Subject was the number of words pronounced correctly on each list. The Subjects were not told whether their responses were correct or incorrect.

The control Subjects were tested individually on the lists of irregular words. The same procedure used in testing the experimental Subjects was used. All testing sessions were recorded on tape to check for examiner error and to provide data for the post-hoc analysis of specific errors.

## Rationale for the Levels of Mastery

Because a definite level at which attainment of the terminal objective of the Word Attack Element of the Wisconsin Design can be assumed is not specified in the Word Attack Element of the Wisconsin Design, it was necessary to define an operational level of mastery for this study. Recently empirical standard setting procedures have been developed for mastery learning. Block (1971) states that the work done in this area suggests that if students master eighty to eighty-five per cent of the criterion related questions in a given task, they are likely to exhibit the maximum positive cognitive and affective achievement. According to Bormuth (1974), requiring students to attain a mastery level of ninety per cent or above is an unrealistic expectation.

Therefore, eighty per cent was the mastery level chosen to evaluate the experimental Subjects' performances on the synthetic and regular word lists. However, a more stringent level was desired for the Dolch words, so 99 per cent was the mastery level chosen for these words. These mastery levels are specified in the hypotheses presented below.

## Hypotheses

1. At least 80 per cent of a sample of synthetic words containing phonic and/or structural elements taught in the Word Attack Element of the Wisconsin Design can be decoded by at least 90 per cent of the experimental Subjects who completed the Word Attack Element of the Wisconsin Design.

2. At least 80 per cent of a sample of phonically and/or structurally regular words of Frequency Stratum 1 can be decoded by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

3. At least 80 per cent of a sample of phonically and/or structurally regular words of Frequency Stratum 2 can be decoded by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

4. At least 80 per cent of a sample of phonically and/or structurally regular words of Frequency Stratum 3 can be decoded by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

5. At least 99 per cent of the sample of words from the Dolch list can be recognized at sight by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

6. At least 80 per cent of all of the phonically and/or structurally regular words in the sample can be decoded by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

7. The per cent of phonically and/or structurally irregular words that can be decoded by 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design will be lower than the per cent of phonically and/or structurally regular words that can be decoded by the experimental Subjects.

8. The mean scores of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design on the test lists of phonically and/or structurally irregular words will be higher than the mean scores of the control Subjects on the test lists of phonically and/or structurally irregular words.

## CHAPTER III

## RESULTS AND DISCUSSION

In this chapter, the results of the study are presented in relation to the specific questions and hypothesis of the study.

### Synthetic Word Lists

The first question of the study asked what per cent of a sample of synthetic words containing phonic and/or structural elements taught in the Word Attack Element of the Wisconsin Design could be decoded by the experimental Subjects who had successfully completed the Word Attack Element of the Wisconsin Design. The first hypothesis of the study predicted that at least 80 per cent of the synthetic words could be decoded by at least 90 per cent of the experimental Subjects. On both of the synthetic word lists, the Subjects' mean score was 90.4 per cent. The standard deviation on Synthetic Word List 1 was .64, and on Synthetic Word List 2, it was 1.47. The distribution of the relative true scores on the two synthetic word lists is presented in Table 5.

TABLE 5

Distribution of the Relative True Scores on the Synthetic Word Lists*

| Percentage Covered by Interval | Percentile Interval | Lower Limit | Upper Limit |
|---|---|---|---|
| 95 % | 2.5 to 97.5 | .787 | 1.00 |
| 90 % | 5.0 to 95.0 | .806 | 1.00 |
| 75 % | 12.5 to 87.5 | .835 | .972 |

* Confidence Coefficient = 95 %[1]

The figures in Table 5 show that it can be estimated with at least 95 per cent confidence that at least 90 per cent of the experimental Subjects knew 80.6 per cent of all synthetic words. Thus the results presented in Table 5 support Hypothesis 1. At least 90 per cent of the experimental Subjects were able to decode all of the synthetic words at the specified 80 per cent mastery level. The fact that the mean was the same for both synthetic test lists, i.e., 90.4 indicates that the parallel forms of the synthetic word lists were closely enough related so as not to give an unfair advantage to Subjects tested on either one of the lists.

[1] Tolerance factors used are from W. Dixon and F. Massey, Jr., Introduction to Statistical Analysis, pp. 436-437.

Because the synthetic word lists were both divided into sublists with each sublist testing a specific phonic or structural element, the experimental Subjects' responses to the synthetic word lists were further analyzed in terms of these elements. The first sublist in each list tested the long vowel sound (long 'e' in List 1 and long 'o' in List 2). The experimental Subjects tested on List 1 specifically mispronounced the long 'e' element in the synthetic words 16 per cent of the time. Those tested on List 2 failed to correctly decode the long 'o' sound 13 per cent of the time. On the sublists testing the short vowel sounds, the experimental Subjects tested on List 1 mispronounced the short 'i' two per cent of the time. Those tested on List 2 mispronounced the short 'a' five per cent of the time. None of the experimental Subjects tested on List 1 pronounced the 'pl' blend incorrectly while those tested on List 2 missed the 'br' blend one per cent of the time. Both the 'sh' and the 'ch' digraphs were mispronounced one per cent of the time. Nine per cent of the responses to the 'oi' diphthongs on List 1 were incorrect while eleven per cent of the responses to the 'ew' diphthongs on List 2 were incorrect. On the sublists testing vowel plus 'r', three per cent of the responses to the 'or' on List 1 were incorrect, while four per cent of the responses to the 'er' on List 2 were incorrect. On the sublists testing base words plus endings, the experimental Subjects tested on List 1 missed the 'ing' ending one per cent of the time. Those tested.

on List 2 also missed the 'ed' ending one per cent of the time. These results are presented graphically in Table 6.

TABLE 6

Percentages of Incorrect Responses to Synthetic Word Lists

| Phonic Elements | List 1 | Percent of Errors | List 2 | Percent of Errors |
|---|---|---|---|---|
| Long Vowels | Long 'E' | 16.30 | Long 'O' | 13.02 |
| Short Vowels | Short 'I' | 1.76 | Short 'A' | 4.71 |
| Consonant Blends | 'PL' | 0.00 | 'BR' | 0.07 |
| Consonant Digraphs | 'SH' | 1.45 | 'CH' | 0.97 |
| Vowel Diphthongs | 'OI' | 9.42 | 'EW' | 11.62 |
| Vowel plus 'R' | 'OR' | 2.54 | 'ER' | 3.87 |
| Base Words and Endings | +'ING' | 1.45 | +'ED' | 0.07 |

The low percentage of error for each group of synthetic words shown in the analysis of the individual sublists further confirms the fact that the Subjects had mastered at the specified level the phonic and structural analysis skills tested in the study. However, the comparatively high percentage of errors on the long vowel sounds and the vowel diphthongs needs to be considered. The long vowel errors seem to indicate that the Subjects may have been confused by the variant spellings of the long vowel sounds. The larger percentage

of error in response to the diphthongs might be explained by the fact that diphthongs are vowel combinations and may naturally be more difficult. They are also the last of the phonic elements taught in the Design, and their position in the curriculum might have affected the degree of the experimental Subjects' mastery of them.

