A STUDY TO COMPARE THE EFFECTIVENESS OF AN INDUCTIVE VERSUS

A DEDUCTIVE STRATEGY IN TEACHING SPELLING LESSONS

FROM A LINGUISTICALLY BASED SPELLING PROGRAM

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A Dissertation

Presented to

the Faculty of the College of Education

University of Houston

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In Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

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by

Sally Williams Blewett, B.M., B.S., M.Ed.

May 1974

ACKNOWLEDGEMENT

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ABSTRACT

The aim of this study was to determine the relative

effectiveness of an inductive versus a deductive strategy in teaching

spelling lessons from a linguistically based spelling program. The

intention was to compare the two strategies to see whether one

strategy of teaching was superior to another with given pupils.

Fifty-eight fourth grade and forty-eight fifth grade pupils

were selected to participate in the study. The pupils were students

in four language arts classes in a single elementary school. The

classes were randomly assigned by grade to inductive or deductive

strategy groups. Four special instructors, one per class, were

employed and trained to teach spelling generalizations daily for a

period of two weeks. Deductive groups were taught rules and inductive

groups were led to discover rules for themselves. Common lists of

words were used to teach the generalizations for each grade level.

Three pre- and post-test scores were analyzed for each

pupil: (1) a spelling test constructed by the researcher consisting of a random sample of the words taught in connection with the generalizations; (2) the spelling portions of the <u>Metropolitan Achievement</u> <u>Tests</u>, Forms F and G respectively; and (3) a spelling generalization test derived from the test constructed by the researcher where only the graphemes corresponding to the phonemes in the generalizations taught were scored regardless of the spelling of the rest of the word.

The three independent variables involved in the study were: (1) strategy, inductive or deductive; (2) grade, four or five; and (3) sex, male or female. Nine null hypotheses were tested. Hypotheses I, IV, and VII predicted a relationship between spelling gain scores and the strategy employed. Hypotheses II, V, and VIII predicted a relationship between spelling gain scores and grade level. Hypotheses III, VI, and IX predicted a relationship between spelling gain scores and sex.

A multiple regression analysis technique was used to analyze the data. Every variable was correlated with every variable using Pearson Product-Moment correlation coefficients. All statistical analyses were done with the use of a Univac 1108 computer at the University of Houston in the computer center.

Hypotheses I, II, V, and VII were rejected. It was shown statistically that strategy did make a significant difference in spelling gain scores on the test constructed by the researcher and on the spelling generalization test. In both instances, the deductive strategy group scored significantly higher than did the inductive strategy group. An unexpected relationship was detected between the grades on the test constructed by the researcher. The fourth grade scored significantly higher on both the pre-test and the post-test. The fifth grade scored significantly higher on the Metropolitan Tests as would be expected, however. No significant difference could be found favoring either strategy group on the standardized test. Hypotheses III, IV, VI, VIII, and IX could not be rejected. That sex and grade have an impact on the basic relationship between strategy and gain was not shown statistically. Sex and grade did add a small amount to the predicted variance, but the amount in each case was statistically insignificant.

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CHAPTER I

INTRODUCTION

BACKGROUND OF THE STUDY

The ability to spell is a necessity for every person who functions well in today's society. A frequent complaint against the schools is that pupils cannot spell (Fox, 1946; Hall, 1961; Hodges, 1964; and Dallman, 1966). Correct spelling is a prime prerequisite for written communications. Children must acquire skill in spelling if they are to be able to express themselves effectively through writing. Educators have the responsibility of seeking more effective strategies for teaching spelling.

Spelling research of the past has concentrated on four basic questions: (1) what words should be taught, (2) in what sequence should these words be taught, (3) at what grade level should these words be studied, and (4) how much time should be allotted to

teaching spelling (Horn, 1969). The spelling of each word has been considered as a separate act similar to the rote memorization of a Chinese character (Hanna and others, 1971).

This study is an attempt to go beyond the type of spelling research that has been cited by Horn. It compares the relative effectiveness of two strategies utilized in teaching pupils how to spell in contrast to other studies which have emphasized what should be taught in spelling. Basic assumptions underlying this study are conclusions from linguists who have pointed out the regularity of American English orthography.

Under the direction of Paul R. Hanna, an intensive computerized study was launched at Stanford University to analyze the relationships between phonemes and graphemes in over 17,000 different words (1966). A preliminary study conducted by James T. Moore under the supervision of Hanna (1953) demonstrated that eighty per cent of the 3,000 words in a typical elementary school program were spelled on a phonological basis alone and that a smaller, but still significant number of words were spelled correctly by compounding and affixation. The Stanford study, known as Project 1991, showed that forty-nine per cent of the 17,000 words analyzed were spelled correctly on a phonological basis alone. Another thirty-six per cent of the words were spelled with only one error.

