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AN EVALUATION OF THE INDUCTIVE AND DEDUCTIVE GROUP APPROACHES TO TEACHING SELECTED WORD ANALYSIS GENERALIZATIONS TO DISABLED READERS IN EIGHTH AND NINTH GRADES.

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THE RELATIVE EFFECTIVENESS OF INDUCTIVE AND DEDUCTIVE APPROACHES TO THE INSTRUCTION OF WORD ANALYSIS TASKS WAS STUDIED. A NUMBER OF PHONIC AND STRUCTURAL ANALYSIS GENERALIZATIONS, APPLIED TO THE PRONUNCIATION OF WORDS ABOVE THE PRIMARY LEVEL IN DIFFICULTY, WERE PRESENTED TO EIGHTH- AND NINTH-GRADERS OF AVERAGE MENTAL ABILITY BUT WHO WERE WEAK IN WORD ANALYSIS. RESULTS INDICATED THAT BOTH EXPERIMENTAL GROUPS, INDUCTIVE AND DEDUCTIVE, DIFFERED ON TOTAL MEAN SCORES FROM A CONTROL GROUP. THE EXPERIMENTAL GROUPS WERE SUPERIOR IN ORAL READING BUT NOT IN SILENT READING. (GD)

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RESEARCH AND DEVELOPMENT
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AND RE-EDUCATION

Technical Report No. 12

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FOREWORD

This technical report is based on the doctoral dissertation of Lou E. Burmeister. Members of the examining committee were Theodore L. Harris, Chairman; Frank B. Baker; Thomas C. Barrett; Herbert J. Klausmeier; and Wayne Otto.

Through synthesizing present knowledge and conducting research to generate new knowledge about human learning and variables associated with efficiency of school learning, the R & D Center for Learning and Re-education is working toward its primary goal of improving cognitive learning in children and adults, commensurate with good personality development. Knowledge is being focused upon the three main problem areas of the Center: developing exemplary instructional systems, refining the science of human behavior and learning on the one hand and the technology of instruction on the other, and inventing new models for school experimentation, development activities, etc.

Miss Burmeister focused her two-phase study on an area of instruction basic to all learning. She identified phonic and structural analysis generalizations of a high utility level and arranged for the teaching of those generalizations to disabled readers in eighth and ninth grade. The superiority of the two experimental groups after only two weeks instruction is noteworthy; differences between the control group and the experimental groups were significant on tests of oral reading although not on tests of silent reading. This study holds important implications for long-term instruction in word analysis generalizations.

Herbert J. Klausmeier
Co-Director for Research

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ABSTRACT

The purpose of this study was to identify a minimum number of phonic and structural analysis generalizations which apply to the pronunciation of words above the primary level in difficulty and to determine the value, for eighth and ninth grade students who are of average mental ability but who are weak in word analysis, of learning these generalizations by the inductive and deductive approaches.

A fourteen level stratified random sampling of the Thorndike and Lorge Teacher's Word Book of 30, 000 Words was examined to determine utility levels of selected phonics and structural analysis generalizations. Generalizations describing the pronunciation of double and triple vowels were arrived at inductively. Criteria used in the selection of the generalizations to be taught were need of the students to be taught and approximately a 90 per cent or better utility level for the generalization. The desired high utility level necessitated modifying some of the generalizations as they are commonly taught.

The following were deemed desirable to teach: three structural and three phonic syllabication generalizations; generalizations concerned with the pronunciation of "c" and "g" as either hard or soft; generalizations concerned with the pronunciation of vowels—including single vowels in open and closed syllables, the effect of the "final e," and the following adjacent-vowel situations: ai, ay, ea, ee, oa, ow; au, ou, oi, oy, oo; ei and ie; ia; ia and io following certain consonants (c, t, s); and common suffixes; tion, sion, cious, consonant plus ous, ious, eous.

The two-week instructional plans were written to be used in the teaching of these generalizations, one of which followed an inductive approach and one a deductive approach. A posttest-only control group design was used, with intact classes assigned to method at random. Each of ten teachers had three classes, one of which was assigned to the inductive approach, one to the deductive approach, and one to the control. Nine randomly selected disabled readers within each class served as the sample. Sample means were used in the analyses. Delayed, unannounced posttests were given from two and one-half to three weeks after completion of the teaching.

A one-way analysis of variance of the oral posttest data, testing pronunciation ability, showed that there were differences among the groups, significant at the .01 level. The Scheffé confidence interval formula indicated that it was the two experimental groups, together, which differed from the Control group and that the Inductive and Deductive groups were not significantly different. Improvement, therefore, was independent of the methods used in this study. A one-way analysis of variance of the silent posttest data, testing meaning vocabulary, indicated that there were no significant differences among the groups on this test. Total means of the experimental groups were in all cases superior to the total means of the Control group.

I

GENERAL PROBLEM

SIGNIFICANCE OF THE STUDY

Topic

Anyone who has taught in junior or senior high school realizes that there are many students—even many good students—at these levels who are weak in word analysis ability; that is, they are weak in the ability to pronounce written words which are not in their sight vocabularies.

Word analysis generalizations, otherwise known as phonic and structural analysis generalizations, are among the tools which might help students pronounce these words. In The Torch Lighters Mary Austin says:

> While it has been recommended that no one method of word attack, in particular, phonetic analysis, be used to the exclusion of all others, it is assumed that phonetic and structural analysis will be included in any list of techniques of word recognition (1961, p. 146).

And from "A Report of a Conference of Reading Experts" comes the following quotation:

> We consider phonics one of the essential skills that help children identify printed words that they have not seen before and then understand the meaning that those words represent. Without phonics most children cannot become self-reliant, discriminating, efficient readers (1962, pp. 3–4).

The person who agrees in principle that the teaching of word analysis generalizations is desirable might very likely flounder, however, when he begins to make decisions about which generalizations ought to be taught. Anyone examining the literature will find scores of generalizations, and evidence is beginning to accrue which would make any interested observer question the value of most of them.

For example, recent research which was designed to examine the value of commonly taught phonic generalizations in the primary grades (see Chapter I) has indicated that some of these generalizations have extremely low utility levels[1] when they are applied to basal materials that run the gamut of the primary grades (Clymer, 1963). In fact, it has been found that there are more instances of exception to many "generalizations" than there are instances of application. Because of such findings, it seems apparent that teaching phonics and structural analysis generalizations—or teaching more phonics and structural analysis generalizations—in itself is not the answer.

If we wish to help junior and senior high school students who are not severely retarded in word analysis, a study is needed to identify generalizations which have high frequency and utility value for words above the primary level in difficulty, and a study is needed to determine the value of teaching these generalizations. Of great interest, in addition, is the identification of a teaching approach which will best facilitate retention and transfer value. Since a considerable amount of research today is focusing on determining the relative values of the inductive and deductive approaches, the experimental part of the present study has been designed with the hope that it will cast additional light on this matter.

Level

Students above the primary level would benefit from knowing the generalizations incorporated in the lesson plans of the present study because these generalizations apply to most

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[1] The "utility level," or per cent of utility, of a generalization is computed by dividing the total number of instances in which the generalization under consideration is followed in the sample material by the total number of instances in which it could be expected to be followed.

words commonly found at the fourth-grade level and above. They should be particularly helpful to children who are functioning above the fourth-grade (4.0) level in word attack who are able to utilize generalizations in a learning situation.

The reasons for using eighth- and ninth-grade students in the present study are:

1. There is a need among many junior and senior high school students for such help; eighth and ninth grade represent both levels, and are close enough together to be used in one statistical analysis.

2. Junior and senior high school teachers frequently feel that the teaching of phonics to their students is either undesirable or is an impossible feat, perhaps for several reasons: they may feel that it is already too late to reach these students unless the students get special remedial help from a reading specialist; they may feel that it is not a part of their duty; or they may feel that it is too difficult a task for them since most of these teachers are not too familiar with phonic generalizations themselves.

Mary Austin says:

> Unfortunately, many prospective teachers themselves do not know these (phonetic and structural analysis) techniques. Many of the current generation of college students were taught to read by methods which did not include structural and phonetic analysis and thus have never been exposed to them. If they are to be able to use a variety of approaches in their teaching, they should know the basic elements of these ways of unlocking words (Austin, 1961, p. 146).

Conant (1963), in The Education of American Teachers, argues for giving every prospective elementary school teacher "a thorough grounding in the basic reading skills and the extension of these basic skills into the upper grade reading program" (pp. 156-157). He adds, "a future (high school) English teacher should have . . . given some time to familiarizing himself with . . . reading problems" (p. 173).

Added to this can be the results of a recent study by Spache and Baggett (1965) which indicate that teachers, including junior and senior high school teachers, who have been in the profession for several, or perhaps many years are unfamiliar with many important phonic and syllabication generalizations. Similar studies have been reported (Aaron, 1960; Schubert, 1959).

One of the by-products of this study is to show teachers who may have been untrained in teaching phonics that for them learning the generalizations is not overly difficult and that teaching these generalizations can be done profitably in a short period of time.

Attack

The choice of The Teacher's Word Book of 30,000 Words by Thorndike and Lorge (1944) for selecting sample material can be justified on the grounds that it contains and classifies words of varying levels of frequency and presumably of varying levels of difficulty. It is the only notable publication in the field. Children's Knowledge of Words, by Edgar Dale and Gerhard Eichholz (1960), another possible choice, presented the familiarity scores on 17,350 words in grades 4, 6, 8, 10, and 12. This, however, was an interim report and is out of print.

The American College Dictionary (Barnhart, 1961) is considered by all to be a reputable work. Its editorial advisory committee contains such famous linguists as Charles Fries, Leonard Bloomfield, and Bernard Bloch, and, in addition, Irving Lorge, Kemp Malone, and W. Cabell Greet. Its editor-in-chief is C. L. Barnhart. It utilizes the schwa symbol, the symbol for the most common vowel sound in American English today, and, therefore, gets closer to the realities of pronunciation than do more conservative dictionaries in this respect.

With The Teacher's Word Book of 30,000 Words and The American College Dictionary as authorities, the writer had only to make an academic analysis of the words to determine utility levels of generalizations. The size of the sample was felt to be adequate since there was a high degree of consistency in utility levels when moving from subsample to subsample. This was not the case with the adjacent vowel situations, and, therefore, the sample for inductively formulating these generalizations was approximately tripled.

The generalizations themselves are of little value unless it can be determined that the learning of them will result in improved word attack, and hopefully this will lead to improvement in word recognition as measured by increased understanding of the printed word.

SPECIFIC PURPOSES OF THE STUDY

The specific purposes of the present study are:

1. to identify a minimum number of important phonic and structural analysis generalizations which apply to the pronunciation of words above the primary level in difficulty, and

2. to determine the value—for eighth and ninth grade students who are of average mental ability but who are weak in word analysis—of learning these generalizations by the inductive and deductive approaches.

MAJOR QUESTIONS

The question related to Purpose 1 is: Which phonic and structural analysis generalizations should be taught to disabled readers in junior and senior high school?

Questions related to Purpose 2 are: When the generalizations deemed important in the first part of the present study are the learning materials, (1) is the inductive or deductive approach more effective in bringing about improvement in word recognition as measured by the ability to pronounce the key words in the "Reading Vocabulary Test" of the Gates Reading Survey (16) test? (2) Is the inductive or deductive approach more effective in bringing about improvement in word recognition as measured by the ability to select the synonyms for the key words from the multiple choice items following each key word in the "Reading Vocabulary Test" of the Gates Reading Survey test?

II

IDENTIFICATION OF PHONIC GENERALIZATIONS TO BE TAUGHT

RELATED LITERATURE

In order to answer the question: "Which phonics and structural analysis generalizations should be taught to disabled junior and senior high school readers?" a review of the literature in the field was undertaken.