Thus, the results of the synthetic word lists indicate that Hypothesis 1 is supported. Ninety per cent of the experimental Subjects who had completed the Word Attack Element of the Wisconsin Design were able to decode the synthetic words with at least 80 per cent mastery.

## Real Word Lists

The second specific objective of the study was to determine what per cent of a sample of phonically and/or structurally regular words could be decoded by the experimental Subjects who had completed the Word Attack Element of the Wisconsin Design. On the test lists of regular words the experimental Subjects' mean score was 94.43 per cent with a standard deviation of 8.54. This total mean score can be broken down into the mean scores on the various frequency stratums of the regular word lists. The mean score on the first stratum, i.e., the most frequent words, was 97.82 per cent and the standard deviation was 0.0. On the second stratum the experimental Subjects' mean score was 94.31 per cent with a standard deviation of 5.39. The mean score on the third frequency stratum was

86.57 per cent with a standard deviation of 9.20. The means and standard deviations for each stratum are presented graphically in Table 7.

TABLE 7

Means and Standard Deviations for Regular Word Lists

| Variable | Mean | Standard Deviation |
|---|---|---|
| Regular; Frequency 1 | 97.82 | 0.0 |
| Regular; Frequency 2 | 94.31 | 5.39 |
| Regular; Frequency 3 | 86.57 | 9.20 |
| Dolch Words | 99.02 | 0.00 |
| All Regular Words | 94.43 | 8.54 |

The five hypotheses of this study specifically concerned with the regular word lists are:

At least 80 per cent of a sample of phonically and/or structurally regular words of Frequency Stratum 1 can be decoded by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

At least 80 per cent of a sample of phonically and/or structurally regular words of Frequency Stratum 2 can be decoded by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

At least 80 per cent of a sample of phonically and/or structurally regular words of Frequency Stratum 3 can be decoded by at least 90 per

cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

At least 99 per cent of the sample of words from the Dolch list can be recognized on sight by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

At least 80 per cent of all the phonically and/or structurally regular words in the sample can be decoded by at least 90 per cent of the experimental Subjects who have completed the Word Attack Element of the Wisconsin Design.

In order to determine whether these hypotheses are supported by the study, it is necessary to know the distribution of the experimental Subjects' relative true scores on the various stratums of the regular word lists. This distribution is presented in Table 8.

TABLE 8

Distribution of the Relative True Scores on the Regular Word Lists*

| Variable | Percentage Covered by Interval | Interval | | |
|---|---|---|---|---|
| | | Lower Limit | | Upper Limit |
| | 99 per cent | 0.5th percentile | | 99.5th percentile |
| Dolch Words | | .9902 | - | .9902 |
| Regular; Frequency 1 | | .9782 | - | .9782 |
| Regular; Frequency 2 | | .7850 | - | 1.000 |
| Regular; Frequency 3 | | .5952 | - | 1.000 |
| All Regular Words | | .6937 | - | 1.000 |

Table 8 Continued

| Variable | Percentage Covered by Interval | Interval Lower Limit | | Interval Upper Limit |
|---|---|---|---|---|
| | 95 per cent | 2.5th percentile | | 97.5th percentile |
| Dolch Words | | .9902 | - | .9902 |
| Regular; Frequency 1 | | .9782 | - | .9782 |
| Regular; Frequency 2 | | .8228 | - | 1.000 |
| Regular; Frequency 3 | | .6598 | - | 1.000 |
| All Regular Words | | .7563 | - | 1.000 |
| | 90 per cent | 5.0th percentile | | 95.0th percentile |
| Dolch Words | | .9902 | - | .9902 |
| Regular; Frequency 1 | | .9782 | - | .9782 |
| Regular; Frequency 2 | | .8421 | - | 1.000 |
| Regular; Frequency 3 | | .6929 | - | 1.000 |
| All Regular Words | | .7843 | - | 1.000 |
| | 75 per cent | 12.5th percentile | | 87.5th percentile |
| Dolch Words | | .9902 | - | .9902 |
| Regular; Frequency 1 | | .9782 | - | .9782 |
| Regular; Frequency 2 | | .8724 | - | 1.000 |
| Regular; Frequency 3 | | .7448 | - | .9866 |
| All Regular Words | | .8323 | - | 1.000 |

*Confidence Coefficient = 95 %

The hypothesis that eighty per cent of the phonically and/or structurally regular words of Frequency Stratum 1 can be decoded by ninety per cent of the experimental Subjects is supported by the data presented in Table 8. In the interval which contains ninety per cent of the students, the lower limit score is 97.82. Thus, it can be stated with ninety-five per cent confidence that 97.82 per cent of the phonically and/or structurally regular words could be decoded by at least ninety per cent of the experimental Subjects. The hypothesis that eighty per cent of the phonically and/or structurally regular words of Frequency Stratum 2 can be decoded by ninety per cent of the experimental Subjects is also supported by the figures in Table 8. In the interval containing ninety per cent of the students, the lower limit score is 84.21 per cent. Thus, it can be stated with ninety-five per cent confidence that at least 84.21 per cent of the regular words of Frequency Stratum 2 could be decoded by at least ninety per cent of the experimental Subjects. The hypothesis that eighty per cent of the phonically and/or structurally regular words of Frequency Stratum 3 could be decoded by ninety per cent of the Subjects is not supported by the figures in Table 8. In the interval containing ninety per cent of the Subjects, the lower limit score was 69.29 per cent, a score which is lower than the hypothesized eighty per cent mastery level. The hypothesis that ninety-nine per cent of the words on the Dolch list sample can be decoded by ninety per

of the experimental Subjects is supported by the data in Table 8. In the interval containing ninety per cent of the experimental Subjects, the lower limit score on the Dolch word sample was 99.02 per cent. The hypothesis that eighty per cent of all phonically and/or structurally regular words can be decoded by ninety per cent of the experimental Subjects is not supported by the figures in Table 8. In the interval containing ninety per cent of the students, the lower limit score on all regular words was 78.43 per cent, a score which is lower than the hypothesized eighty per cent mastery level for all regular words.