Hanna concluded (1971):

> ...the American English orthography is an alphabetically based orthography, i. e., it employs graphic symbols to represent the speech sounds, the phonemes of language...and there is a more consistent relationship between sounds and letter representations than has been traditionally thought...This suggests a much different approach to the spelling problem than that which maintains that each word needs to be learned in its entirety as a separate learning act (p. 97).

Three major points about American English orthography which the findings of Project 1991 established are: (1) American English orthography is an alphabetically based orthography; (2) there is pattern and system in the way words have been and continue to be created in American English orthography; and (3) the number of words which do contain rare, even unique, spellings of phonemes is relatively small (Hanna and others, 1971). The data analyzed in Project 1991 have been used to suggest word selection and gradation according to linguistic principles in order to make possible, hopefully, an almost unlimited correctly spelled writing vocabulary (Horn, 1969).

As early as 1933, Leonard Bloomfield pointed out large numbers of words which contained highly consistent phoneme-grapheme relationships. Carl Lefevre has noted a basic pattern to the way American English orthography symbolizes the language even though, at times, it may seem capricious (1963 and 1970). Robert Hall has emphasized that letters represent sounds (1961). Spelling lessons

should be designed to develop in the learner a reasonable correlation between sounds and letters. Such knowledge should enable the child to build the power to spell through the aural-oral analysis of his own speaking vocabulary (Haynes, 1962).

Spelling is a multisensory-multimotor process involving speech, audition, vision, and haptics (Hanna and others, 1971). In an alphabetic orthography, the act of spelling is basically one of encoding the phonemes of speech into the graphemes of the writing system. The ability to spell involves more than sensory memories and motor responses. It is also related to the development of concepts about orthography, i.e. how the writing system reflects or fails to reflect speech. According to Hanna and others (1971), "The acquisition of these concepts can come about primarily in two major ways; deductively or inductively (p. 104)." Although deductive learning is considered important in modern spelling programs, it is generally conceded that building spelling power rests on the individual's ability to induce important spelling concepts and then to apply them (Benthul and others, 1968; Glim and others, 1967; and Kottmeyer and Claus, 1968).

Hanna has noted that spelling is a process which lends itself to an inductive approach. "An effective spelling program is aimed primarily at teaching pupils to induce their own rules and

generalizations (Hanna and others, 1971, p. 122)." He has stressed

the importance of using inductive strategies:

> The instructional area most likely to be neglected in
> the spelling program is that of pupils' discovery of
> the behavior of phoneme-grapheme correspondences
> in his language and the rules and generalizations upon
> which the orthography is based. The inductive approach
> should be given the importance it deserves; and the
> teacher, rather than initiating the rule or principle
> to be learned, should encourage the pupil to extract
> it from close examination of words which illustrate
> the generalization being presented in a particular
> lesson (p. 122).

David Ausubel (1968), on the other hand, has concluded

that inductive strategies have been overrated generally. He has charged

that the use of such strategies is often unproductive and time consuming.

Furthermore, he has identified deductive strategies as processes

through which large bodies of subject matter are usually acquired

while he has associated inductive strategies with problem solving

experiences typical of the early stages of learning. Ausubel has made

an attempt to break through the mystique which has come to surround

inductive strategies--particularly discovery approaches.

Linguistically based spelling programs seek to do more

than teach children how to spell lists of words. Such a spelling pro-

gram is a study of language as a whole with special reference to the

written language. It seeks to guide children toward an understanding

of their oral code and orthography, its visible counterpart (Hanna

and others, 1971). Pupils consider phonology, morphology, and context in their study of spelling (Benthul and others, 1968; Glim and others, 1967; and Kottmeyer and Claus, 1968).

THE PURPOSE OF THE STUDY

Hanna (1971) has pointed out a need for controlled studies that provide statistical data on the results of various types of programming in teaching spelling, "Fox example, the need to establish the relative effectiveness of inductive and deductive methods (so that we can present an optimum mix of teaching-learning strategies) (p. 112)."

This study was based on spelling lessons designed to teach either inductively or deductively certain sound-letter generalizations as suggested by the extensive computer analysis of phoneme-grapheme relationships completed at Stanford in Project 1991. The purpose of this research was to test the relative effectiveness of an inductive versus a deductive strategy in teaching spelling lessons from a linguistically based spelling program to fourth and fifth grade pupils. The intention was to compare the two strategies to see whether one strategy of teaching was superior to another with given pupils.