No researcher has addressed himself to this specific question. However, a related question has been answered in whole or in part by several reading specialists. Their concern was more specifically with which sight words and which phonics and structural analysis skills were important in teaching reading in the primary grades, some going as high as the fourth-grade level, but only Dolch higher than this.

Most of these writers sampled primary reading materials, especially basal readers; and their generalizations, as well as the utility levels of these generalizations, when ascertained, were formed on words appearing at these levels. Except in Dolch's (1955) study, difficult words were not included in their analyses.

The most prominent of these studies, in chronological order, were those done by Vogel, Jaycox, and Washburne (1923), Horn (1929), Dolch (1939), Oaks (1952), Black (1952), Dolch (1955), Fry (1960), Clymer (1963), and Fry (1964).

Dolch (1939) and Fry (1960) each contributed a list of words which they felt children at the various levels through third grade should have in their sight vocabularies. Dolch's list contains 220 words and is a classic in the field; Fry's newer list contains 300 "Instant Words." These lists do not contribute anything to phonic inquiry, but they may serve as an adjunct in a remedial or developmental situation.

Vogel, Jaycox, and Washburne (1923) asked, "What phonograms will be most helpful to children in sounding out new words?" A phonogram was defined in this study as "any group of letters consisting of one or more vowels followed by one or more consonants."

Every phonogram which occurred in the Twentieth Yearbook of the NSSE (Packer, 1921) word list from a number of primers and first readers was tabulated according to the number of "book-words"[2] in which it occurred. "Altogether, 345 such phonograms were found and ranked, from 'er' (as an ending) with 425 book-words down to such phonograms as 'ode' with only one book-word" (Vogel, Jaycox, & Washburne, 1923, p. 438). The relative importance of the first fifty of these phonograms in ten more modern primers and first readers was then investigated, and the final results were tabulated.

The list, undoubtedly of value, has one serious shortcoming. The utility levels of the generalizations were not ascertained. For example, there were 325 book-words in which the initial vowel was lengthened by a silent "final e"; no statement was made about the number of book-words in which the initial vowel was not lengthened by a silent "final e." Also, according to this study "ea" is pronounced as in "eat" in 135 book-words and as in "bread" in 51 book-words. First graders were taught the "final vowel-consonant-e" rule and were also taught that "ea" has a "long e" sound; no mention was made, even in second or third grade, that "ea" often has a "short e" sound because phonograms for the higher levels were taken from other sources, and "ea" as in "bread" again did not enter the high-frequency list. The same thing happened with other phonograms.

An important contribution of this article is the rank listing of initial consonant combinations, in order of importance: "st, th, sh, gr, br, dr, wh, pl, fl, sp, ch, bl, sw, tr, cr, cl, sl, sn, sm, tw" (Vogel, Jaycox, & Washburne, 1923, p. 440).

Oaks (1952) examined primary basal readers, concentrating on analyzing vowel sounds. She asked the following questions:

1. What types of vowel situations occur in the vocabularies of basal readers de-

[2] The total number of "book-words" for a word is the total number of books in the sample material in which the word is found.

signed for use in the primary grades? Included in this question was: (a) At what reader level does each of the vowel situations first appear? and (b) What is the incidence of each vowel situation at each reader level?

2. What principles are basic to the pronunciation of the vowels? (a) What is the incidence of applications of each of the principles? (b) What is the incidence of exceptions to these principles?
3. What other factors are involved in the pronunciation of the vowels? (a) What is the incidence of the vowel situations in which the pronunciation is modified by lack of stress? (b) What is the incidence of situations in which the vowel is silent? (p. 604)

From evidence gained in this study, Oaks defined eight principles which she felt were basic to the pronunciation of vowel letters. They embraced the following situations and had the following percentages of application:

1. "When a stressed syllable ends in 'e,' the first vowel in the syllable has its own 'long' sound and the final 'e' is silent." Primer reader, 53%; first reader, 56%; second reader, 67%; third reader, 71%.
2. "When a stressed syllable containing only one vowel ends with that vowel, the vowel has its own 'long' sound." Primer, 71%; first, 81%; second, 85%; third, 89%.
3. "When there is only one vowel in a stressed syllable and that vowel is followed by a consonant, the vowel has its 'short' sound." Primer, 74%; first, 69%; second, 66%; third, 70%.
4. "When a word of more than one syllable ends with the letter 'y,' the final 'y' has the sound of 'short i.' When a word of more than one syllable ends with the letters 'ey,' the 'e' is silent and the 'y' again has the sound of 'short i.'" Primer, 100%; first, 100%; second, 100%; third, 100%.
5. "When a syllable contains only the one vowel, 'a,' followed by the letters 'l' or 'w,' the sound of the 'a' rhymes with the word 'saw.'" Primer, 100%; first, 86%; second, 96%; third, 95%.
6. "When there are two adjacent vowels in a syllable, the first vowel has its own 'long' sound and the second vowel is silent." Primer, 50%; first, 49%; second, 47%; third, 51%.
7. "When, in a word of more than one syllable, the final syllable ends in the letters 'le,' the 'l' becomes syllabic (i.e., it functions as a vowel) and is pronounced, but the 'e' is silent." Primer, 100%; first, 100%; second, 100%; third, 100%.
8. "When, in a word of more than one syllable, the final syllable ends in the letters 'en,' the 'n' becomes syllabic and is pronounced, but the 'e' is silent." Primer, no occurrences; first, 100%; second, 100%; third reader, 100%.

(Oaks, 1952, pp. 609–610, 612)

According to Oaks, these principles or exceptions to them operated in approximately 70 per cent of the <u>total</u> vowel situations. The principles were applicable in approximately 50 per cent of the <u>total</u> vowel situations. In general, the principles with high percentages of application represented a relatively small number of vowel situations.

Horn (1929) looked at just the letter "a" and asked: "What varieties of experiences may a child be expected to have with the letter 'a' in Grades I to III?" Horn found that "a" by itself or in combination with another vowel can take on eighteen different sounds (according to Webster's <u>New International Dictionary</u>). He also found that--

> "It is interesting to note here a very early and frequent exception to the effect of the final 'e' as given in most phonic systems."
>
> And, "It is interesting to note in the word <u>diamond</u> that the 'ia,' which appears several places in the table as a digraph, is here separated into the vowels 'i' and 'a,' which appear in different syllables."
>
> He continued: "Indeed, from the point of view of the primary child there are additional complications due to the fact that some of the vowels with which the letter 'a' sometimes forms a digraph are not infrequently separated from 'a' in syllabication, influence the sound of consonants, or are actually used as consonants" (Horn, 1929, pp. 165, 167).

Horn cautions, "One cannot, of course, conclude from these data that phonics should not be taught. One can only conclude that plans for teaching phonics must take into account such facts as are here presented. When this is done, the results of teaching phonics will undoubtedly be more satisfactory" (p. 168).

A different focal point was used by Black (1952), who examined the pronunciation of consonants in syllabic situations in a primary reading vocabulary. Data were obtained on the following questions:

1. What is the incidence of the following consonant situations, when analyzed according to their (a) initial and (b) final syllabic positions:
   a. single consonant letters ?
   b. consonant digraphs ?
   c. consonant trigraphs ?
   d. consonant blends ?
   e. syllabic consonants and blends ?
2. What is the incidence of letter "r" situations ?
3. What is the incidence of consonant phonograms containing silent letters ?

(Black, 1952, p. 618)

Only base forms and compound words were selected for analysis. Reader levels ranged from primer through third grade (Betts' Primary Reading Vocabulary Studies).

The second question is most pertinent to the present study. Black found that:

> Of the consonant and vowel-colored "r" situations analyzed in this study, 606 involved letter "r." These accounted for 14.9% of all consonant situations tabulated.
> a. A total of 264 letter "r" phonograms, 6.5% of all consonant situations, appeared in initial syllabic positions.
> b. Thirty vowel-colored "r" situations (e.g., bird), comprising .7% of the total consonant situations, appeared in medial positions.
> c. There were 310 letter "r" situations, 7.7% of all consonant situations in the vocabulary, identified in final parts of syllables.
> d. Letter "r" situations appeared at all reader levels encompassed by this study.
>
> (Black, 1952, p. 621)

In his article entitled "Recognition of Long Words," Dolch (1955) said: "If we think of the three primary grades as the time to learn the common words, that is, the 'little words,' we can then think of all the rest of schooling as the time for the 'big words'" (p. 604).

Dolch drew an analogy with the spelling lists used in schools. The words on these lists, he said are

> ...obviously common words. But look at the lists for the various school years. It will be found that during the primary years, the great majority of the words are monosyllables, or little words.... Beginning with the fifth year list (words met with during the fourth year of reading) the lists are about half polysyllables. . . . The real point is that, beginning with the new subjects of the fourth grade and for the rest of school and of after life, the problem of every school subject and of every kind of reading is the "long word" or the polysyllable (Dolch, 1955, p. 604).

How should the long words be attacked? Dolch suggested that, "The study of prefixes and suffixes would naturally begin with the third grade perhaps, and continue on through all the other grades and into high school" (p. 605). He stressed the importance of not crowding this into a short period of time, but of making it a natural part of learning at all times.

Dolch added that "the greatest defect of the approach through prefixes and suffixes is that these concern relatively few words and do not give a general method of attack on all long words. Stauffer found that 24 per cent of Thorndike's 20,000 words have prefixes, but this also says that 76 per cent of those common words do not" (p. 605). Dolch continued:

> A second common attack on long words is "finding small words in the big words." ...The results showed that, about 40% of the time, the correct word resulted, and about 60% of the time, the wrong result was found. . . .this method cannot be fully recommended.
>
> Third, the most common method of teaching attack on long words is just showing how particular words are actually divided. . . . This telling how particular words are divided does not give a method. It does not give rules (Dolch, 1955, p. 605).

The rules Dolch stressed as being important are:

1. Every vowel or vowel combination means a syllable.
2. Divide syllables between two consonants that are between vowels or in front of one consonant that is between vowels.... But children should look out for the digraphs, such as th, ch, and so on. They are never divided.

3. Usually a syllable that ends in a vowel has the long vowel sound, and a syllable that ends in a consonant has the short sound of the vowel. . . .For recognition, we recommend that the child try the sound that the rule would give; and if the word is not recognized, try the other sound. ...We must also look out for the vowel with "r," as the "r" is practically never divided from the vowel, and it (the vowel) has a special sound (Dolch, 1955, pp. 606-607).

From an extensive study, Clymer (1963) reported on the utility levels of forty-five phonic generalizations found in grades one to three in four basal series: American Book Company, Scott-Foresman, Ginn, and Macmillan. Clymer used the combined vocabularies of these three levels from the four series to determine the percent of utility of these generalizations. He did not publicize the utility level of any of the generalizations at any specific primary level, nor did he publicize the utility level of a generalization for a specific basal series.

From this study, eighteen generalizations were identified as having, according to Clymer, a "'reasonable' degree of application." His criteria for "reasonableness" were:

1. ...the composite word list must contain a minimum of twenty words to which the generalization might apply. Generalizations with lower frequencies of application do not seem to merit instructional time.
2. ...a percent of utility of at least 75 (Clymer, 1963, p. 255).

He, however, made the point that this study did not establish the per cent of utility required for a generalization to be useful, and that 75 per cent might be too high.

Fry (1964) asked, "What is the most useful phonics rule that I can teach a child? What is the next most important phonics rule to teach a child that will have the widest applicability? etc." (p. 759).