In summarizing the results of the regular word lists, it can be stated that ninety per cent of the experimental Subjects could decode at least eighty per cent of the phonically and/or structurally regular words on Frequency Stratums 1 and 2 and the words on the Dolch list. However, not all of ninety per cent of the experimental Subjects attained the suggested eighty per cent mastery level on the lists of regular words from the third Frequency Stratum, nor did they attain the suggested eighty per cent mastery level on all regular words. Thus, in the final evaluation of the regular word lists, the terminal objective of the Word Attack Element of the Wisconsin Design, which states that students will be able to decode phonically and/or structurally regular words, was not attained.

Another specific objective of the study was to determine what per cent of a sample of irregular words could be decoded by the

experimental Subjects who had completed the Word Attack Element of the Wisconsin Design. On the lists of irregular words the mean score for the experimental Subjects was 85.17 per cent and the standard deviation was 10.76. The mean score on the irregular words lists can be broken down into scores for each of the three frequency stratums of irregular words. On the first frequency stratum of irregular words, i.e., the most frequent words, the experimental Subjects' mean score was 96.16 per cent and the standard deviation was 0.0. On the second frequency stratum of irregular words, the experimental Subjects' mean score was 83.44 per cent and the standard deviation was 8.19. On the third frequency stratum of irregular words, the mean score was 75.90 per cent and the standard deviation was 11.08. These means and standard deviations are presented in Table 9.

TABLE 9

Means and Standard Deviations for Irregular Word Lists

| Variable | Mean | Standard Deviation |
|---|---|---|
| Irregular; Frequency 1 | 96.16 | 0.0 |
| Irregular; Frequency 2 | 83.44 | 8.19 |
| Irregular; Frequency 3 | 75.90 | 11.08 |
| All Irregular Words | 85.17 | 10.76 |

Hypothesis 7 of this study states that the percentage of phonically and/or structurally irregular words that can be decoded by ninety per cent of the experimental Subjects will be lower than the percentage of phonically and/or structurally regular words that can be decoded by ninety per cent of the experimental Subjects. In order to determine whether this hypothesis is supported by the test results, it is necessary to compare the experimental Subjects' scores on the irregular word lists to their scores on the regular word lists. The distribution of the experimental Subjects' scores on the irregular word lists is presented in Table 10.

TABLE 10

Distribution of the Relative True Scores on the Irregular Word Lists*

| Variable | Percentage Covered by Interval | Interval Lower Limit | | Interval Upper Limit |
|---|---|---|---|---|
| | 99 per cent | 0.5th percentile | | 99.5th percentile |
| Irregular; Frequency 1 | | .9615 | - | .9615 |
| Irregular; Frequency 2 | | .5942 | - | 1.000 |
| Irregular; Frequency 3 | | .4336 | - | 1.000 |
| All Irregular Words | | .5360 | - | 1.000 |
| | 95 per cent | 2.5th percentile | | 97.5th percentile |
| Irregular; Frequency 1 | | .9615 | - | .9615 |
| Irregular; Frequency 2 | | .6515 | - | 1.000 |
| Irregular; Frequency 3 | | .5114 | - | 1.000 |
| All Irregular Words | | .6115 | - | 1.000 |

Table 10 Continued

| Variable | Percentage Covered by Interval | Interval Lower Limit | | Upper Limit |
|---|---|---|---|---|
| | 90 per cent | 5.0th percentile | | 95.0th percentile |
| Irregular; Frequency 1 | | .9615 | - | .9615 |
| Irregular; Frequency 2 | | .6810 | - | .9878 |
| Irregular; Frequency 3 | | .5512 | - | .9668 |
| All Irregular Words | | .6501 | - | 1.000 |
| | 75 per cent | 12.5th percentile | | 87.5th percentile |
| Irregular; Frequency 1 | | .9615 | - | .9615 |
| Irregular; Frequency 2 | | .7271 | - | .9417 |
| Irregular; Frequency 3 | | .6136 | - | .9044 |
| All Irregular Words | | .7106 | - | .9928 |

*Confidence Coefficient = 95 %

The results of the irregular word lists support Hypothesis 7. The per cent of phonically and/or structurally irregular words that can be decoded by the experimental Subjects will be lower than the per cent of structurally and/or phonically regular words that can be decoded by the experimental Subects. This fact can be seen more clearly if the scores of ninety per cent of the experimental Subjects

on the regular and irregular word lists are compared. This comparison is presented in Table 11.

TABLE 11

Comparison of the Relative True Scores of Ninety Per Cent of the Experimental Subjects on the Regular and Irregular Word Lists

| Variable | Percentage Covered by Interval | Interval | |
|---|---|---|---|
| | | Lower Limit | Upper Limit |
| | 90 per cent | 5.0th percentile | 95.0th percentile |
| Dolch Words | | .9902 | .9902 |
| Regular; Frequency 1 | | .9782 | .9782 |
| Regular; Frequency 2 | | .8421 | 1.000 |
| Regular; Frequency 3 | | .6929 | 1.000 |
| All Regular Words | | .7843 | 1.000 |
| Irregular; Frequency 1 | | .9615 | .9615 |
| Irregular; Frequency 2 | | .6810 | .9878 |
| Irregular; Frequency 3 | | .5512 | .9668 |
| All Irregular Words | | .6501 | 1.000 |

The results of the irregular word lists indicate that the experimental Subjects who had completed the Word Attack Element of the Wisconsin Design were not as successful in decoding phonically and/or structurally irregular words as they were in decoding the

phonically and/or structurally regular words. While ninety per cent of the experimental Subjects did well on the irregular words of the first frequency stratum (lower limit score of 96.15 per cent), their scores dropped considerably when they encountered words of the second and third frequency stratums (lower limit scores of 68.10 per cent and 55.12 per cent). These results indicate that the experimental Subjects did well when attempting to decode words with which they were probably already familiar, but had difficulty with words which they had probably not seen either as often or possibly not at all.

Thus the Subjects' previous acquaintance with the words seems to be an important factor when considering their scores on the irregular word lists. Since this is the case with the irregular words, it might be argued that familiarity with the words, i.e., frequency, was also the major factor in the Subjects' performance on the regular word lists, because the Subjects' scores were lower on the words of the third frequency stratum of the regular words than they were on the first and second frequency stratums (see Table 8). However, if previous acquaintance with the words were the only factor influencing the Subject's performance, the scores on the various stratums of both the irregular and regular word lists should be relatively similar. This is not the case as can be seen from the comparisons of the means and standard deviations given in Table 12.