HYPOTHESES

Specifically, this study was designed to test nine hypotheses.
Hypotheses I, IV, and VII predicted a relationship between spelling
gain scores and the strategy employed. Hypotheses II, V, and VIII
predicted a relationship between spelling gain scores and grade level.
Hypotheses III, VI, and IX predicted a relationship between spelling
gain scores and sex. Each is stated in null form:

> Hypothesis I--There is no significant difference between
>
> the inductive group's residual gain score
>
> and the deductive group's residual gain
>
> score as measured by the test constructed
>
> by the researcher.
>
> Hypothesis II--There is no significant difference between
>
> the fourth grade's residual gain score and
>
> the fifth grade's residual gain score as
>
> measured by the test constructed by the
>
> researcher.
>
> Hypothesis III--There is no significant difference between
>
> the boys' residual gain score and the girls'
>
> residual gain score as measured by the test
>
> constructed by the researcher.

Hypothesis IV--There is no significant difference between

the inductive group's residual gain score

and the deductive group's residual gain score

as measured by the spelling portion of the

Metropolitan Achievement Tests.

Hypothesis V--There is no significant difference between

the fourth grade's residual gain score and the

fifth grade's residual gain score as measured

by the spelling portion of the Metropolitan

Achievement Tests.

Hypothesis VI--There is no significant difference between

the boys' residual gain score and the girls'

residual gain score as measured by the

spelling portion of the Metropolitan Achieve-

ment Tests.

Hypothesis VII--There is no significant difference between

the inductive group's generalization residual

gain score and the deductive group's general-

ization residual gain score as measured by

the test constructed by the researcher.

Hypothesis VIII--There is no significant difference between

the fourth grade's generalization residual

gain score and the fifth grade's generaliza-

tion residual gain score as measured by the

test constructed by the researcher.

Hypothesis IX--There is no significant difference between

the boys' generalization residual gain score

and the girls' generalization residual gain

score as measured by the test constructed

by the researcher.

DEFINITION OF TERMS

For the purpose of this investigation the following

definitions were adopted:

Alphabetic Principle

The principle of using graphemes to signify phonemes

which underlies many written forms of languages. Ideally, each

phoneme would be represented by its own distinctive grapheme. In

American English, the alphabetic principle is approximated (Hanna

and others, 1971).

American English

The kind of English spoken in the United States, as com-

pared with British English.

Deductive Strategy

Reception expository method represented by a simple, straightforward example of traditional teaching (Barrish, 1972). Pupils confront a major premise or generalized body of information. They are led to analyze critically and apply the generalization to numerous situations. According to Hanna (1971):

> To acquire a concept deductively is first to be told a concept and then to seek verifying examples of it. For example, a child might be told that in American English the phonemes /b/, /d/, and /g/ are almost always spelled b, d, and g, respectively. Then having these concepts available, he would attempt to verify if such spellings actually occurred. Much formal learning is, of course, transmitted to pupils in this way in our schools. The deductive approach is presumed to expedite the learning process since the pupil does not have to devise the concept for himself; he needs only to verify it (p. 105).

Generalization

A principle upon which American English orthography is based, a principle that could become a part of a pupil's spelling repertoire and be applied in spelling words he could pronounce but whose spellings may be unfamiliar.

Grapheme

A unit of writing which in alphabetic systems represents a spoken sound.

Inductive Strategy

Guided discovery instructional method as defined by Cres-
well (1970) and Barrish (1972). Pupils investigate specific data, dis-
cover relationships and class data into conceptual groupings and finally
formulate generalizations. According to Hanna and others (1971):

> In inductive learning, the learner himself develops
> a concept by noticing that certain common features
> exist in his environment. All concepts are essen-
> tially non-verbal in nature; they are experimental
> categories produced as a result of interaction with
> one's environment. They are said to be acquired
> inductively if the individual infers from his exper-
> iences that there is a common property about certain
> objects or events which is useful in helping him or-
> ganize his views of the world around him; such in-
> ferred properties are concepts. Inductive concept
> formation, then is inverse to deductive concept for-
> mation in that it begins with the observation of raw
> data (experiences) and ends with the individual ex-
> tracting and constructing a concept from these data
> (p. 105).

Linguistically Based Spelling Program

A spelling program with a master plan for enabling pupils
to observe in a systematic way the spelling patterns which constitute
American English orthography as described by Hanna and others
(1971).

Linguistics

The scientific study of language.

Morpheme

The smallest meaningful unit of language.

Morphology

The study of morphemes.

Orthography

A set of rules, principles, standards, and conventions by which spoken forms of language are transcribed into written forms-- spelling. In English the orthography is largely a set of rules for transcribing phonemes into graphemes (Hanna and others, 1971).

Phoneme

The smallest meaningful unit of sound whereby the substitution of one for another changes the meaning of a morpheme.

Phonology

The study of phonemes.

Spelling

The process of encoding, or of rendering spoken words into written symbols (Hanna and others, 1971).