Fry formulated his rules from his own experiences in a reading clinic situation and then ranked them according to their frequency of use "as determined by Moore's (1951) frequency count of 3,000 common English words." Sister Mary Carla Black (1961) then applied them to 1,300 English words: the 600 commonest English words (Instant Words) and 700 words from a fourth grade social studies book which were not instant words. According to Fry, "Black's count confirmed the importance of the rules as well as the order in which they were ranked."

Fry (1964) says, "...many old standby rules of phonics, such as the Short Vowel, and Final E Rules are borne out by the frequency count" (p. 760). Also,

> Possibly the more unique features of these studies are:
>
> 1. The relative high importance of the "schwa" sound.
> 2. The small number of combinations (seven) for the long vowel digraph.
> 3. The importance of the R Rule and the Y Rule, including the teaching that Y has a long E sound at the end of a word.
> 4. The fact that there are relatively few exceptions to these rules and that none other than those mentioned are worth teaching beginning readers.
>
> (Fry, 1964, p. 760)

Fry did not compute utility levels of generalizations—a serious shortcoming of this research, as it was also of Vogel, Jaycox, and Washburne's. Fry says, "Despite frequency as a gauge of importance, the problem of frequency of exception has also troubled us. While I do not claim to have done a thorough study on this, some attempt was made by Black, and all the rules are good except the Syllable Ending Rule. Part of the problem is that single vowels frequently tend to have the schwa or other sounds. Therefore, the Syllable Ending Rule has limited usefulness and may with more research have to be discarded (p. 760)."

ANALYSIS UNDERTAKEN IN THE PRESENT STUDY

The writer of the present study, in an attempt to identify and to find utility levels of generalizations which are important for sounding out difficult words, used stratified random samplings from The Teacher's Word Book of 30,000 Words, "Part I: List of Words Occurring at Least Once per 1,000,000 Words, Column G" (31). The words were selected in the following ways:

Words occurring the following number of times per million running words:

100 or more	- 5% sample	- 54	words
50 - 99	- 5% "	- 47	"
38 - 49	- 5% "	- 23	"
30 - 37	- 5% "	- 24	"
24 - 29	- 5% "	- 23	"
20 - 23	- 5% "	- 22	"
16 - 19	- 5% "	- 32	"

13 - 15	- 5%	sample - 30	words
10 - 12	- 5%	" - 47	"
8 - 9	- 5%	" - 48	"
6 - 7	- 5%	" - 65	"
4 - 5	- 2.7%	" - 52	"
2 - 3	- 1.3%	" - 52	"
1	- 1.0%	" - 52	"

The 5 per cent samples were taken starting with the seventh word in each stratification in the complete alphabetical list and taking every twentieth word following that. The "4-5," "2-3," and "1" stratifications were taken by listing the first word in the appropriate stratification in every eighth column of the list, "4-5" starting with column 3; "2-3" starting with column 1; "1" starting with column 2, the starting points being randomly selected.

The pronunciation of each word as given in the American College Dictionary (2) was recorded. Each word was then analyzed to determine whether or not it followed basic pronunciation generalizations appropriate to the spelling of that word. These generalizations are:

1. those related to syllabication
   a. determination of a syllable
      1.) Every single vowel means a syllable (excluding "final e," except "final consonant-l-e").
      2.) Every vowel combination means a syllable.
   b. structural syllabication
      1.) Divide between a prefix and a root.
      2.) Divide between two roots.
      3.) Divide between a root and a suffix.
   c. phonic syllabication (applied only when structural syllabication generalizations do not apply)
      1.) When two vowel sounds are separated by two consonants, divide between the consonants, but consider "ph," "ch," "sh," and "th" to be single consonants.
      2.) When two vowel sounds are separated by one consonant, divide before the consonant, but consider "ph," "ch," "sh," and "th" to be single consonants.
      3.) If a word ends with a "consonant-l-e," these three letters form a syllable.

2. those related to the sounds of "c" and "g"
   a. "C" followed by "e," "i," or "y" sounds soft; otherwise "c" is hard (omit "ch").
   b. "G" followed by "e," "i," or "y" sounds soft; otherwise "g" is hard (omit "gh").

3. those related to nonadjacent vowels
   a. one vowel in a syllable
      1.) open syllable
         a.) The vowel in an open syllable has a long sound (omit final syllable of a word ending in "consonant + y").
         b.) When "consonant + y" are the final letters in a monosyllabic word, the "y" has a "long i" sound; in a polysyllabic word the "y" has a "short i" ("long e") sound.
      2.) closed syllable
         A single vowel in a closed syllable has a short sound (consider "final consonant-l-e" to be "final consonant-e-l," and, therefore, a closed syllable).
   b. final vowel-consonant-e
      When a word ends in "vowel-consonant-e," the vowel is long, and the "e" is silent.

Unless otherwise noted, the utility level of each of these generalizations as given in the charts of this chapter was computed on the total stratified sample. Raw data and the utility levels of individual stratifications are available in the original report (Burmeister, 1966).

Generalizations appropriate for adjacent vowels were formulated in a different manner. The writer felt that the number of words with double or triple vowels in them was too small in this sampling to enable her to make any valid generalizations, or to verify or refute generalizations made by other writers.[3] Therefore, the sampling for adjacent-vowel generalizations was approximately tripled: a ten per cent stratified random sampling of The Teacher's Word Book of 30,000 Words was used, and 205 additional words with adjacent vowels were added to the sampling—the last word on each page of the Thorndike-Lorge list which contained an adjacent-vowel situation.

Each adjacent-vowel situation was then analyzed, again using the American College Dictionary as the authority, and generalizations covering commonly found adjacent-vowel situa-

[3] The reader may wish to see "When 'Two Vowels Go Walking'" (Burrows & Zyra, 1963).

tions were formulated inductively, and their utility levels were ascertained. These situations were: ai, ay, ea, ee, oa, ow; au, u, oi, oy, oo; ei and ie; ia; ia and io following certain consonants (c, t, s); and common suffixes: tion, sion, cious, consonant plus ous, ious, eous.

A "long vowel" was defined in the present study as one that is the same as the name of the vowel symbol. It is indicated in the respelling in the American College Dictionary by a macron placed above the vowel symbol, and in the case of the letter "a," it may also be marked "ä": long "a" before an "r," as in "dare, chair."

A "short vowel" was defined as any other single vowel sound, represented by the:

a in hat	o in box
a in father	u in cup
e in ebb	u in hurt
i in if	a, e, i, o, u as a schwa ("ə") as in alone, system, easily, gallop, circus

FINDINGS IN RELATED LITERATURE AND THE PRESENT STUDY

The table that follows gives the utility levels of the generalizations of the present study as well as those of the same or related generalizations found in the literature or the field. An asterisk is used to indicate that the study recommends the teaching of the generalization but no utility level was computed. From this table it can be seen that variations in the statements of the generalizations as well as the use of different sampling materials may result in slight to meaningful differences in utility levels.

CONCLUSIONS FOR THE LESSON PLANS

The present study reinforces some observations made by Clymer (1963), Fry (1964), and Dolch (1955). It also contradicts or modifies some made by Fry, Dolch, and Oaks (1952). It emphasizes the importance of making utility level studies rather than frequency counts for phonic generalizations.

Common structural syllabication generalizations were found to have satisfactory utility levels for teaching purposes, although the generalization "Divide between a root and a suffix" may need modification. Two of the three common phonic syllabication generalizations are useful when stated as they are in the present study. One phonic syllabication generalization has a low to moderate utility level: "When two vowel sounds are separated by one consonant, divide before the consonant, but consider 'ph,' 'ch,' sh,' and 'th' to be single consonants": 69%. Clymer's (1963) study using a similar generalization for two-syllable words had a utility level of 44 per cent; he did not include the statement about digraphs in his generalization.

The utility value of the "c" and "g" generalizations as stated in the present study was confirmed, although it is recognized that the "g" generalization has numerous exceptions in Anglo-Saxon words, which are commonly taught in the primary grades.

The present study strongly confirms Fry's (1964) observation that the "syllable ending rule" has limited usefulness. The "open syllable–long vowel" generalization was found to have a utility level of 31 per cent. However, the "closed syllable–short vowel" generalization, when stated as it is in the present study, has a 98 per cent utility level.

That the "final e" generalization as ordinarily stated has limited value is confirmed by Clymer, Oaks, Horn, and the present study. And the present study reemphasizes the importance of teaching common adjacent vowels as specific instances of several generalizations.

Scope

Basic to the choice of the substance to be taught is the need of the students who are being instructed. In the present study students were selected only if they already were familiar with some phonic principles, as demonstrated by their ability to correctly pronounce at least twenty words on the pretest. The assumption was made that these students were familiar with consonant sounds and consonant blends and digraphs, and that they had facility in blending letters to form a syllable, both of which are probably necessary for them to pass twenty items.

Students selected for the study did not respond correctly to more than fifty-two items, indicating probable weakness in ability to syllabicate, to recognize situations which indicate the gamut of vowel sounds and the two different sounds of the consonants "c" and "g."

The following generalizations were, therefore, deemed important for these students to learn:

1. those related to syllabication
   a. determination of a syllable: Every single vowel or vowel combination means a syllable, except a "final e"

Table 1

Utility Levels of Various Phonic Generalizations According to Different Studies

Generalization	Author of Study					
	Fry	Dolch	Horn	Oaks	Clymer	Burmeister
SYLLABICATION						
I. Every single vowel or vowel combination means a syllable		*				
A. Single vowels						
1. Every single vowel means a syllable (excluding "final e," except "final consonant-l-e")						939/942 = 99.7%
2. A "final e" is silent, unless it is "final consonant-l-e"						113/116 = 97.5%
3. When, in a word of more than one syllable, the final syllable ends in the letters "le," the "l" becomes syllabic, but the "e" is silent				100%		
4. When, in a word of more than one syllable, the final syllable ends in the letters "en" the "n" becomes syllabic and is pronounced, but the "e" is silent. (sudden, kitten)				100%		
B. Vowel combinations						
1. Every vowel combination means a syllable (computed on 10% stratified sample plus random sampling of vowel combinations)						454/537 = 84.5%
2. Every vowel combination means a syllable (computed on stratifications: AA to 6)						135/149 = 90.6%
3. Every vowel combination means a syllable computed on stratifications: 1-5)						47/62 = 75.8%
4. A vowel combination means no syllable (-que)						4/537 = 0.7%
5. A vowel combination means <u>two</u> syllables:						79/537 = 14.8%
a. "ia" means two syllables (ia = 2 syl.: 28/42) (ia = 1 syl.: 14/42)						28/537 = 5.2%
b. "ie" means two syllables (ie = 2 syl.: 6/31) (ie = 1 syl.: 25/31)						6/537 = 1.0%

c. "ea" means two syllables (ea = 2 syl.: 8/57) (ea = 1 syl.: 49/57)			8/537 = 1.5%
d. "eous, ious" means two syllables (eous = 2 syl.: 2/2) (ious = 2 syl.: 8/17)			10/537 = 1.9%
e. miscellaneous			27/537 = 5.0%
II. Structural syllabication			
A. Divide between a prefix and a root	*		106/112 = 95%
B. Divide between two roots			40/42 = 95%
C. Divide between a root and a suffix	*		148/187 = 74%
III. Phonic syllabication			
A. Situation: vccv			
1. If the first vowel sound in a word is followed by two consonants, the first syllable usually ends with the first of the two consonants.		404/563 = 72%	
2. When the first vowel element in a word is followed by "th," "ch," or "sh," these symbols are not broken when the word is divided into syllables and may go with either the first or second syllable.		30/30 = 100%	
3. When two vowel sounds are separated by two consonants, divide between the consonants, but consider "ph," "ch," "sh," and "th" to be single consonants. (This rule is applied only when structural syllabication rules do not apply.)			135/143 = 94%
B. Situation: vcv			
1. If the first vowel sound in a word is followed by a single consonant, that consonant usually begins the second syllable.		190/427 = 44%	
2. When two vowel sounds are separated by one consonant, divide before the consonant, but consider "ph," "ch," "sh," and "th" to be single consonants. (This rule is applied only when structural syllabication rules do not apply.)			128/186 = 69%