TABLE 12

Comparisons of Means and Standard Deviations
On Regular and Irregular Lists

| Regular Words | | | Irregular Words | | |
|---|---|---|---|---|---|
| | Mean | Standard Deviation | | Mean | Standard Deviation |
| Frequency 1 | 97.82 | 0.0 | Frequency 1 | 96.16 | 0 |
| Frequency 2 | 94.31 | 5.89 | Frequency 2 | 83.44 | 8.19 |
| Frequency 3 | 86.57 | 9.20 | Frequency 3 | 75.90 | 11.08 |
| Dolch Words | 99.02 | 0.0 | - - - - - - - - - - - - - - - - - - - - | | |
| All Regular Words | 87.52 | 8.54 | All Irregular Words | 76.65 | 10.76 |

The fact that there is a marked difference between the mean scores on the regular and irregular lists on all three frequency stratums indicates that the Subjects' familiarity with the words, i.e., the relative frequency of the words is not the only factor influencing the Subjects' performance on the regular word lists. The Subjects' phonic and/or structural analytic ability also influenced their performance. The Subjects were more successful in decoding words when they were able to directly apply the phonic and/or structural analysis skills they learned from the Word Attack Element of the Wisconsin Design. The graph in Figure 1 (p. 60) which shows a

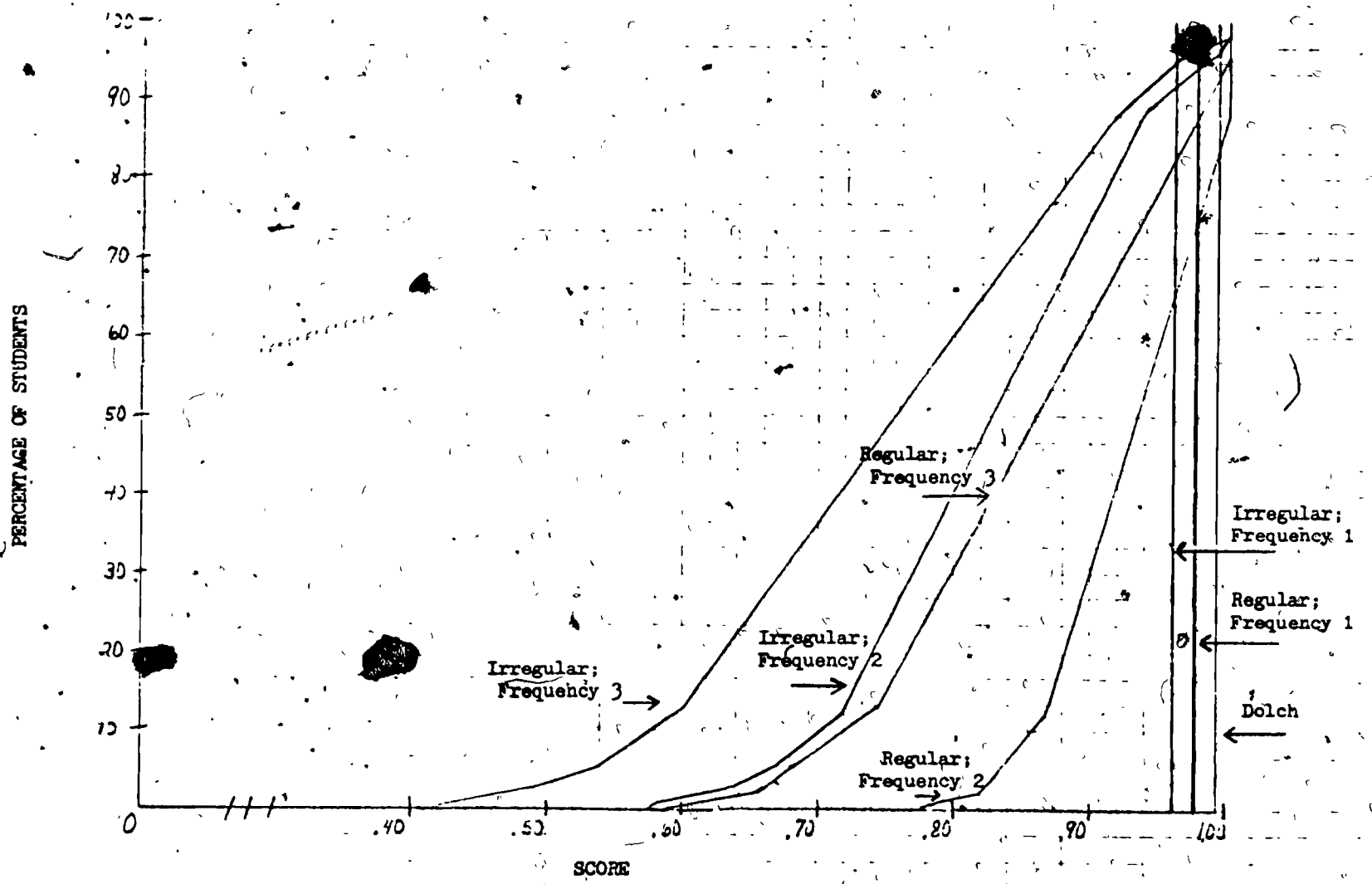


FIGURE 1

Cumulative Distribution of Regular and Irregular Words from Each Frequency Stratum

comparison of the Subjects' scores on the various stratums of regular and irregular words, further illustrates that the Subjects were more successful when they were able to directly apply phonic and structural skills, i.e., when they were decoding regular words.

The fifth objective of the study was to determine what per cent of a sample of irregular words could be decoded by a group of control Subjects who had not used the Word Attack Element of the Wisconsin Design. On the first stratum of irregular words, i.e., the most frequent words, the mean score for the control Subjects was 93.28 per cent. On the second stratum of irregular words, the control Subjects' mean score was 78.34 per cent, and on the third stratum of the irregular words, the control Subjects' mean score was 68.98 per cent. These scores are somewhat lower than the scores attained by the experimental Subjects on the three frequency stratums of the irregular words. The scores are compared in Table 13.

TABLE 13

Comparison of Control Subjects' and Experimental Subjects' Mean Scores on the Irregular Word Lists

| Frequency Stratum | Mean of Experimental Subjects | Mean of Control Subjects |
|---|---|---|
| Irregular; Frequency 1 | 96.16 | 93.28 |
| Irregular; Frequency 2 | 83.44 | 78.34 |
| Irregular; Frequency 3 | 75.90 | 68.98 |
| All Irregular Words | 85.17 | 80.15 |

The differences between the scores of the experimental and control Subjects presented in Table 13 support the hypothesis that the mean scores of the experimental Subjects on the test lists of phonically and/or structurally irregular words will be higher than the mean scores of the control Subjects on the test lists of phonically and/or structurally irregular words.