Teaching Strategy

A pattern of teacher behavior that is recurrent, applicable to various subject matters, characteristic of more than one teacher, and relevant to learning (Gage, 1969).

LIMITATIONS OF THE STUDY

The following limitations were recognized and reported for this study:

Subjects, whom school officials considered representative of families of approximately middle class, were chosen for the present study from the fourth and fifth grade classes in a school in southeast Texas. Generalizations made from this study are limited to populations similar to those used in this study.

Use of the terms inductive and deductive are limited as described in the definition of terms.

The research was limited to a period of two weeks. Generalizations made from the study are limited to short time periods.

ASPECTS OF THE PROBLEM INVESTIGATED

The present study was an attempt to compare the relative effectiveness of two strategies in teaching spelling lessons from a linguistically based spelling program. The intention was to compare the inductive strategy to the deductive strategy in order to see whether either strategy was superior to the other with given pupils.

To accomplish this purpose, all subjects were randomly assigned by grade to inductive or deductive strategy groups. Four special instructors, one per class, were employed and trained to teach spelling lessons using the designated strategy. Classes studied spelling generalizations thirty minutes daily for a period of two weeks. Deductive groups were taught rules and inductive groups were led to discover rules for themselves. Common lists of words were used teach the generalizations for each grade level.

Three pre- and post-test scores were analyzed for each subject: (1) a spelling test constructed by the researcher consisting of a random sample of the words taught in connection with the generalizations; (2) the spelling portions of the Metropolitan Achievement Tests, Forms F and G respectively; and (3) a spelling generalization test derived from the test constructed by the researcher where only the graphemes corresponding to the phonemes in the generalizations taught were scored regardless of the spelling of the rest of the word.

A multiple regression analysis technique was used to analyze the data. Every variable was correlated with every other variable using Pearson Product-Moment correlation coefficients. All statistical analyses were done with the use of a Univac 1108 computer at the University of Houston in the computer center.

BASIC ASSUMPTIONS

In order to design the study, certain basic assumptions were made. A primary assumption was based upon the results of Project 1991 and its relevance to the teaching of spelling. It was assumed that the teaching of spelling generalizations would provide pupils with skills necessary to spell words in their aural-oral vocabularies.

It was further assumed that lessons from the Power to Spell (Hanna and others, 1967) spelling textbooks carried out the principles and procedures advocated by Hanna and others as a result of the findings from Project 1991. Lessons for the study were selected and adapted from these textbooks.

Since the spelling portions of the Metropolitan Achievement Tests, Forms F and G were selected as a measure of spelling gain scores, it was assumed that the spelling functions measured by these tests were relevant to the present study.

ORGANIZATION OF THE STUDY

Chapter I has presented an overview describing the nature and purpose of the study. This included background of the study, the

statement of the purpose, hypotheses tested, definition of terms,

limitations of the study, aspects of the problem investigated, and basic

assumptions.

Chapter II is devoted to a review of literature and research

related to the subject. In Chapter III, the population is described and

a detailed description of the procedures followed in gathering data is

presented. Chapter IV contains the statistical analysis, and the final

chapter includes the summary of findings, conclusions, and recom-

mendations.

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CHAPTER II

REVIEW OF THE LITERATURE

Controversy among leading authorities in American English orthography has centered around the utility of teaching spelling generalizations. Advocates of the phonetic generalization hypothesis have generally recommended the inductive method of teaching such generalizations. Much of the available research which refutes the generalization question has been based upon the deductive mode of instruction.

One of the most controversial issues in the field of learning is concerned with the value of inductive versus deductive strategies in teaching. "Teacher-telling" has been questioned while "pupil discovery" has been emphasized.

This chapter reviews the literature as it related to the areas of the generalization question, inductive versus deductive strategies, and these two strategies as they apply to teaching spelling generalizations.

THE UTILITY OF SPELLING GENERALIZATIONS

Two aspects of the generalization question were researched: (1) the alphabetic principle; and (2) what authorities say about applying generalizations to teaching spelling.

The Alphabetic Principle

An analysis of American English orthography clearly reveals that this writing system is essentially alphabetic in structure. Large numbers of words contain highly consistent phoneme-grapheme relationships (Bloomfield, 1933). Bloomfield's attempts to apply directly the evidence from linguistic science to the teaching of language skills has had a fundamental effect upon spelling instruction (Hanna and others, 1966).