TABLE 1 (continued)

Generalization	Fry	Dolch	Horn	Oaks	Clymer	Burmeister
3. In a word of more than one syllable, the letter "v" usually goes with the preceding vowel to form a syllable.					53/73 = 73%	5/12 = 41.7%
4. In a word of more than one syllable, the "r" usually goes with the preceding vowel to form a syllable.		*				17/37 = 46%
5. Combine rules 2, 3, and 4 above						151/190 = 80%
C. Situation: word ending in "consonant-l-e" If the last syllable of a word ends in "le," the consonant preceding the "le" usually begins the last syllable.				100%	62/64 = 97%	14/15 = 93%
CONSONANT SOUNDS						
I. "C" generalization						
A. "C" followed by "e" or "i" sounds like "s"					66/69 = 96%	
B. "C" followed by "a" or "o" sounds like "k"					143/143 = 100%	
C. "C" followed by "e," "i," or "y" sounds soft; otherwise "c" is hard (omit "ch")	*					156/156 = 100%
II. "G" generalization						
A. The letter "g" often has a sound similar to that of "j" in "jump" when it precedes the letter "i" or "e"	*				49/77 = 64%	
B. "G" followed by "e," "i," or "y" sounds soft; otherwise "g" is hard (omit "gh")						54/60 = 90%
III. Consonant combinations						
A. containing "c"						
1. When "c" and "h" are next to each other, they make only one sound					103/103 = 100%	
2. "ch" is usually pronounced as it is in "kitchen," not like "sh" as in machine					99/104 = 95%	
3. When a word ends in "ck," it has the same last sound as in look	*				46/46 = 100%	

B. Silent letters
1. number 3, above
2. When "ght" is seen in a word, "gh" is silent — 30/30 = 100%
3. When a word begins with "kn," the "k" is silent — * — 10/10 = 100%
4. When a word begins witn "wr," the "w" is silent — * — 8/8 = 100%

VOWEL SOUNDS

I. Single vowels

A. Open syllable
1. If the only vowel letter is at the end of a word, the letter usually stands for a long sound — 23/31 = 74%
2. When a stressed syllable containing only one vowel ends with that vowel, the vowel has its own "long" sound
3. The vowel in an open syllable has a long sound (omit final "consonant + y" in Burmeister study) — * — * — 68/217 = 31%
4. When "consonant + y" are the final letters in a monosyllabic word, the "y" has a "long i" sound; in a polysyllabic word the "y" has a "short i" ("long e") sound — * — 71/72 = 99%

B. Closed syllable
1. When a vowel is in the middle of a one-syllable word, the vowel is short — 408/657 = 62%
2. When there is only one vowel in a stressed syllable and that vowel is followed by a consonant, the vowel has its "short" sound — 70%
3. A single vowel in a closed syllable has a short sound — * — 641/660 = 98%
4. When a syllable contains only the one vowel, "a," followed by the letters "l" or "w," the sound of "a" rhymes with the word "saw" (ball, paw — broad "a") — 94%

Table 1 (continued)

Generalization	Fry	Dolch	Horn	Oaks	Clymer	Burmeister
C. Vowel plus "r" rule: The basic rule is that "r" after a vowel makes a new vowel sound:	*					
"er," "ur," and "ir" all make the same sound	*					
"ar" makes the sound of "arm" or "vary"	*					
"or" makes the sound of "for"	*					
II. Single or double vowels						
A. final "y"						
1. When "y" is the final letter in a word, it usually has a vowel sound					169/201 = 84%	
2. When a word of more than one syllable ends with the letter "y," the final "y" has the sound of the "short i." When a word of more than one syllable ends with the letters "ey," the "e" is silent, and the "y" again has the sound of "short i" (city, money).				100%		
3. When "y" or "ey" is seen in the last syllable that is not accented, the long sound of "e" is heard					0/157 = 0%	
4. "Y" at the end of a long word has the sound of "long e" as in baby	*					
5. "Y" at the end of a short word or in the middle of a word has the sound of "long i" in my, cycle	*					
B. When "y" is used as a vowel in a word, it sometimes has the sound of a "long i"					29/199 = 15%	
C. The "r" gives the preceding vowel a sound that is neither long nor short	*				484/618 = 78%	
D. When the letter "i" is followed by the letters "gh" the "i" usually stands for its long sound and the "gh" is silent					22/31 = 71%	
E. The letter "a" has the same sound (ô) when followed by "l," "w," and "u"					61/126 = 48%	

F. Broad O sound is made by AU, AW, A followed by L and O in some words such as "off"	*			
G. When "a" follows "w" in a word, it usually has the sound of "a" in "was"			15/47 = 32%	
III. Final vowel-consonant-e				
A. When there are two vowels, one of which is "final e," the first vowel is long and the "e" is silent	*		180/288 = 63%	
B. In many two and three syllable words, the "final e" lengthens the vowel in the last syllable			52/114 = 46%	
C. When a word ends in "vowel-consonant-e," the vowel is long and the "e" is silent				57/93 = 61%
D. When a stressed syllable ends in "e," the first vowel in the syllable has its own "long" sound and the "final e" is silent		62%		
E. Specific cases:				
1. -āce; -īce (c = consonant)			164/272 = 60%	
2. When "a" is followed by "r" and "final e," we expect to hear the sound heard in "care"			9/10 = 90%	
IV. Adjacent vowels (vv or vvv)				
A. When two vowels are together, the first is long; the second is silent		49%	309/686 = 45%	
B. Specific instances in which the generalization stated in "a" above tends to be true:				
1. "ai, ea, oa, ui" — first long, second silent			179/271 = 66%	
a. "ai" = long a	*		43/67 = 64%	35/43 = 81%
b. "ea" = long e	*		101/152 = 66%	32/57 = 56%
"ea" = short e	*			10/57 = 18%
c. "oa" = long o	*		34/35 = 97%	12/16 = 75%[a]
2. others:				
d. "ay" = long a	*		36/46 = 78%	21/21 = 100%
e. "ee" = long e	*		85/87 = 98%	31/35 = 89%

[a]The low percentage here is perhaps due to a "fluke" in sampling: the exceptions were "broad," "broadcast," and "Broadway."

Table 1 (continued)

Generalization	Fry	Dolch	Horn	Oaks	Clymer	Burmeister
f. "ow" = long o	*				50/85 = 59%	18/31 = 58%
"ow" = "ou"	*					13/31 = 42%
g. "w" is sometimes a vowel and follows the vowel digraph rule					50/125 = 40%	
h. "ue" as in due	*					
C. Specific instances in which the generalization stated in "A" above tends not to be true:						
1. "ei" and "ie"						
a. "ei" = long a						8/13 = 61%
long i						2/13 = 16%
long e						2/13 = 16%
short i						1/13 = 8%
b. "ie" = long e					8/47 = 17%	8/31 = 26%
long i						5/31 = 16%
schwa						4/31 = 13%
yə						1/31 = 3%
short i/schwa						2/31 = 6%
short i/short i						1/31 = 3%
long i/schwa						2/31 = 6%
short i/short e						1/31 = 3%
2. blends and diphthongs						
a. "au" = ô (audit)						10/13 = 77%
b. "ou" = ou	*					24/37 = 65%
= long o						5/37 = 14%
c. "oi" = oi	*					14/16 = 88%
d. "oy" = oi	*					3/3 = 100%
e. "oo" = o͞o (ooze)	*					19/38 = 50%
= o͝o (book)	*					14/38 = 37%
3. division between vowels is common (note SYLLABICATION, I. B. 4)						
a. "ia" - do not divide						14/42 = 33%
- do divide						28/42 = 67%
= schwa						11/42 = 26%
= yə						2/42 = 5%
= short i						1/42 = 2%

"ia" as two syllables			
= short i/schwa			18/42 = 43%
= long i/schwa			5/42 = 12%
= short i/long a			2/42 = 5%
= short i/short a			2/42 = 5%
= short i/short e			1/42 = 2%
4. "ia" and "io" help to make a consonant sound			
a. tia: ingratiating		*	*
partial			
tio: attention			
b. cia: musician		*	
physician			
cio: -cious			*
(cea: ocean)			
5. suffixes			
a. tion = shən			59/60 = 98%
b. sion = zhən			13/23 = 57%
= shən			10/23 = 43%
c. consonant + ous:			
ous = əs			13/13 = 100%
d. ious = əs			8/17 = 47%
= short i/əs			7/17 = 41%
e. eous = short i/əs			2/2 = 100%

in a "vowel-consonant-e" ending. (Other exceptions, e.g., "ia," were taught as individual cases later, in the section on vowel sounds.)

b. structural syllabication:
   1.) Divide between a prefix and a root.
   2.) Divide between two roots.
   3.) Usually divide between a root and a suffix.

c. phonic syllabication:
   1.) When two vowel sounds are separated by two consonants, divide between the consonants, but consider "ph," "ch," "sh," and "th" to be single consonants.
   2.) When two vowel sounds are separated by one consonant, usually divide before the consonant. Try dividing first, before the consonant, and second, after it, until you recognize the word.
   3.) When a word ends in "consonant-l-e" divide before the consonant.

2. those related to the sounds of "c" and "g":
   a. "C" followed by "e," "i," or "y" sounds soft; otherwise "c" is hard (omit "ch").
   b. "G" followed by "e," "i," or "y" sounds soft; otherwise "g" is hard (omit "gh"). There are numerous exceptions in easy, Anglo-Saxon, words; there are very few exceptions in difficult words.

3. those related to one vowel in a syllable:
   a. closed syllable: A single vowel in a closed syllable has a short vowel sound.
   b. open syllable:
      1.) A single vowel in an open syllable usually has a short sound, although it may have a long sound, especially in a one syllable word. Try pronouncing the vowel both ways until you recognize the word (omit "final consonant + y").
      2.) If a word of more than one syllable ends in "y" (consonant + y), the "y" has a "long e" ("short i") sound.

4. those related to two vowels in a syllable:
   a. adjacent vowels
      1.) In the following combinations: ai, ay, ea, ee, oa, ow, the first vowel is usually long, and the second vowel is silent. But "ea" frequently has a "short e" sound, and "ow" frequently has an "ou" sound.
      2.) In the following combinations: au, ou, oi, oy, oo, the two vowels usually blend. An "oo" may sound as it does in "book" or "rooster."
      3.) The combinations "ei" and "ie" are unpredictable.
      4.) The combination "ia" usually forms two syllables, although it may represent a schwa sound, as in "marriage."
      5.) In the combination "ia" or "io" after a "c," "t," or "s," the "i" is consonantized, and the "a" or "o" is a schwa: musi<u>cian</u>, atten<u>tion</u>, pas<u>sion</u>, propul<u>sion</u> ("ci" and "ti" = "sh"; "si" = "sh" or "zh").
   b. final vowel-consonant-e:
      When a word ends in "vowel-consonant-e," the "e" is silent, and the vowel may be long or short. Try long first, then short, until you recognize the word.

Sequence

The sequence which was followed was designed to comply with the principles of logic and interest. Logically, the easiest generalizations should be taught first, and the interest of students should be captivated at the beginning, if possible.

The "c" and "g" generalizations are easy to teach, and they are of unusual interest to young people. The understanding of them is not dependent upon the understanding of principles of syllabication. Therefore, they were taught first, "c" before "g" because exceptions to the "c" generalization are extremely rare.