Correlations Between Responses to Synthetic and Real Word Lists

The final objective of the study was to determine what, if any, relationship existed between the performances of the experimental Subjects on the synthetic word lists and their performance on the real word lists. The coefficients of the correlations found between the synthetic word lists scores and the real word lists scores are presented in Table 14.

TABLE 14

Correlations Between Responses to Synthetic and Real Word Lists

| | Regular Words | | |
|---|---|---|---|
| | Frequency 1 | Frequency 2 | Frequency 3 |
| Synthetic Words | -.057 | .331 | .414 |

| | Dolch Words | All Regular Words |
|---|---|---|
| Synthetic Words | -.025 | .426 |

Table 14 Continued

| | Irregular Words | | |
|---|---|---|---|
| | Frequency 1 | Frequency 2 | Frequency 3 |
| Synthetic Words | .271 | .282 | .440 |
| | All Irregular Words | | |
| Synthetic Words | .448 | | |

The figures in Table 14 indicate that very low correlation coefficients were obtained in this portion of the study. These low correlation coefficients were probably due to the very low ranges in the scores on all of the word lists and especially the very low range of scores on the synthetic word lists.

## Effect of List Length

When the real word lists were developed, they were constructed of different lengths in order to find out whether the length of the word list would have any effect on the performance of the Subjects. The mean scores for each of the eight real word lists indicate that list length appeared to have little effect on the performance. These mean scores are shown below.

TABLE 15

Mean Scores for each of the Eight Real Word Lists

| List 1 | List 2 | List 3 | List 4 |
|---|---|---|---|
| 91.88 | 94.27 | 88.65 | 92.23 |
| **List 5** | **List 6** | **List 7** | **List 8** |
| 87.87 | 91.54 | 91.06 | 92.75 |

Summary of the Results

The analysis of the results of the synthetic word lists shows that Hypothesis 1 of the study is supported. At least eighty per cent of the sample of synthetic words could be decoded by at least ninety per cent of the experimental Subjects who had successfully completed the Word Attack Element of the Wisconsin Design.

The analysis of the results of the regular word lists shows that Hypotheses 2 and 3 of the study are supported. At least eighty per cent of a sample of phonically and/or structurally regular words of Frequency Stratums 1 and 2 could be decoded by at least ninety per cent of the experimental Subjects. The analysis of the results of the regular word lists also indicates that Hypothesis 4 must be rejected. Not all of ninety per cent of the experimental Subjects could decode at least eighty per cent of the phonically and/or

structurally regular words of Frequency Stratum 3. Hypothesis 5 is supported by the results of the regular word lists. At least 99 per cent of the sample of words from the Dolch list could be recognized on sight by at least 90 per cent of the experimental Subjects. However, the analysis of the results of the entire regular word list indicates that Hypothesis 6 must be rejected. Not all of ninety per cent of the experimental Subjects could decode at least 80 per cent of all the phonically and/or structurally regular words in the sample. Thus, the terminal objective of the Word Attack Element of the Wisconsin Design was not attained.

The analysis of the results of the irregular word lists supports Hypothesis 7. The per cent of the sample of phonically and/or structurally irregular words that could be decoded by the experimental Subjects who had completed the Word Attack Element of the Wisconsin Design was lower than the per cent of phonically and/or structurally regular words that could be decoded by the experimental Subjects. The analysis of the results of the irregular word lists also indicates that Hypothesis 8 is supported. The mean scores of the experimental Subjects on the test lists of phonically and/or structurally irregular words were higher than the mean scores of the control Subjects on the irregular word lists.

One of the specific questions asked in the study was what, if any, relationship exists between the experimental Subjects' scores on the synthetic word lists and their scores on the real

word lists. The analysis of the results shows that there is only a very low correlation between the experimental Subjects' scores on the synthetic word lists and their scores on the real word lists. This result was probably due to the very limited range of the synthetic word lists.

# CHAPTER IV

## SUMMARY, LIMITATIONS, AND IMPLICATIONS OF THE STUDY

### Summary

The primary purpose of this study was to provide empirical evidence for the assumption that if the essential subskills of word attack are mastered, then functional word attack ability will result. Because phonic and structural analysis is recognized as a valuable technique for decoding words in the language, test lists of phonically and/or structurally regular words were developed to test the phonic and structural subskills of word attack. These regular words were chosen from a corpus of words which children will probably encounter in everyday reading tasks both in and out of school. The words on the lists were ranked in three stratums on the basis of their relative frequency. Because the acquisition of a sight vocabulary is considered a basic skill of word attack, the regular word lists included a sample of words taken from the Dolch list. To determine whether the Subjects were using basic phonic and structural analysis skills rather than identifying the words by sight, a test list composed of synthetic words, which tested specific phonic and structural subskills of word attack, was also included in the study. However, since not all the words in the English language are regular, a list of phonically and structurally irregular words was developed to test the extent to which students who had learned basic phonic

and structural subskills of word attack could decode phonically and/or structurally irregular words. The irregular words were also ranked in three stratums according to frequency.

Because the study was designed to evaluate empirically a skill-oriented approach to word attack, the experimental Subjects for this study had to be a group of students who had successfully completed a skill-oriented approach to word attack. The experimental Subjects chosen for this study were students from the public elementary schools of Duluth, Minnesota, who had been taught and had mastered the word attack subskills according to the procedures outlined in the Word Attack Element of the Wisconsin Design for Reading Skill Development. The terminal objective of the Word Attack Element of the Wisconsin Design is that the student, upon attainment of all skills outlined in the Word Attack Element of the Design, will be able to attack phonically and/or structurally regular words and will recognize on sight all words on the Dolch list. Therefore, the specific questions and hypotheses of the study were developed to determine to what extent this terminal objective had been achieved.

Additional questions and hypotheses were developed to determine the extent to which students who had mastered phonic and structural analysis skills could decode phonically and/or structurally irregular words. Since the focus of the Word Attack Element of the Wisconsin Design is specifically oriented toward phonically and/or structurally

regular words, it was expected that the experimental Subjects would score higher on the test lists of phonically and/or structurally regular words than on the test lists of irregular words. It was also attempted in this study to determine whether learning basic phonic and structural subskills of word attack would aid the students in attacking irregular words. Because the students' ability to attack irregular words is not directly related to the terminal objective of the Word Attack Element of the Wisconsin Design, it was necessary to include in this section of the study a control group of Subjects who had not used the Word Attack Element of the Wisconsin Design.

The analysis of the results of the study indicate that at least ninety per cent of the experimental Subjects who had completed the Word Attack Element of the Wisconsin Design were able to decode the synthetic words with at least eighty per cent mastery. A further analysis of the individual sublists of the synthetic word lists indicated that the experimental Subjects had mastered each of the specific phonic and structural skills tested at this level of mastery. However, the percentage of error was considerably higher on the sublists testing the long vowel sounds and the vowel diphthongs.