James T. Moore, Jr., directed by Paul R. Hanna, conducted basic research into Bloomfield's observation at Stanford University (1951). This research demonstrated that eighty per cent of the 12, 546 phonemes comprising the 3, 000 most frequently used American English words are spelled consistently, while only twenty per cent of the phonemes present unusual difficulty. In emphasizing the possibility of using linguistic principles to reinforce other types

of learning, the study has influenced the current approach to the sub-
ject of elementary school spelling. Many schools have adopted new
programs utilizing a sound-to-letter approach in which the pupil learns
that certain specific graphemes are used to write the phonemes in a
word he says and hears. The general teaching strategy suggests that
the consistently spelled phonemes are taught first in the developmental
program; then those phonemes are introduced that have optional spell-
ings. The pupil is helped systematically to observe the consistency
of phoneme and grapheme, and to arrive at basic principles for the
orthography of the American English language inductively (Hanna and
others, 1967).

The results of Moore's research suggested the feasibility
of designing spelling curriculum based upon the alphabetic principle.
Both Hanna and Moore proposed that (1966, p. 6):

1. Time be set aside during the school day for the purpose
of learning to translate sounds into written symbols.

2. Spelling be integrated with other subjects in order that
there may be an emphasis on meaning and correct usage, and a prac-
tical application of the proficiency acquired during the regular spelling
period.

3. Definite groups of words and syllables in American
English which belong in certain phonic categories be learned inductively.

The child should develop a sense of the probable letter or letters to be used to represent the speech sounds as they occur in words belonging to such group patterns.

4. The beginner proceed slowly from the simple phonic pattern to those which are more complex in structure.

5. The relatively few English words which follow a rarely occurring phonic pattern be individually memorized.

These conclusions were challenged by many spelling authorities. Ernest Horn (1957), a scholarly spokesman, maintained that less frequently used words, beyond the 3,000 word sample analyzed, might show less consistent phoneme-grapheme regularities. To substantiate his contention, Horn analyzed 10,000 words. His conclusions were sharply disparate with the findings of Hanna and Moore. Horn suggested that the limited number of words wholly consistent with the alphabetic principle precluded the development of curriculums which primarily are based upon such linguistic evidence. He advocated teaching phoneme-grapheme relationships whenever pertinent, but maintained that "Some claims made for the contribution of phonics to spelling do not appear to be well grounded (1957, p. 432)," and in the main, "...each word should be selected on the basis of the extent and nature of its distribution among the various types of writing that have been sampled."

Subsequent investigations of American English orthography

have drawn rather different conclusions from Horn's (Garvin, 1963;

Hall, 1961; Lloyd and Warfel, 1956). These investigators, mostly

linguists, have reemphasized the basic validity of the Hanna-Moore

study. Their findings concur that American English orthography is

essentially alphabetical in structure.

Project 1991, the extensive computer analysis of 17, 310

words at Stanford, (Hanna and others, 1966) was designed to clearly

establish the degree to which the phonological structure of American

English orthography is consistently represented through the lexicon.

This extensive analysis was based upon linguistic principles and utilized

the powerful research tool of computer technology. The analysis was

based upon a standard (midwest) pronunciation system of 22 vowel and

30 consonant phonemes. With phonological cues alone, it was found

that individual phoneme-grapheme relationships could be predicted

with an accuracy of 89.6 per cent. When the algorithm was applied

to full words, the accuracy was just under 50 per cent. Of the words

spelled incorrectly, 6,332 (37.2 per cent) were spelled with one error;

1,941 (11.4 per cent) had two errors, and 390 (2.3 per cent) had three

or more errors.

According to Thomas D. Horn (1969), the promise of

Project 1991, for establishing usable generalizations rests upon:

(1) the validity of the pronunciation system used to establish the regularity of phoneme grapheme relationships; (2) the reliability of resulting generalizations in terms of regional and social dialects and words with more than one acceptable pronunciation; and (3) the extent to which students can assimilate and effectively use generalizations in learning to spell (p. 1292).

Hanna advocates, on the basis of his studies, that modern methods of teaching spelling should be based on these facts: (1) spoken language is basic and original; (2) written language is secondary and derived. Children should be led to generalize the phoneme-grapheme correspondences that are peculiar to American English orthography.

What Authorities Say About Generalizations

A review of the literature on the teaching of rules in spelling for the past sixty years had revealed considerable disparity of opinion among educators concerning the value of teaching rules. Turner (1912) reported that direct drill on words without reference to rules was superior to combining direct study with a study of rules. According to Tone (1924) there was no advantage to using rules to teach inflected forms in spelling. Statistical and experimental reports convinced McKee (1939) that emphasis should not be placed

upon the teaching of spelling rules. Research by George Spache (1941)
indicates that in the lower grades spelling rules were not helpful and
had limited value in the upper grades. A general distrust of rules
was indicated by McKim and others (1959) when they stated that rules
generally apply only to a comparatively small number of words. Marie
(1963) found a "thought method" superior to both an inductive and a
deductive method of teaching rules with relevant words whose spell-
ings could be generalized from the rules.