Syllabication generalizations were taught next—moving logically from the determination of a syllable to structural syllabication and then to phonic syllabication.

Finally the vowel generalizations were taught, for the understanding of them is dependent upon the understanding of syllabication. Generalizations covering one vowel in a syllable were taught first, beginning with the closed syllable generalization to which there are only very rare exceptions, and then the open syllable generalization. Next the generalizations covering more than one vowel in a syllable were taught: first the adjacent vowel generalizations and next the "final vowel-consonant-e" generalization.

III

BACKGROUND AND METHODOLOGY OF THE EXPERIMENTAL STUDY

RELATED LITERATURE

Effects of Learning Phonic and Structural Analysis Generalizations

The substance of the lesson plans of the experimental study consists of the phonic and structural analysis generalizations deemed important in the first part of the present study (see Chapter II). It is the purpose of this section to examine studies which focus on the value of phonic knowledge and the teaching of pronunciation generalizations above the primary level.

No study utilizing all, or many, of the generalizations to be taught in the present experiment has been reported in the literature. However, several related studies have been published. Among the most pertinent ones are those by House (1941), Templin (1954), and Tiffin and McKinnis (1940).

House (1941) based his experiment upon a proposition which he assumed to be self-evident. (This proposition is similar to the one upon which "Words in Color" and "i/t/a" were later based.) House said:

> All methods for promoting word recognition and word-analysis prove to be impractical, because modern readers are printed in an incomplete symbolization. The pupil does not know the value of the vowels and of many of the consonants. Hence, he can arrive at the correct pronunciation of a new and difficult word in one or two ways, which are: (1) he must have someone pronounce the word for him, again and again, until he can recognize it by sight, or (2) he must be taught how to use a complete symbolization in making an independent analysis of the word. The problem, therefore, of the present study is to determine how successfully fourth-grade pupils can master the use of a complete symbolization, as measured by independent analysis of unfamiliar words, following a controlled experience with a specific form of instructional material (House, 1941, p. 54).

House used three experimental groups and a control group. The variable within the experimental groups was the symbolization employed. Group E_1 used the regular spelling with diacritics. Group E_2 employed the Webster system of phonetic respelling with diacritics. Group E_3 used the International Phonetic Alphabet. The method of instruction for the experimental groups was "highly motivated drill." Instruction was carried on for 54 days, 20 minutes per day. House, himself, taught these classes.

The control groups were taught by the regular classroom teachers. The teachers taught the skills needed whenever the occasion presented itself throughout each of the 54 days of the experiment.

Two tests were administered both initially and finally. Each test contained fifty words felt to be too difficult for most of the children to have previously met in their reading materials.

It was found that the achievements of the subjects in the experimental groups were superior to the achievement of the subjects in the control groups. Group E_1 showed the lowest gains of the experimental groups.

Another study, a status study, done by Tiffin and McKinnis, "was conceived to determine whether, and to what extent, phonic ability, as measured by a reliable instrument, is related to reading ability as measured by certain standardized reading tests" (Tiffin & McKinnis, 1940, p. 190).

The phonic test was an individual oral test modified by the authors from Roger's (1938) test, Part II, the original of which contained one hundred nonsense words utilizing most of the letter combinations found in the English language. The modification used one hundred nonsense words which were presented individually on cards. Except for three of these

words, only one pronunciation was acceptable. Of the others, according to the present study, sixteen or more might have at least two very acceptable pronunciations; among these words are:

Key Word	"Acceptable Pronunciation"
gupitis	gūpĭtis
tamu	tāmū
ubidge	ūbij
dapu	dāpū
archemp	arkemp
safu	sāfū
bisuape	bĭswāp
vapdow	vapdō
eaput	ēput
hien	hēn

The reliability of the test was computed by the odd-even method and was found to be .94 ± .006 for 155 pupils (Tiffin & McKinns, 1940). No measure of validity was made.

The relation between phonic ability and reading ability was measured by correlating the results of the Individual Phonics Test with the results of two reading tests: New Stanford Reading Test and Iowa Silent Reading Test (Comprehension and Rate) and were found to be:

Reading Criterion	Correlation with Phonic Ability
New Stanford Reading Test	.70 ± .027
Iowa Silent Reading Test—Comprehension	.66 ± .030
Iowa Silent Reading Test—Rate	.55 ± .038

According to the authors, "These correlations show with reasonable certainty that phonic ability is significantly related to reading ability among the pupils studied" (Tiffin & McKinnis, 1940, p. 191). One wonders if the correlations might not have been higher had the phonics test been more valid.

The authors add:

> ...it is felt that a program of reading instruction which does not, by direct or indirect instruction, yield a mastery of the principles of phonics is not accomplishing its full purpose.... It seems highly probable that cases found to be markedly deficient in phonic ability and not markedly deficient in other important characteristics, may be profitably treated by instruction and drill in the specific principles of phonics. Several cases in which such a procedure has been followed indicate the validity of this approach (Tiffin & McKinnis, 1940, p. 192).

Templin (1954) said, "There is no close agreement concerning the role of phonic training in the acquisition of reading and spelling skills although this problem has been discussed and studied over the years" (p. 441). Her study, also a status study, was concerned with the relation of phonic knowledge to spelling and reading achievement. It was designed to investigate (1) the level of phonic knowledge of fourth grade pupils, (2) the relation between phonic knowledge and reading and spelling skills at this grade level, and (3) what differences, if any, exist in the phonic knowledge of good and poor spellers and of good and poor readers.

Tests to determine the children's ability to associate sounds with the written symbols used to represent them were constructed. One was a "recall phonic test," in which the children wrote out the spelling of twenty-five different consonant sounds and sound combinations which were uttered by the experimenter. There were three "recognition" type tests: (a) a word phonic test, (b) a nonsense-word phonic test, and (c) a sound phonic test. These were written multiple choice tests. There was also a sound discrimination test.

The word phonic test used a familiar word uttered by the experimenter as the stimulus for each item. The subjects listened for the sound in a particular part of the word and indicated which one of the four multiple choice items represented that sound.

The nonsense-word phonic test used as stimuli nonsense words. Otherwise it was the same as the above test.

The sound phonic test used sounds as stimuli, and the subjects selected from three or four words the one that had the same sound in the position indicated.

The sound discrimination test, a "same-different" type test, measured the ability of the students to discriminate between consonant sounds which were presented orally by the experimenter.

Of note in the results is:

> Phonic knowledge is not applied equally in all of the recognition tests. It is applied most successfully when a sound is to be associated with a symbol in a familiar word, and least successfully when a sound is to be associated with a symbol in a nonsense word. A difference of over 10 percentage points in the scores is obtained. As the

tests were designed, the word phonic test measures the application of phonic knowledge in familiar words and application in new words (Templin, 1954, p. 445).

On contrasting the best 26 spellers with the worst 26, IQ held constant, the author found that there was a significant difference at the .20 level, favoring the good spellers, in the nonsense-word recognition test and a significant difference at the .02 level, favoring the good spellers, in the sound recognition test. Other differences were not significant. When contrasting the best 26 readers with the poorest 26 readers, IQ held constant, the same results were found with levels of significance at .20 and .05, respectively.

The correlations between MA, spelling knowledge, and phonic ability were found to be:

Test	Correlation		
	MA	Spelling	Reading
Recall	.24	.34	.25
Recognition:			
Word	.43	.54	.40
Nonsense-word	.36	.55	.44
Sound	.37	.57	.47
Sound Discrimination	.29	.23	.22

(From Templin, 1954, p. 446)

For the total sample, correlations between phonic knowledge and spelling were somewhat higher than between phonic knowledge and reading. And

> Among the recognition measures, significantly higher scores are obtained when the stimulus is a familiar word rather than a sound or a nonsense word. The differences among the scores on the tests using three different stimuli are significant above the .05 level for the total sample, the good spelling and good reading deviate groups. For the poor spelling and poor reading deviates, however, the differences between the word phonic and the other recognition tests are significant, but the differences between the nonsense-word and sound phonic tests are not.
>
> That the poor spellers and poor readers applied their phonic knowledge less well than good spellers and good readers in the unfamiliar test situations while the difference was not significant when phonic knowledge measured in familiar words is an intriguing finding. The degree of understanding of sound-symbol association differs for the upper and lower deviate groups although the measured scores show little difference in the familiar test situation. This may indicate a real difference in the ability of children of similar intellectual level to transfer what they know from one situation to another. . . . On the other hand it may be related to the various methods of teaching used with these children or to the particular testing procedure used in this study. As the present investigation was designed, a conclusive answer cannot be given. However, the implication of this finding is important enough for educational procedure and psychological theory to warrant thorough and controlled investigation (Templin, 1954, p. 453).

Effects of the Inductive and Deductive Teaching Approaches

Pertinent questions in the present study:

1. Is the inductive or deductive approach more effective in bringing about improvement in word recognition as measured by the ability to pronounce the key words in the "Reading Vocabulary Test" of the Gates Reading Survey test?

2. Is the inductive or deductive approach more effective in bringing about improvement in word recognition as measured by the ability to select the synonyms for the key words from the multiple choice items following each key word in the "Reading Vocabulary Test" of the Gates Reading Survey test?

Several studies in the literature cited in the original report (Burmeister, 1966) have indicated that there is a relationship between phonic ability and reading ability. Tiffin and McKinnis (1940) argue that ". . . a program of reading instruction which does not, by direct or indirect instruction, yield a mastery of the principles of phonics is not accomplishing its whole purpose" (p. 192). However, the necessity for using a "complete symbolization" system, which contains one symbol, and only one symbol, for each sound in the English language (House, 1941) was challenged in the present study since the present study used the normal English alphabet and utilized words as they are normally

encountered in reading materials.

A major purpose of the present experiment was to identify the approach which would be more profitable for eighth and ninth graders when the subject matter is word analysis. Haslerud and Meyers' (1958) finding that "principles derived by the learner solely from concrete instances will be more readily used in a new situation than those given to him in the form of a statement of principle and an instance" (p. 294) formed the basis for one of the approaches. This approach, similar to Katona's (1940) "learning by examples" and "learning by help," was termed the inductive. The other approach, called the deductive, was patterned after Craig's (1956) "directed group," in which a short general statement of the principle was given to the subjects initially. This approach differed somewhat from Kittell's (1957), in which the teacher supplied the principle during discovery. Both Kittell and Craig indicated that subjects in these groups retained more learned relationships than did those in "independent groups."

Katona's finding that organization suitable to the structure or inherent relations of the material is essential was accepted and cut across approach lines. The over-all structure of the lesson plans was felt to be as meaningful as possible; within this structure and in the substructures, every possible effort was made to group together similar "elements" and thus to separate dissimilar ones.

Decisions about the posttest resulted from the basic philosophies of Katona (1940), Haslerud and Meyers (1958), and Hendrix (1947). Students were not asked to verbalize the generalizations. What was sought was evidence of "behavior that would have been impossible, without the generalization(s)" (Hendrix, 1947, p. 197) as well as the effect on retention (Haslerud & Meyers, 1958; Katona, 1940). Interest was in finding evidence of ability to apply the generalizations, not to "elements" or exercises formerly used in the classroom, but to tasks which had not been practiced.

METHODOLOGY

General Plan of the Study

The lesson plans following the inductive approach provided for the use of what was felt to be a sufficient number of examples—supplied by either the teacher or the students or by both—from which students were guided toward the formulation of the desired generalizations.

The plans following the deductive approach provided for the statement of the generalization by the teacher before examples were furnished by the teacher or the students, or both.