The analysis of the results of the regular word lists indicated that ninety per cent of the experimental Subjects who had completed the Word Attack Element of the Wisconsin Design achieved

the suggested eighty per cent mastery level on the first and second frequency stratums of the regular word lists. However, their scores dropped below the eighty per cent mastery level when they were tested on the regular words of the third frequency stratum. The lower limit score of the interval which contains ninety per cent of the experimental Subjects for all regular words was 78.43 per cent which is also below the specified mastery level.

The scores of the experimental Subjects on the irregular word lists were considerably lower than their scores on the regular word lists. However, their scores were higher than the scores of the control Subjects on the irregular word lists.

The above results warrant the following conclusions. The fact that the experimental Subjects who had completed the Word Attack Element of the Wisconsin Design attained the suggested eighty per cent mastery level on the synthetic word lists indicates that they had learned the phonic and structural analysis skills which were tested in the study. The low percentage of error for each group of synthetic words in the individual sublists further confirms that the Subjects had attained these skills. The larger percentage of errors in response to the specific words testing diphthongs and long vowel sounds indicates that students had more difficulty in coping with these phonic elements.

The results of the regular word lists show that the terminal objective of the Word Attack Element of the Wisconsin Design was

not achieved. The fact that at least ninety per cent of the experimental Subjects who had completed the Word Attack Element of the Wisconsin Design were able to decode the words of the first and second frequency stratums of the regular word sample at the specified eighty per cent mastery level indicates that they had some ability to decode phonically and/or structurally regular words. However, since they did not achieve the specified mastery level when decoding words of the third frequency stratum or on all the regular words, the terminal objective of the Word Attack Element of the Wisconsin Design was not achieved. Furthermore, it might be argued that familiarity with the words rather than phonic and structural analytic ability was the major factor in the experimental Subjects' success in decoding words of frequency stratums one and two. This argument may be countered by the fact that the experimental Subjects were more successful in decoding the three frequency stratums of the regular words than they were in decoding the three frequency stratums of the irregular words. Therefore, more than familiarity, i.e., frequency, seems to be involved in their successful decoding of the regular words in the first and second frequency stratums. The experimental Subjects' phonic and/or structural analytic ability appears to have influenced their performance on the regular word lists. They were more successful in decoding words when they were able to directly apply the phonic and structural analysis skills they learned in the Word Attack Element of the Wisconsin Design.

## Limitations of the Study

One of the major limitations of the study was that the testing procedure created an artificial reading situation which could not really be used to evaluate all of the subskills of word attack. Because the words were presented in isolation rather than in context, the Subjects could not apply the word attack subskill of meaning clues, but were limited to the use of the sight vocabulary and phonic and structural analysis skills. Because the important word attack subskill of meaning clues cannot be evaluated using the testing procedures designed for this study, the study is not a rigorous evaluation of all word attack skills. Rather, it is limited to the evaluation of the phonic and structural analysis subskills and to the acquisition of a sight vocabulary.

While the study tested both phonic and structural subskills on the real word lists, the synthetic word lists emphasize more phonic than structural subskills. Except for the words that tested base words plus endings, all of the synthetic words tested phonic analysis subskills. This is another limitation of the study since the synthetic words do not really test whether the experimental Subjects had mastered the structural analysis techniques such as syllabication and accent. The synthetic word lists could have included more words that emphasized structural analysis techniques.

Another limitation of the study is that the method of selection of experimental Subjects might have resulted in a Subject sample

containing only students of high or average ability. Because the experimental Subjects who were chosen had to have mastered the entire Word Attack Element of the Wisconsin Design, students of below average ability who had been instructed in the Design could have been eliminated as Subjects. It was attempted to control for this problem by choosing experimental Subjects who were in their sixth and seventh year in school and requiring mastery only of those skills which should be mastered by students of average ability in their fifth year in school. However, students of lower ability levels may still have been excluded.

Another limitation of the study was the nature of the control group. A rigorous control group for a study of this type would have had to consist of Subjects who had not had any instruction in the phonic and structural analysis subskills of word attack. The control Subjects in this study were distinguished from the experimental Subjects only by the fact that they had not been instructed in and mastered the word attack skills according to the guidelines set forth in the Word Attack Element of the Wisconsin Design. However, the control Subjects may have acquired skill in phonic and structural analysis by some other method of instruction. To find Subjects for a control group who had no instruction in techniques of phonic and structural word analysis would be a difficult, if not impossible, task. This lack of a rigorous control group limits the conclusions that can be drawn from the results of the irregular word lists in this study.

Implications of the Study for Further Research in Word Attack

Because not all of ninety per cent of the experimental Subjects in this study attained the specified eighty per cent mastery level on the regular word lists, the terminal objective of the Word Attack Element of the Wisconsin Design was not attained. Therefore, the study does not provide rigorous empirical evidence for the assumption that if the basic subskills of word attack are mastered, then functional word attack ability will result. However, an analysis of the results of the study indicates that there is some evidence to support the idea that phonic and structural analysis skills can aid the student in decoding phonically and structurally regular words. The fact that the experimental Subjects who had mastered the Word Attack Element of the Wisconsin Design attained higher scores on the tests of phonically and/or structurally regular words than they did on the tests of irregular words appears to indicate that their phonic and structural analytic ability influenced their performance, since they were more successful in decoding words to which they could directly apply the phonic and structural analysis skills which they learned from the Word Attack Element of the Wisconsin Design.

Because this difference in the experimental Subjects' scores implies that phonic and structural analysis subskills can aid the student in decoding phonically and structurally regular words, more research should be conducted to investigate which phonic and structural subskills are most helpful to the student. There is no

indication in the Word Attack Element of the Wisconsin Design, for example, as to which of the various phonic and structural subskills of word attack aid the student most when he attempts to decode new words. Research that helps to refine the list of essential phonic and structural analysis subskills and establishes a hierarchy of such skills would be valuable in determining how word attack skills can be taught most effectively.

That some of the phonic and structural subskills taught in the Word Attack Element of the Wisconsin Design may be more difficult to master than others seems to be indicated by the results of the synthetic word lists in the present study. The results of that test show that the experimental Subjects had a higher percentage of errors when decoding synthetic words containing two consecutive vowels, i.e., synthetic words using a two-vowel variant spelling of the long vowel sound and synthetic words containing diphthongs, than they did when decoding the other synthetic words (see pp. 44-45). The fact that students seem to have more difficulty in decoding such vowel combinations may have important implications for the implementation of a skill-oriented approach to word attack if it were determined that the ability to recognize vowel combinations was one of the more essential of the phonic analysis skills. In a recent study in which he attempts to establish an effectiveness hierarchy of word attack subskills, John McNeil (1974) concluded that the phonic analysis skills necessary to decode words containing

two consecutive vowels are two of the "probably necessary" subskills of word attack. Research that attempts to determine the relative effectiveness of the various phonic subskills seems to be a necessary step in determining how phonic analysis skills can be taught most effectively.