In spite of the arguments against spelling rules, some
educators insist upon their retention. Lester (1917) investigated the
teaching of five rules and concluded that they were helpful. Rowland
(1927) stated that the proper teaching of rules is likely to result in
the improvement of spelling ability. Duboff (1932) found that rules
are of value in the intermediate grades. Jameson and Hicks (1960)
recommended teaching rules as a remedial technique. Otterman
(1955) found that low initial scorers and pupils with low mental ages
showed significantly superior improvement in spelling performance
when prefixes and word-roots were stressed. Glim (1963) found
that upper and lower groups projeted from studying linguistic struc-
ture with the lower group receiving most benefit.

Albert H. Yee (1969) conducted a study designed to help
settle the controversy in spelling instruction concerning the phonetic

generalization hypothesis. It showed questionable advantage for the

phonetic instruction group over the no-phonetic instruction group.

Test-study methods appeared to be more promising than phonetic

approaches, however. According to Yee:

> Phonetic instruction alone may provide the pupil some
> preparatory process to attack unfamiliar words and
> thus help him perform slightly better...But used as
> blanket rules, they lend themselves to more errorful
> spelling by perhaps creating less dissonance or con-
> cern on the part of pupils to check and concentrate
> upon the spelling of individual words (p. 90).

Thomas Horn (1969) pointed out that the utility of any rule

is dependent upon the degree to which it satisfies the following cri-

teria: (1) a rule must have wide application and few exceptions; and

(2) student knowledge of the rule must make a positive difference in

the ability to learn. Under these criteria, relatively few spelling

rules based upon morphological or orthographic considerations quali-

fy. Rules that do qualify include the following (E. Horn, 1960):

1. Rules for adding suffixes (Changing "y" to "i," dropping

final silent "e," doubling the final consonant).

2. The rules for the use of periods in abbreviations.

3. Rules for the correct use of the apostrophe to show

possession or indicate the missing letters in contractions.

4. Three specific rules:

a. The letter "q" is followed by "u" in common English words.

b. English words do not end in "v."

c. Proper nouns and most adjectives formed from proper nouns should begin with capital letters.

Methods for effectively teaching rules include the following recommendations (E. Horn, 1960; King, 1932; Sartorius, 1931; and T. Horn, 1969):

1. With few exceptions, only one rule should be introduced at a time.

2. Students should be taught each rule inductively in connection with the words to which each rule applies.

3. Both positive and negative aspects of the rule, if any should be taught.

4. After initial explanation, the rules should be systematically applied and reviewed.

5. The emphasis should always be on the use of rules rather than on their verbalization.

Paul and Verna Anderson (1964) have indicated that the teaching of traditional spelling rules should be replaced with the leading of pupils to generalize from identical elements in different situations. Teachers should plan situations in which the identical

elements needed for a generalization may be discovered by the learner.

INDUCTIVE STRATEGY VERSUS DEDUCTIVE STRATEGY

Along with the question of who shall be educated and for what purpose, the question of how to teach is perennial (Gage, 1969). Some authorities have found that teaching strategies do not account for significant variance in educational outcomes. Wallen and Travers (1963) concluded that "teaching methods do not seem to make much difference" and that "there is hardly any direct evidence to favor one method over another." Siegel and Siegel (1967) stated:

> ...it is generally discovered that students learn about as much when exposed to one kind of instructional environment as they do when exposed to another. The absence of significant difference is reported with monotonous regularity (p. 306).

Lecture method usually employs deductive strategies. In this mode the teacher predominates, exercising close and continuous control over what the learners receive. Discovery methods utilize inductive strategies where the teacher withholds control and induces the learners to find for themselves, with varying degrees of guidance, the concepts and principles to be learned (Gage, 1969).

At issue is the inductive versus the deductive arrangement of structuring cognitive learning experiences. The use of deductive

strategies has been challenged by proponents of inductive strategies. In spite of this, research evidence is meager, and "there exists a dearth of controlled classroom experimentation dealing with the inductive-deductive hypothesis (Rizzuto, 1971).

Bruner (1961) championed the cause of inductive strategies. He has attributed many benefits to learning by induction, such as a shift from extrinsic to intrinsic rewards, a way of conserving memory, and a technique for learning the heuristics of discovery. David Ausubel (1963) has taken an opposing position. He has tried to break through what he has termed the "elaborate mystique" surrounding inductive strategies, particularly the discovery method.

Empirical evidence has not supported any one strategy with regard to the relative effectiveness of the inductive and deductive strategies. In fact, results are often quite contradictory. However, several general trends appear to emerge. Deductive groups appear to learn faster and perform better on practiced tasks, as evidenced by their superior scores on immediate retention tests. Although inductive treatment groups take more time for initial learning, they seem to retain more material over a longer period of time. They seem to do consistently better on all immediate and delayed transfer tests. Studies which have investigated problem solving performance also seemed to show an advantage for inductive groups (Weisner,

1971).