In all classes an exacting attempt was made to keep the number of examples used for each generalization precisely the same. When the teacher supplied the examples, they were the same for both methods; and they were the same for all teachers involved in the study.

Written exercises following each generalization or group of related generalizations were the same for all classes.

Delayed posttests were given approximately two and one-half weeks after the teaching was completed. No immediate posttest was given, since interest was in retention value only. During the interim period, ideas related to the generalizations were discussed by the teacher only when students asked questions; such discussion was kept at a minimum.

Subjects

Students who participated in the experiment were eighth and ninth graders and were drawn from six schools in a large Midwest city. Five three year junior high schools and one four year high school were used.

The design provided that each teacher involved have three classes and that two teachers be used at each school involved. Programs of all eighth and ninth grade teachers in the public schools were examined in the fall, and every teacher having at least three ninth-grade English or eighth-grade English language arts classes, or a combination of these, was listed. Teachers were grouped according to school, and a priority list of schools was made, priority being determined by the number of suitable teachers the school had. (This was felt to be necessary because teacher programs changed at second semester time, and only the schools themselves had the projected schedules. It was felt that if a school had several suitable teachers during the first semester, it was likely to have several during the second semester.)

Next, several "inner core" schools were eliminated because they were already committed to another sizable experiment.

Principals at the first six schools were then approached and told of the experiment. All principals agreed to participate, and each found two suitable teachers—teachers who were interested in the experiment, were willing to participate, had the required number of classes. The deciding factor in the selection of teachers proved to be, in almost all cases, the number of classes the teacher had.

All in all, 46 classes, all of the eighth- and ninth-grade English language arts or English classes of 13 teachers (one alternate was included), were given the oral reading pretest. Eight teachers had three classes each; three teachers had four classes each; and two teachers had five classes each.

The seven extra classes were eliminated from the experiment in the following ways:

1. Classes which had fewer than ten students scoring between 20 and 52 correct responses on the oral pretest were dropped first. This accounted for the dropping of two classes.

2. Using a table of random numbers, the writer assigned the classes intact to the approach. The class whose hour of meeting appeared first was assigned to the inductive approach, second to the deductive approach, third to serve as the control; other classes were unassigned.

This left thirteen teachers as listed in Table 2 with the number of students initially scoring between 20 and 52 correct responses on the oral pretest.

A table of random numbers was then used to reduce the cells to the size of the smallest: eleven. Further random reduction—to nine members per cell—became necessary because of absences and drop-outs. These nine students formed the "Evaluation Groups" for the classes involved in the experiment. (See Burmeister, 1966, for pretest raw data.)

Table 3 illustrates the school hours when the sections met.

In the final analyses, classes of only ten teachers were used. Errors in posttesting necessitated the dropping of the classes of two teachers, and teacher absence during the teaching period necessitated the dropping of the classes of another teacher.

Design

The design used in this experimental study is known as "The Posttest-Only Control Group Design," often illustrated in the following way (Campbell & Stanley, 1963, p. 195):

$$\begin{array}{lll} R & X & O_1 \\ R & & O_2 \end{array}$$

adapted for this study to:

Table 2

Number of Students Scoring Between 20 and 52 Correct Responses on the Gates Oral Pretest and Total Number of Students in Class

School	Teacher	Approach		
		Inductive	Deductive	Control
		20-52/total	20-52/total	20-52/total
1	1	15/30	11/26	11/30
1	2	11/27	17/26	13/25
2	1	11/33	20/34	14/31
2	2	14/31	14/35	20/32
3	1	16/32	14/34	26/31
3	2	22/34	20/36	14/30
4	1	22/26	21/36	12/22
4	2	13/30	11/29	12/35
5	1	11/30	13/34	18/34
5	2	12/31	16/33	13/31
6	1	15/31	24/30	18/31
6	2	22/40	13/35	20/33
6	3*	11/36	15/26	7/32

*alternate

Table 3

Class Hour by School and Teacher When the Sections Involved in the Present Experiment Met

School	Teacher	Approach		
		Inductive	Deductive	Control
		hour	hour	hour
1	1	2	8	4
1	2	7	6	2
2	1	1	3	6
2	2	2	3	1
3	1	2	1	5
3	2	7	2	4
4	1	2	6	1
4	2	6	5	3
5	1	3	2	6
5	2	3	2	7
6	1	5	3	2
6	2	5	7	3
6	3	7	2	6

$$\begin{array}{lll} R & X_1 & O_1, 1' \\ R & X_2 & O_2, 2' \\ R & & O_3, 3' \end{array}$$

where R stands for random assignment, X for treatment, and O for observation.

In the present study, intact groups were randomly assigned to treatments, one group for each teacher being assigned to X_1, the inductive approach, another to X_2, the deductive approach, and the third to serve as a control. O_1, O_2, and O_3 represent the oral posttest observations, while O_1', O_2', and O_3' represent the silent posttest observations.

The null hypotheses are:

1. $O_1 = O_2 = O_3$
2. $O_1' = O_2' = O_3'$

Training of Teachers and Graduate Assistants

TEACHERS A four-hour orientation session was provided on a Saturday morning for the teachers. Before the teachers attended this session they read and studied the lesson plans. This session was designed to provide time for discussion of the generalizations and approaches, explanation of the pacing of the teaching, and related questions such as those concerned with the design of the experiment.

It was stressed at this point that the teaching was to take two weeks only, that the plans were complete in themselves, and that no additional out-of-class related assignments were to be given the students, although other related assignments might profitably be given after the posttest period.

Teachers were encouraged to expend the same amount of energy on both approaches and to be, as far as possible, equally enthusiastic about both. They were told that the control group was not to be directly taught the generalizations in any form, although teachers were free to answer questions asked by members of the control group.

It was also stressed that the purpose for teaching the generalizations was to help the students read the words that they already know orally, that the students should be encouraged to try "sounding out" words according to the generalizations, and they should then ask themselves if the pronunciation which results reminds them of a word which they know orally; if it does, that is probably the word.

Since teachers administered the group tests, they were instructed in the manner in which to give these tests. The directions were slightly different from those given in the Manual. Teachers were instructed to read to the students the instructions printed in the test booklet on the "Reading Vocabulary Test" page, and they were to add: "This is an untimed vocabulary test; your score is the number of correct answers."

To minimize student communication, sections not directly involved in the experiment were not to be taught the generalizations before the posttests were given. After the posttests

were completed teachers were free to use the plans in any way they wished.

GRADUATE ASSISTANTS Two two-hour training sessions were provided for the graduate assistants. During these meetings, the assistants were trained in giving and scoring the oral tests and in other details associated with the testing.

In order to provide for uniformity in the scoring of the oral tests, two provisions were made:

1. A tape recording was made by the writer illustrating correct, incorrect, and borderline responses. Individually the assistants scored five taped pretests during the first training session and seven posttests during the second training session. There was a discussion after each scoring. A high degree of uniformity in scoring was achieved in a short period of time; the scores deviated by not more than one, and in rare instances two, points. It was stressed that foreign accents, speech impediments, and low usage level were not to be considered as errors.
2. Whenever possible, only one graduate assistant was assigned to each teacher for the pretests and only one for the posttests. Thus only one person scored, in most cases, the oral pretests, and only one was to score the oral posttests of the students assigned to the inductive and deductive approaches and the control group of any one teacher.

Fortunately the oral posttests were taped. It was found to be necessary that these tests be rescored because of lack of uniformity. To provide for greater reliability, two people independently graded all of these tests—one was the author of this study and the other was a graduate student specializing in the teaching of reading. All discrepancies were resolved by listening together to the tapes until agreement was reached.

V

RESULTS OF THE EXPERIMENTAL STUDY

ORAL READING

The question asked in relation to oral reading was:

> Is the inductive or deductive approach more effective in bringing about improvement in word recognition as measured by the ability to pronounce the key words in the "Reading Vocabulary Test" of the Gates Reading Survey (Gates, 1958) test?

Students were graded on their ability to correctly pronounce the key words on Form 2 of the Gates "Reading Vocabulary Test." Foreign accent, low usage level, and speech impediments were not considered to be errors. The student's score was the number of correct responses. (Raw scores for individuals are reported in Burmeister, 1966.)

A one-way analysis of variance was performed on the oral reading posttest data. The summary of this analysis is presented in Table 4.

An F value of 5.91 with 2 and 27 degrees of freedom indicates that differences exist between the groups which are significant at the .01 level.

Further analysis of the data by means of the Scheffé confidence interval formula indicated that there were no significant differences between the total means of the two experimental groups and that the average of the total means of the experimental groups differed from the total mean of the Control group, significant at the .05 level.

Following is the formula for the Scheffé confidence interval:[4]

$$\hat{\psi}_g - S\sqrt{V(\hat{\psi}_g)} \leq \psi_g \leq \hat{\psi}_g + S\sqrt{V(\hat{\psi}_g)}$$

where $\hat{\psi}$ = the difference between the means being compared, g being the groups being compared

$$\sqrt{V(\hat{\psi}_g)} = \sqrt{(\text{MS error}_w)w_g} = \sqrt{\text{est. var. } (\hat{\psi})}$$

and w_g = weights

also $S = \sqrt{J-1}F_\alpha$

where J = the number of independent means.

[4]As given in Statistics for Psychologists, by William L. Hays, New York: Holt, Rinehart and Winston, 1963. Pages 483–485.

Table 4

Analysis of Variance on Gates Oral Reading Posttest Scores for Eighth and Ninth Grade Experimental and Control Groups

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between	123.344	2	61.672	
Within	281.756	27	10.435	5.910*
Total	405.100	29		

*$p < .01$

Table 5

Raw Score Class Means and Mean Variances on the Gates Oral Posttest Data for Eighth and Ninth Grade Experimental and Control Groups

Teacher	Approach					
	Inductive		Deductive		Control	
	Class Mean	$(X_i-\bar{X})^2$	Class Mean	$(X_i-\bar{X})^2$	Class Mean	$(X_i-\bar{X})^2$
A	46.444	.870	49.000	4.889	40.555	2.427
B	48.000	6.195	47.444	.429	35.555	43.007
C	41.666	14.784	47.111	.104	49.444	53.744
D	40.777	22.411	45.000	3.201	41.000	1.239
E	47.000	2.217	47.111	.104	43.666	2.412
F	45.111	.160	45.222	2.455	46.111	15.984
G	49.777	18.199	50.000	10.311	39.555	6.543
H	46.000	.239	41.555	27.395	44.555	5.963
I	46.111	.360	46.444	.119	36.714	29.149
J	44.222	1.662	49.000	4.889	42.777	.441
Totals	455.108	67.097	467.887	53.896	419.932	160.909
$\bar{X}$	45.511		46.789		42.113	

When the confidence interval fails to cover zero, the comparison is said to be significant.

Using the oral reading posttest data of the two experimental groups in comparing them to the Control group in the above formula with an $F_{.05}$ gives a confidence interval of

$$.827 \leq \psi_g \leq 7.247$$

which does not span zero. It can, therefore, be concluded that improvement was made among the students in the experimental groups independent of the two methods employed.

A comparison of the group means was also made. The data for this comparison, together with the squares of the deviations of the class means from their respective group means are presented in Table 5.

From the data in Table 5 it can be observed that the total mean of the Deductive group was 4.68 points higher than that of the Control group, and the total mean of the Inductive group was 3.40 points higher than that of the Control group.

SILENT READING

The question asked in relation to silent reading was:

> Is the inductive or deductive approach more effective in bringing about improvement in word recognition as measured by the ability to select the synonyms for the key words from the multiple choice items following each key word in the "Reading Vocabulary Test" of the Gates Reading Survey test?