McNeil also came to some conclusions regarding the relative effectiveness of structural analysis techniques. Of the seven word attack subskills he labels as "probably necessary", three are structural analysis skills, i.e., determining the number of syllables, identifying base words, and recognizing compound words. Research that would further investigate the nature and utility of structural analysis skills is also essential in determining which phonic and structural word analysis skills are most valuable in teaching word attack. McNeil's study is only an initial step in refining the list of essential skills of word attack, but his research is one type of research which is necessary to further develop and evaluate skill-oriented curriculums of word attack.

A further implication of the study can perhaps be inferred from one of its limitations. One limitation of the present study was that the testing procedure created an artificial reading situation, a situation which prevented the Subjects from applying the word attack subskill of context clues. This limitation implies the need for research which investigates the nature and effectiveness of meaning clues as a basic subskill of word attack. A study which

presented words to be decoded in context would provide its Subjects with the opportunity to employ the additional word attack subskill of meaning clues as well as the subskills of phonic and structural analysis and sight vocabulary.

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## APPENDIX

## STATEMENT OF SKILLS AND OBJECTIVES FOR THE WORD ATTACK ELEMENT OF THE WISCONSIN DESIGN FOR READING SKILL DEVELOPMENT

Level A

The child ...

1. Listens for rhyming elements

   a. Words

      Objective: Given familiar words pronounced by the teacher, the child indicates which of three words rhymes with a stimulus word; or tells whether two words do or do not rhyme.

   b. Phrases and verses

      Objective: In real or nonsense verses read by the teacher, the child supplies the missing word in a verse (e.g., "The big tall man/Fried eggs in a _____"); or identifies the rhyming words.

2. Notices likenesses and differences

   a. Pictures (shapes)

      Objective: The child identifies shapes that are the same or different in form and orientation.

   b. Letters and numbers

      Objective: The child selects the letter (upper or lower case) or number of a series that is identical to a key number or letter.

   c. Words and phrases

      Objective: The child selects the word or phrase in a series that is identical to a stimulus word or phrase (e.g., down: wand, down, bone, find; back and forth: bank and find, back and forth, found it).

3. Distinguishes colors

Objective: The child identifies the colors blue, green, black, yellow, red, orange, white, brown, purple, when named by the teacher.

4. Listens for initial consonant sounds

Objective: Given a familiar word pronounced by the teacher, the child indicates which of three other words begins with the same consonant sound.

Level B

The child ...

1. Has a sight word vocabulary

Objective: Given a maximum one-second exposure per word, the child recognizes preprimer and primer level words from the adapted Dolch sight vocabulary list.

2. Follows left-to-right sequence

Objective: The child reacts to number or letter stimuli in a left-to-right sequence.

3. Has phonic analysis skills

a. Consonant sounds

1) Beginning consonant sounds

Objective: Given real or nonsense words pronounced by the teacher, the child identifies the letter that stands for the initial sound and tells whether two words do or do not begin alike; or supplies another word that begins with the same sound.

2) Ending consonant sounds

Objective: Given real or nonsense words pronounced by the teacher, the child identifies the letter that stands for the ending sound and tells whether two words do or do not end alike; or supplies another word that ends with the same sound.

b. Consonant blends

Objective: Given real or nonsense words that begin with the consonant blends bl, cl, fl, gl, pl, sl, br, cr, dr, fr, gr, pr, tr, the child identifies the two letters that stand for the initial blend in words pronounced by the teacher; or identifies words that begin with the same blend as a stimulus word pronounced by the teacher and pronounces words that begin with the blends listed above.

c. Rhyming elements

Objective: Given a word, the child selects a rhyming word based on structure (e.g., man, pan, and fan are from the same word family); or supplies a real or nonsense rhyming word based on structure.

d. Short vowels

Objective: Given a one-syllable word with a single short vowel sound pronounced by the teacher (e.g., man, duck, doll, hop), the child identifies the letter that stands for the vowel sound or reproduces the vowel sound.

e. Simple consonant digraphs

Objective: Given real or nonsense words pronounced by the teacher, the child identifies the letters in the simple two-consonant combinations sh, ch, th, that result in a single new sound.

4. Has structural analysis skills

a. Compound words

Objective: The child identifies compound words; or specifies the elements of a compound word.

b. Contractions

Objective: The child identifies simple contractions (e.g., I'm, it's, can't) and uses contractions correctly in sentences.

c. Base words and endings

Objective: The child identifies the root word in familiar inflected words (e.g., jumping, catches, runs).

d. Plurals

Objective: The child tells whether familiar words (noun plus s or es) are singular or plural.

e. Possessive forms

Objective: The child identifies the possessive forms of nouns used in context.

Level C

The child ...

1. Has a sight word vocabulary

Objective: Given a maximum one-second exposure per word, the child recognizes first grade words from the adapted Dolch sight vocabulary list.

2. Has phonic analysis skills

a. Consonants and their variant sounds

Objective: Given words containing variant sounds of c, s, and g (e.g., cake-city, sit-trees, go-giant), the child indicates whether the underlined letters in given pairs of words have the same or different sounds.

Note: Although the consonants c, g, s, q, d, x, t, and z have more than one sound, variant sounds of c, s, and g are most common at this level.

b. Consonant blends

Objective: Given real or nonsense words beginning with the consonant blends st, sk, sm, sp, sw, sn, the child identifies the two letters that stand for the initial blend in words pronounced by the teacher; or identifies words that begin with the same blend as a stimulus word pronounced by the teacher and pronounces words that begin with the blends listed above.

c. Vowel sounds

1) Long vowel sounds

Objective: The child identifies the letter that stands for a single vowel sound in real or nonsense words pronounced by the teacher (e.g., nose, brile, cheese, seat, labe, run, mab) and indicates whether the sound is long or short; or pronounces real or nonsense words with a single vowel sound.

2) Vowel plus r

Objective: The child identifies the vowel that is with r in real or nonsense words pronounced by the teacher (e.g., darl, der, mur, form, girt); or pronounces words with r-controlled vowels (e.g., part, fur, hurt, bird).

Note: Because er, ir, and ur have the same sound e, i, or u is the appropriate response in er, ir, and ur words.

3) a plus l

Objective: The child identifies the letters that stand for the al sound in real or nonsense words pronounced by the teacher; or pronounces words in which there is an al combination (e.g., salt, ball zall).