Some studies which have reported the superiority of inductive strategy groups include: Haselerud and Meyers (1958); Hendrix (1947); Kersh (1958); and Ray (1961). A study by Rizzuto (1971) demonstrated that under certain conditions the inductive strategy group was superior to the deductive group in learning morphological and syntactical concepts of language structure. A consistent pattern of superiority was indicated on both immediate and delayed criterion measures. Rowlette (1960) also found that the directed discovery method led to significantly superior transfer of learning in learning orthographic principles.

Studies which reported findings in favor of deductive strategy groups included: Craig (1953 and 1956); and Fowler (1931). Deductive procedures seem to result in greater initial learning and retention according to Grote (1960), Guthrie (1967), and Wittrock (1963). A study by Marie (1963), found the deductive group superior to the inductive group, although a group taught by a "thought method" was significantly superior to the others cited.

Still other studies have been found which show the two strategies equally effective (Forgus and Schwartz, 1957; Nichols, 1957; Sobel, 1956; Weisner, 1971; and Krumboltz and Yabroff, 1965).

Wolfe (1963) obtained similar results when he compared the effects of inductive and deductive teaching through programmed learning on an achievement and transfer test. There were no significant differences between inductive and deductive groups which were taught units from the regular mathematics curriculum. Moss (1964) found no difference as determined by the amount of initial learning retention at one and six weeks, and transfer at one and six weeks. In addition, there was no advantage in using either method in teaching particular intellectual levels.

Clearly, neither strategy may be designated as superior to the other. Many authorities presently appear to favor the inductive technique. Based upon empirical evidence, however, there appears to be justification for utilizing both strategies. While aware of the value of inductive techniques, Jarvis (1967) has formulated the following reasons for utilization of deductive strategies also:

1. The systematized presentation of knowledge following the deductive teaching model is an expeditious way to transmit cognitive learnings.

2. The explanatory process of the deductive method is ideally suited for transmitting the specific terms which are requisite for learning materials in various disciplines.

3. In-depth classroom preparation is required when the

teacher employs the deductive teaching strategy.

4. Greater economies of time can likely be achieved in the acquisition of cognitive learnings when the deductive method is used.

5. Deductive teaching limits classroom discussion.

6. It is impractical to utilize inductive strategies all of the time in teaching.

7. The deductive method effectively and expeditiously bridges the gap between what children know and what they do not know.

8. Both inductive and deductive proponents know before the teaching act what generalizations they want children to formulate.

INDUCTIVE VERSUS DEDUCTIVE STRATEGY
IN TEACHING SPELLING

The spelling area has received little attention in regard to incorporating inductive strategies (Weisner, 1971). Horn (1954) and Hildreth (1955) were early proponents of the use of discovery techniques as one step toward improving spelling programs. Hanna and Moore (1966) maintain that the nature of American English orthography demands an inductive approach to generalizing the principles involved in spelling.

The extensive computerized analysis at Stanford, Project

1991, directed by Hanna (1966), led Hodges and Rudorf (1965) to the

following definitional model for the spelling of American English:

> The orthography of American English is determined
> by a set of rules for unit phoneme-grapheme relation-
> ships based, with decreasing productivity, upon three
> levels of analysis--phonological, morphological, and
> syntactical.

Since the initial study by Moore (1951), under the direction

of Hanna, several spelling programs have adopted the suggestions of

Hanna and Moore cited on pages 22 and 23 of this chapter. Spelling

for Word Mastery (Patton and Johnson, 1956) emphasizes teacher and

pupils working together to discover through repeated experiences the

generalizations which govern the spelling of certain classes of words.

Basic Spelling Keys (Glim and others, 1967) stresses the development

of phonetics and structural skills using visual and auditory discrimi-

nation activies. In so attacking the words, the child begins to build

inductively the knowledge that some words are spelled as they sound

and that some are unique. Lists of words are organized to help

students build phonetic generalizations and patterns in spelling are

inductively developed and systematically applied. Basic Goals in

Spelling (Kottmeyer and Claus, 1968) presents words in groups to

illustrate the expected spelling of American English sounds. Children

are led to make fundamental generalizations about phoneme-grapheme

relationships and to note agreement with or deviation from the

expected spelling. Power to Spell (Hanna and others, 1967) teaches

a basic word list for itself and as a vehicle to teach the symbols that

are used to stand for sounds that the pupil hears in words which he

writes.