Students were graded on correctness of response in choosing from among the five multiple choice items following each key word in the Gates "Reading Vocabulary Test," Form 2, the one indicated as correct in the Manual of the Gates Reading Survey test. The student's score was the total number of correct items.

A one way analysis of variance was also performed on the silent reading posttest data. The summary of this analysis is presented in Table 6.

An F value of 2.15 with 2 and 27 degrees of freedom indicates that no significant differences exist between the groups.

Group means were also compared. The data for this comparison, together with the squares of the deviations of the class means from their respective group means, is presented in Table 7.

From the data in Table 7 it can be observed that the total mean of the Deductive group was 2.21 points higher than that of the Control group, and the total mean of the Inductive group was 1.96 points higher than that of the Control group.

Table 6

Analysis of Variance on Gates Silent Reading Posttest Scores for Eighth and Ninth Grade Experimental and Control Groups

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between	29.703	2	14.852	
Within	186.442	27	6.905	2.150
Total	216.145	29		

Table 7

Raw Score Class Means and Mean Variances on the Gates Silent Posttest Data for Eighth and Ninth Grade Experimental and Control Groups

Teacher	Approach					
	Inductive		Deductive		Control	
	Class Mean	$(X_1-\bar{X})^2$	Class Mean	$(X_1-\bar{X})^2$	Class Mean	$(X_1-\bar{X})^2$
A	46.111	1.259	47.444	4.889	41.777	1.553
B	45.333	.118	45.888	.429	36.111	47.776
C	43.333	2.742	44.000	1.520	47.888	23.668
D	42.444	6.477	45.111	.015	41.444	2.493
E	47.555	6.584	45.555	.104	42.777	.061
F	48.777	14.349	42.333	8.410	44.555	2.347
G	46.222	1.520	46.111	.771	41.555	2.155
H	44.000	.978	40.888	18.879	46.777	14.093
I	42.666	5.396	46.333	1.210	42.666	.127
J	43.444	2.387	48.666	11.785	44.555	2.347
Totals	449.885	41.810	452.329	48.012	430.105	96.620
$\bar{X}$	44.989		45.233		43.023	

DISCUSSION

One of the assumptions underlying the use of the analysis of variance is homogeneity of variance among the groups. The variance of the Control group on the oral posttest data was 160.909, about three times as large as the variance of the Deductive group and about two and one-half times as large as the variance of the Inductive group. The variance of the Control group on the silent reading posttest data was 96.620, about twice as large as the variance of each of the experimental groups. A test of homogeneity of variance was, therefore, run.

The formula for the Cochran test is

$$C = \frac{s^2 \text{ largest}}{\Sigma s_j^2}$$

and the critical values for three treatments with $n - 1 = 9$ degrees of freedom for each of the variances are: $C_{.99}(3,9) = .6912$ and $C_{.95}(3,9) = .6167$.

Using the data of the oral posttests in the Cochran formula yields a value of .571, and

for the silent posttest data the value is .518, neither of which exceeds the critical values. Therefore, the hypothesis of homogeneity of variance is not rejected.

SUMMARY OF FINDINGS

The posttest data collected from ten teachers, each with three sections—one taught inductively, one deductively, and one serving as a control—were used in two one-way analyses of variance, one for the oral posttest and one for the silent posttest scores. The means of the groups of nine students each, randomly selected from a band ranging from 20 to 52 correct responses on an oral pretest, comprised the basic data.

The analysis of variance of the oral posttest data indicated that there were differences between groups which were significant at the .01 level. Use of the Scheffé post-hoc confidence interval formula indicated that there were no significant differences between the total means of the two experimental groups and that the total means of the experimental groups together differed from the total mean of the Control group, significant at the .05 level. Comparison of the total means of the three groups on the oral posttest data showed a 4.68 point difference favoring the Deductive group over the Control group and a 3.40 point difference favoring the Inductive group over the Control group.

The analysis of variance of the silent posttest data indicated that there were no significant differences between the groups on these scores. The comparison of total means on the silent posttest data showed a 2.21 point difference favoring the Deductive group over the Control group and a 1.96 point difference favoring the Inductive group over the Control group.

V

CONCLUSIONS AND IMPLICATIONS

GENERAL PURPOSE OF THE INVESTIGATION

The purpose of this study was two-fold:

1. To identify a minimum number of phonic and structural analysis generalizations which apply to the pronunciation of words above the primary level in difficulty, and
2. to determine the value—for eighth- and ninth-grade students who are of average mental ability but who are weak in word analysis—of learning these generalizations by the inductive and deductive approaches.

SUMMARY OF THE IDENTIFICATION AND SELECTION OF WORD ANALYSIS GENERALIZATIONS

Procedure

A fourteen-level stratified random sample of the Thorndike and Lorge (1944) Teacher's Word Book of 30,000 Words was examined to find whether certain phonics and structural analysis generalizations have high utility levels and, therefore, might be worthy of being taught. Generalizations describing the pronunciation of adjacent vowels were arrived at inductively upon examination of a sample about three times as large. Comparisons were made with related studies in the literature of the field.

Criteria used in the selection of the generalizations to be taught were (a) need of the students to be taught and (b) a utility level for the generalization of at least 90 per cent. Four generalizations which met criterion "a" but not "b" were modified by the author in order to meet criterion "b" also.

Results

The following generalizations were deemed desirable to teach: those concerned with syllabication, including the determination of a syllable and the determination of syllabic division points through the use of structural syllabication generalizations, which indicate divisions between prefix and root, between root and root, and between root and suffix; and also phonic syllabication generalizations, which indicate where divisions are commonly made between vowel sounds separated by one or two consonants and also where the division is made when a word ends with a "consonant-l-e." Also selected were the generalizations concerned with the pronunciation of "c's" as either hard or soft and of "g's" as either hard or soft. In addition generalizations which describe the pronunciation of vowels were selected, including single vowels in open and closed syllables, the effect of a "final e," and the following adjacent-vowel situations: ai, ay, ea, ee, oa, ow; au, ou, oi, oy, oo; ei and ie; ia; ia and io following certain consonants (c, t, s); and common suffixes—tion, sion, cious, consonant plus ous, ious, eous.

SUMMARY OF THE EXPERIMENTAL STUDY

Procedure

Two two-week instructional plans covering the same content were written to be used in the teaching of these generalizations. One plan followed an inductive approach in which examples were supplied by the teacher and/or the students and the students were led to formulate the appropriate generalizations. The second plan followed a deductive approach in which the generalization in each case was initially stated by the teacher and then followed by examples supplied by the teacher, by students or by both. Examples supplied by the teachers were the same for both approaches.

Design

A posttest-only control group design was used, with intact classes assigned to method

at random. Each teacher had three eighth and/or ninth grade classes, one of which was assigned to the inductive approach, one to the deductive, and one to a control group. Nine students within each of these classes were selected at random from the group of students who scored between 20 and 52 correct responses on an oral pretest to form the evaluation groups for each class. Group means were used in all of the analyses.

Results

A one-way analysis of variance of the oral posttest data showed that there were differences among the groups, significant at the .01 level. The Scheffé indicated that the two experimental groups, together, differed from the Control group, significant at the .05 level and that there were no significant differences between the Inductive and Deductive groups on the oral posttest data. A one-way analysis of variance of the silent posttest data indicated that there were no significant differences among the groups on this test. The total means of the experimental groups were in all cases superior to the total means of the Control group, and the total means of the Deductive group were superior to the total means of the Inductive group.

GENERAL CONCLUSIONS OF THE PRESENT STUDY

Phonic and Structural Analysis Generalizations

The use of words which cover a much wider range of difficulty, including principally longer and more difficult words than any other writer has examined and the use of utility levels rather than frequency counts which some writers have used in determining the value of word analysis generalizations, has led the writer of the present study to conclusions about some generalizations which differ at times from those of Dolch (1955) and Fry (1964). The present study, for example, suggests that the following phonic syllabication generalization appears to have limited usefulness: "When two vowel sounds are separated by a single consonant, divide before the consonant," even with the qualification, "but consider 'sh,' 'ph,' 'ch,' and 'th' to be single consonants." In addition, the present study supplies evidence that the vowel digraph rule may have even more limited value than was borne out by Fry's frequency count and that other generalizations for commonly found adjacent vowels need further examination.

On the other hand, the analysis made in the present study agrees with some recent observations made by Clymer (1963) and Fry (1964) and gives strong support to the recommendation that the "open syllable–long vowel" generalization should be discarded, as well as the "final e" generalization as it is commonly taught.

The present study reaffirms the value of other commonly taught phonic and structural analysis generalizations, for example, the structural syllabication generalizations, two phonic syllabication generalizations, the soft and hard "c" and "g" generalizations and the "closed-syllable–short vowel" generalization.

Inductive and Deductive Approaches

The results of the experiment of the present study indicate that when the training period is short the inductive and deductive approaches as used in this experiment are equally effective in bringing about improvement in word analysis among eighth and ninth grade students. That is, improvement, when using the generalizations of the present study as the basic materials, is independent of the approaches as used in this study among eighth and ninth grade students. However, although differences are not statistically significant, upon comparing the total means of the groups, it appears that the deductive approach may be the better approach.

Additional Information Needed

It would be of great value if additional sizable studies were made to determine the value of the phonic syllabication generalization "When two vowel sounds are separated by a single consonant, divide before the consonant," or to determine a modification of it which has a high utility level, and also to describe the pronunciation of adjacent vowels in words which run the gamut of the grades.

It is recommended that a source other than the Thorndike and Lorge Teacher's Word Book of 30,000 Words be used for such studies because another study based on this list is likely to duplicate the findings of the present study. To gain greater scope, another researcher might consider the possibility of using the final publication of Children's Knowledge of Words (1960), which was to be published in 1966. A random sampling of a reputable high school or college level dictionary is another possibility.

Precautions for Teaching

It is recommended that teachers place more confidence in some generalizations than in

others and that they be particularly cautious when instructing children in the use of phonic generalizations which appear to have limited value. It is suggested that teachers advise children to examine words in which these generalizations might apply in two or more different specific ways until oral recognition is achieved.

IMPLICATIONS FOR FURTHER RESEARCH AND FOR EDUCATIONAL PRACTICE:

EXPERIMENTAL STUDY OF THE TEACHING OF WORD ANALYSIS GENERALIZATIONS

Limitations of the Experimental Study

Conditions for the experiment were in several ways less than optimum. Whole classes, consisting of as many as 35 to 40 students, were taught the generalizations, although the lesson plans were originally designed for use in groups of from 8 to 12 students. It is extremely difficult for a teacher to give the individual attention that is necessary when teaching generalizations of this type to large classes, and it is difficult for a large class to maintain concentrated interest when individual attention cannot be given.

The testing instrument used in the study was the best that could be found, but it was not ideal. It probably did not directly test the students' ability to apply the generalizations they were taught as well as a test specifically designed to accompany the plans would have done.

Recommendations for Teaching

It seems advisable that if the present lesson plans be used again in a school situation that they be paced over a longer period of time if used in a whole class situation. They might, however, be used in a small group situation for a two-week period. It should be understood that the generalizations used in these plans are basic to the pronunciation of the majority of English words but that the teaching of further generalizations may be desirable and necessary for many students.

Recommendations for Further Research

The testing instrument used in any study is of great importance. It would seem advisable to construct a test to accompany these plans, so that the experimenter would be better able to judge whether or not students made sizable gains in the application of the generalizations taught. However, transfer value to regular reading materials should not be overlooked.

The orientation session for the teachers should probably be lengthened to about six hours. Some of the teachers in the present experiment encountered some complex difficulties which could not be resolved in the four hour session provided for them. Also, extreme caution should be taken in training the assistants who are to give the oral tests. One or more intensive training sessions appear to be necessary before each testing session. In addition, it is recommended that the oral tests be taped.