4) a plus w

Objective: The child identifies the letters that stand for the aw sound in real or nonsense words pronounced by the teacher; or pronounces words in which there is an aw combination (e.g., draw, saw, blaw).

5) Diphthongs ew, oi, oy, ou, ow

Objective: Given words containing ew, oi, oy, ou, ow, the child identifies the diphthongs in nonsense words pronounced by the teacher; or pronounces words containing diphthongs.

6) Long and short oo

Objective: The child indicates whether the oo in words has the long oo (e.g., choose) or the short oo (e.g., book) sound; or pronounces words in which there is an oo combination.

d. Vowel generalizations

1) Short vowel generalization

Objective: Given real or nonsense words in which there is a single vowel and a final consonant (e.g., bag, bis, cat, gum), the child tells whether the words are pronounced according to the generalization; or pronounces the words giving the vowel its short sound.

Note: Children should learn that some familiar sight words are exceptions to this generalization (e.g., bold, find, sight, wild).

2) Silent e generalization

Objective: Given real or nonsense words that have two vowels, one of which is a final e separated from the first vowel by a consonant (e.g., cake, cube, mape, jome), the child tells whether the words are pronounced according to the generalization; or first attempts pronunciation by making the first vowel long and the final e silent.

Note: Children should learn that some familiar sight words are exceptions to this generalization (e.g., come, have, prove).

3) Two vowels together generalization

Objective: Given real or nonsense words that have two consecutive vowels (e.g., boat, meet, bait, deach), the child tells whether the words are pronounced according to the generalization; or first attempts pronunciation by making the first vowel long and the second vowel silent.

Note: Children should learn that some familiar sight words (e.g., bread, August) and words containing diphthongs are exceptions to this generalization.

4) Final vowel generalization

Objective: Given real or nonsense words in which the only vowel is at the end (e.g., go, she, thi), the child tells whether the words are pronounced according to the generalization; or pronounces the words giving the vowel its long sound.

Note: Children should learn that some familiar sight words are exceptions to this generalization (e.g., do, who).

5) Common consonant digraphs

Objective: Given real or nonsense words pronounced by the teacher, the child identifies the letters in the two consonant combinations ch, nk, sh, ng, th, wh, that result in a single new sound.

3. Has structural analysis skills

   a. Base words with prefixes and suffixes

      Objective: The child selects base words with or without affixes that are appropriate to the context.

   b. More difficult plural forms

      Objective: The child tells whether more difficult plural forms (e.g., mice, ladies, children) are singular or plural.

4. Distinguishes among homonyms, synonyms, and antonyms

   a. Homonyms

      Objective: Given a sentence context, the child chooses between homonyms (e.g., Mother bought some meet/meat for dinner).

   b. Synonyms and antonyms

      Objective: The child tells whether words in a pair have the same, opposite, or simply different meanings.

5. Has independent and varied word attack skills

   Objective: In both self-directed and teacher-directed reading, the child uses a variety of skills (e.g., picture clues, context clues, structural analysis, sound/symbol analysis, comparison of new to known words) in attacking unknown words.

   Note: The objective can be assessed through an individually administered informal reading inventory or by teacher observation.

6. Chooses appropriate meaning of multiple meaning words

   Objective: Given a multiple meaning word in varied contexts, the child chooses the meaning appropriate to a particular context.

Level D

The child ...

1. Has a sight word vocabulary

Objective: Given a maximum one-second exposure per word, the child recognizes second and third grade words from the adapted Dolch sight vocabulary list.

2. Has phonic analysis skills

   a. Three-letter consonant blends

      Objective: The child identifies the letters in the three-letter blends scr, shr, spl, spr, str, thr, in real or nonsense words pronounced by the teacher.

   b. Simple principles of silent letters

      Objective: Given words containing silent letters (e.g., knife, gnat, write, dumb, doubt, high, flight, eat, four, believed), the child identifies the silent letters; or pronounces words containing silent letters.

      Note: Silent consonants commonly occur in the following combinations: (k)n, (g)n, (w)r, m(b), (b)t, i(gh), (t)ch.

3. Has structural analysis skills

   a. Syllabication

      Objective: The child divides words into single-vowel sound units by applying syllabication generalizations.

   b. Accent

      Objective: The child indicates the accented part (syllable) in familiar words, primarily two-syllable ones.

   c. Unaccented schwa

      Objective: Given words that he knows, the child specifies the unaccented syllable containing a schwa.

      Note: Although the short sound of u in, say, puppy has the same sound as that of the schwa, it is not a schwa because it is in the accented syllable.

   d. Possessive forms

      Objective: The child identifies possessive nouns and pronouns used in context.

BREAKDOWN OF THE ADAPTED DOLCH BASIC WORD LIST BY LEVELS.

Level B: Preprimer

| | | | | |
|---|---|---|---|---|
| a | find | is | not | three |
| and | for | it | one | to |
| away | funny | jump | play | two |
| big | go | little | red | up |
| blue | help | look | run | we |
| can | here | make | said | where |
| come | I | me | see | yellow |
| down | in | my | the | you |

Level B: Primer

| | | | | |
|---|---|---|---|---|
| all | do | no | say | want |
| am | eat | now | she | was |
| are | four | on | so | well |
| at | get | our | soon | went |
| ate | good | out | that | what |
| be | have | please | there | white |
| black | he | pretty | they | who |
| brown | into | ran | this | will |
| but | like | ride | too | with |
| came | must | saw | under | yes |
| did | new | | | |

Level C: First Grade

| | | | | |
|---|---|---|---|---|
| after | fly | his | old | take |
| again | from | how | once | thank |
| an | give | just | open | them |
| any | going | know | over | then |
| as | had | let | put | think |
| ask | has | live | round | walk |
| by | her | may | some | were |
| could | him | of | stop | when |
| every | | | | |

## Level D: Second Grade

| | | | | |
|---|---|---|---|---|
| always | does | its | sit | very |
| around | don't | made | sleep | wash |
| because | fast | many | tell | which |
| been | first | off | their | why |
| before | five | or | these | wish |
| best | found | pull | those | work |
| both | gave | read | upon | would |
| buy | goes | right | us | write |
| call | green | sing | use | your |
| cold | | | | |

## Level D: Third Grade

| | | | | |
|---|---|---|---|---|
| about | eight | hurt | myself | six |
| better | fall | if | never | small |
| bring | far | keep | only | start |
| carry | full | kind | own | ten |
| clean | got | laugh | pick | today |
| cut | grow | light | seven | together |
| done | hold | long | shall | try |
| draw | hot | much | show | warm |
| drink | | | | |