And, finally, it is recommended that the range of scores from which the evaluation groups (sample) are selected be directly related to the evaluation group (sample) size.

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APPENDIX

SUMMARY TABLES OF RAW DATA USED IN DETERMINING GENERALIZATIONS TO BE TAUGHT

SUMMARY TABLES

The following tables are summaries of the raw data. Table 1 contains information about the level and size of each sample, as well as the frequency count and utility level, expressed as a percentage, of twelve structural analysis and phonic generalizations considered for use in the lesson plans of the present experimental study. A description of the contents of Table 1, by column, follows:

Thorndike-Lorge Level: the inclusive level(s) of the sampling as given in "Column G" (Part I: List of Words Occurring at Least Once per 1,000,000 Words)

Sample Size %: The size of the sample as a per cent of the total listing at the given level

Sample Size #: The number of words included in the sample

Structural Syllabication Generalizations:

prefix/root: "Divide between a prefix and a root." (# column: The numerator gives the number of times the generalization is descriptive of the existing situation. The denominator gives the number of possible applications of the generalization. % column gives the per cent of utility of the generalization and is arrived at by dividing the numerator by the denominator.)

root/root: "Divide between two roots."

root/suffix: "Divide between a root and a suffix."

Phonic Syllabication Generalizations:

vc/cv: "When two vowel sounds are separated by two consonants, divide between the consonants, but consider 'ph,' 'ch,' 'sh,' and 'th' to be single consonants."

v/cv: "When two vowel sounds are separated by one consonant, divide before the consonant, but consider 'ph,' 'ch,' 'sh,' and 'th' to be single consonants."

--/cle: "If a word ends with a 'consonant-l-e,' these three letters form a syllable."

Consonant Generalizations:

"c": "'C' followed by 'e,' 'i,' or 'y' sounds soft; otherwise 'c' is hard (omit 'ch')."

"g": "'G' followed by 'e,' ii,' or 'y' sounds soft; otherwise 'g' is hard (omit, 'gh')."

Vowel Generalizations (excluding adjacent vowels):

open syllable: "A single vowel in an open syllable has a long sound (omit final syllable of a word ending in 'consonant + y')."

closed syllable: "A single vowel in a closed syllable has a short sound (consider 'final consonant-l-e' to be 'final consonant-e-l' and, therefore, a closed syllable)."

"final e" (-vce): "When a word ends in 'vowel-consonant-e,' the vowel is long, and the 'e' is silent."

"final y" (ĭ, i.e., ē): "When 'consonant + y' are the final letters in a monosyllabic word, the 'y' has a 'long i' sound; in a polysyllabic word the 'y' has a 'short i' (long e) sound."

Per cent of words in sample having the following number and syllables:

one to six; total number of words in sample

Table 2 contains the summary information of the various pronunciations of commonly found adjacent vowels from the "Adjacent Vowel" samplings: the ten per cent stratified random

sampling of adjacent vowels plus the general random sampling of adjacent vowels. From left to right the columns include:

adjacent vowels: the identification of the adjacent vowels which were found commonly.

pronunciation key: The arabic numeral is used in the raw data section of the original report (Burmeister, 1966) and represents the pronunciation which follows it, the symbol used in the American College Dictionary.

Thorndike-Lorge Level—Frequencies: frequencies of occurrence according to the samplings: general, AA and A, 20-49 stratification, 1-19 stratification, and grand total.

Table 1

Sampling Information, Frequency Count and Utility Level of Structural Analysis and Phonic Generalizations Used in this Study

Thorndike-Lorge Level	Sample Size %	Sample Size #	Structural Syllabication Generalizations						Phonic Syllabication Generalizations					
			prefix/root		root/root		root/suffix		vc / cv		v / cv		-- / cle	
			#	%	#	%	#	%	#	%	#	%	#	%
AA	5	54	2/2	100	0/0		6/7	86	7/7	100	3/4	75	2/2	100
A	5	47	6/7	86	0/0		11/12	92	9/10	90	5/8	68	0/0	
38-49	5	23	5/6	83	0/0		4/5	80	2/2	100	7/9	78	0/0	
30-37	5	24	6/6	100	0/0		8/8	100	7/7	100	3/6	50	1/1	100
24-29	5	23	3/4	75	3/3	100	6/9	67	2/2	100	4/7	57	0/0	
20-23	5	22	2/2	100	3/3	100	5/5	100	9/9	100	7/8	88	0/0	
16-19	5	32	11/11	100	1/1	100	6/6	100	6/6	100	3/4	75	0/0	
13-15	5	30	6/6	100	1/2	50	8/10	80	6/6	100	8/14	57	1/1	100
10-12	5	47	12/12	100	3/3	100	14/19	78	17/20	85	9/15	60	2/3	67
8-9	5	48	7/7	100	5/5	100	10/14	71	16/17	94	13/16	81	1/1	100
6-7	5	65	10/10	100	4/4	100	19/21	90	21/22	95	14/22	64	2/2	100
4-5	2.7	52	15/16	94	10/10	100	14/20	70	10/10	100	16/24	67	2/2	100
2-3	1.3	52	13/14	93	5/6	83	17/25	68	7/9	78	17/26	66	2/2	100
1	1	52	8/9	89	5/5	100	20/26	77	16/16	100	19/23	83	1/1	100
TOTAL	2.85	571	106/112	95	40/42	95	148/187	74	135/143	94	128/186	69	14/15	93
Gates Form 1 Total	100	65	19/20	95	1/1	100	12/26	46	16/16	100	18/28	64	4/4	100
Gates Form 2 Total	100	65	16/16	100	3/3	100	14/21	67	19/20	95	16/26	62	2/2	100

Table 1 (continued)

Thorndike-Lorge Level	Consonant Generalizations "c" #	"c" %	"g" #	"g" %	Vowel Generalizations (excluding adjacent vowels) open syllable #	open syllable %	closed syllable #	closed syllable %	"final e" (-vce) #	"final e" (-vce) %	"final y" (ĭ, -i.e.-ē) #	"final y" (ĭ, -i.e.-ē) %	Per cent of words in sample having the following number of syllables 1	2	3	4	5	6	# of words
AA	8/8	100	3/3	100	2/7	30	41/41	100	5/10	50	1/1	100	70	28	2	2			53
A	16/16	100	5/5	100	3/12	25	44/45	98	4/5	80	8/8	100	51	28	15	6			47
38-49	7/7	100	3/3	100	2/9	22	18/19	95	2/4	50	1/1	100	22	57	17	4			23
30-37	4/4	100	3/3	100	2/6	33	27/27	100	3/4	75	2/2	100	25	42	21	13			24
24-29	4/4	100	4/4	100	3/8	38	24/25	96	2/4	50	0/0		39	39	9	9	4		23
20-23	6/6	100	1/2	50	3/11	27	27/27	100	1/3	33	0/1	0	23	32	41	5			22
16-19	10/10	100	3/4	75	3/9	33	28/30	93	8/8	100	5/5	100	36	44	9	9			32
13-15	7/7	100	4/4	100	3/8	38	39/40	98	2/3	67	4/4	100	17	40	37	7			30
10-12	15/15	100	3/3	100	4/21	19	61/61	100	6/9	67	6/6	100	13	47	19	19	2		47
8-9	13/13	100	4/7	57	7/19	37	51/52	98	5/9	56	7/7	100	21	42	27	10			48
6-7	21/21	100	2/2	100	4/18	22	89/91	98	4/9	44	13/13	100	20	48	22	8	3		65
4-5	19/19	100	4/4	100	9/31	29	68/70	97	6/8	75	8/8	100	8	44	31	12	4	2	52
2-3	13/13	100	10/10	100	14/33	42	57/61	93	3/8	38	9/9	100	8	44	31	15	4		52
1	13/13	100	4/5	80	9/25	36	67/71	94	7/10	70	7/7	100	13	37	35	10	4	2	52
Total	156/156	100	54/60	90	68/217	31	641/660	98	57/93	61	71/72	99	26	40	22	9	2	0.4	571
Gates Form 1 Total	17/17	100	6/7	86	9/40	23	68/69	98	7/13	54	9/10	90	17	32	35	14	2		65
Gates Form 2 Total	25/25	100	6/7	86	8/27	30	85/87	98	6/11	55	5/5	100	15	41	30	11	2		65

Table 2

Pronunciation Key and Frequency Count by Stratifications Used in the Present Study for Commonly Found Adjacent Vowels in the Thorndike and Lorge Samplings

Adjacent vowels	Thorndike and Lorge level					
	Pronunciation Key	General	AA - A	20 - 49	1 - 19	Total
ai	1 = ā	6	7	7	9	29
	2 = ă	1	2	1	2	6
	3 = ĭ	1				1
	4 = ɪ̄	1			1	2
	5 = ə			3		3
	6 = ă/ē				1	1
	7 = ĭ/ī	1				1
ay	1 = ā	4	1	4	12	21
ee	1 = ē	7	7	1	16	31
	2 = ĭ	1			3	4
ea	1 = ē	9	4	1	18	32
	2 = ĕ	1	2	2	5	10
	3 = ā		1		2	3
	4 = ĭ/ə	1			1	2
	5 = ē/ə	2		1	2	5
	6 = û		1		1	2
	7 = ä				1	1
	8 = ē/ ā		1			1
	9 = ĭ				1	1
oa	1 = ō	2	1	2	7	12
	2 = ô		1		2	3
	3 = ō/ə				1	1
ow	1 = ō	10	4	2	2	18
	2 = ou	2	4	3	4	13
ei	1 = ā	2	1	3	2	8
	2 = ē	1		1		2
	3 = ɪ̄	1	1			2
	4 = ĭ		1			1
ie	1 = ē	7		1		8
	2 = ĭ	1	1	2	3	7
	3 = ɪ̄	1	1	1	2	5
	4 = ə	1			3	4
	5 = ĭ/ə	2				2
	6 = ĭ/ĭ	1				1
	7 = ɪ̄/ə		2			2
	8 = yə	1				1
	9 = ĭ/ĕ	1				1
ia	1 = ĭ/ə	7	1	1	9	18
	2 = ə	8		1	2	11
	3 = ī/ə	3			2	5
	4 = ĭ/ā	1			1	2
	5 = yə	1	1			2

Table 2 (continued)

Adjacent vowels	Pronunciation Key	Thorndike and Lorge level: General	AA - A	20 - 49	1 - 19	Total
	6 = ɪ̈			1		1
	7 = ɪ̈/ă				2	2
	8 = ɪ̈/ĕ				1	1
au	1 = ô	2	1		7	10
	2 = ā	1				1
	3 = ă			1		1
	4 = ō				2	2
ou	1 = ou	5	4	1	14	24
	2 = ō	2		1	2	5
	3 = ŭ		2	1		3
	4 = û				1	1
	5 = ū				1	1
	6 = o͞o				1	1
	7 = o͝o				2	2
oi	1 = oi	4	4	1	5	14
	2 = ō/ə	1				1
	3 = ə				1	1
oy	1 = oi	1	1	1		3
oo	1 = o͞o	10	2	1	6	19
	2 = o͝o	6	1	1	6	14
	3 = ō	2	1			3
	4 = ŭ		1			1
	5 = ō/ŏ	1				1
tion	1 = shən	21	4	6	28	59
	2 = chən				1	1
sion	1 = zhən	5		1	7	13
	2 = shən	6	1		3	10
cons. + ous	1 = əs	7	1	3	2	13
ious	1 = ɪ̈/əs	3			4	7
	2 = əs	3		1	4	8
	3 = yəs				1	1
	4 = ɪ̈/əs				1	1
eous	1 = ĭ/əs	2				2