Three studies which are directly related to the present

study were noted. Rowlette (1960) found that the directed discovery

approach led to significantly superior transfer of learning in teaching

orthographic principles. Weisner (1971) found no significant differences

when comparing the effectiveness of discovery versus didactic methods

in teaching basic spelling principles involving the addition of endings

to basic words. The discovery group approached significance, how-

ever, showing some advantage on the delayed transfer test. Sister

Evangelist Marie (1963) found a "thought method" significantly better

than either an inductive or a deductive method of teaching lists of

words governed by spelling rules. The "thought method" was defined

as a combination method by which new words were explained, discussed,

and used in sentences. Pupils were instructed to "figure out" spellings

after meanings were firmly understood. Based upon her study, Marie

concluded that "the development of meaning is the single most impor-

tant factor in spelling mastery, and it should receive emphasis in

any spelling program (p. 647)." Least progress in spelling was made

by the inductive groups, leading Marie to state "that pupils lack

sufficient training in formulating generalizations." The fact that the

deductive groups ranked second in spelling improvement seems to

indicate that children do reason deductively, and with some success.

SUMMARY

Hanna and others (1966), basing their conclusion upon the

findings of Project 1991, have established that American English

orthography is an alphabetic orthography and that there are certain

principles which underlie this system of spelling. The question of

the utility of teaching spelling generalizations remains controversial.

Many authorities who advocate teaching generalizations and others

who maintain that there is little use in doing so have been cited in

this chapter.

The question of inductive versus deductive strategy also

remains controversial. There appears to be strong justification for

utilizing both strategies although more authorities presently appear

to favor inductive strategies.

Authorities in the area of spelling appear to favor teaching

spelling generalizations utilizing inductive strategies. The present

study has been designed to compare the relative effectiveness of the

two strategies in teaching spelling generalizations at the fourth and

fifth grade levels.

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CHAPTER III

PROCEDURE

The intention of this study was to compare the relative

effectiveness of an inductive versus a deductive strategy in teach-

ing spelling lessons from a linguistically based spelling program.

Because of its relevance for the intermediate level, this study was

conducted in the fourth and fifth grades.

BACKGROUND OF THE SUBJECTS

A large urban district in southeast Texas was chosen on

the basis of location, size, permission of the district, and willing-

ness of the principals to allow the study. The school district selected

was considered by its administrators to serve a middle-socio-economic

community. It had eleven elementary schools with a total of 6,140 pupils

and 273 teachers and seven secondary schools with 5,616 pupils and

383 teachers. An examination of the school records reflected that,
based upon the type of occupations reported by the guardians and
compared with the salaries prevailing in that portion of Texas, family
incomes were about average for that part of the state. Records also
indicated that in the district as a whole a majority of the parents of
the pupils had completed high school and eighteen per cent had attended
college.

TABLE I

DESCRIPTION OF THE SCHOOL DISTRICT

Number of School Buildings		Number of Teachers		Number of Students	
Elementary	Secondary	Elementary	Sec.	Elementary	Sec.
11	7	273	383	6, 140	5, 616

One school was randomly selected from the eleven elemen-
tary schools in the district. The school was comparatively large

with approximately seven hundred pupils enrolled in kindergarten

through fifth grade. The school was located in a white, upper-middle

socio-economic neighborhood and served mostly a population of children

whose parents were engaged in professional and white collar occupations.

SELECTION OF THE SUBJECTS

One hundred six pupils were chosen from a population of

two hundred sixty-four fourth and fifth grade pupils to participate in

the study. The children used in the study were all considered to be

normal in intelligence and were functioning in a departmentalized

school setting. Of the one hundred six pupils selected for the study,

fifty-one (48.1 per cent) received the inductive strategy treatment

and fifty-five (51.9 per cent) received the deductive strategy treatment.

Fifty-eight (54.7 per cent) of the pupils were in the fourth grade and

forty-eight (45.3 per cent) were in the fifth grade. Fifty-one (48.1

per cent) of the pupils were male and fifty-five (51.9 per cent) were

female.

TABLE II

DESCRIPTIVE STATISTICS OF THE SAMPLE

Method		Grade		Sex	
Number of Students	% of Total Sample	Number of Students	% of Total Sample	Number of Students	% of Total Sample
Inductive		Fourth		Male	
51	48.1	58	54.7	51	48.1
Deductive		Fifth		Female	
55	51.9	48	45.3	55	51.9
Totals					
106	100.0	106	100.0	106	100.0

SPECIAL INSTRUCTORS

In order to control the teacher variable, four graduate students were employed as instructors. The following criteria were

accepted in selecting the instructors:

1. The subjects were to be recent graduates of a university
who were currently enrolled in a graduate program at a southeast
Texas university.

2. The subjects were to be identified as excellent teaching
prospects by the head of the elementary education department at the
southeast Texas university.

3. The subjects were to have experience as elementary
teachers or as substitute teachers at the elementary level.

4. The subjects were to be between the ages of twenty-four
and thirty-four.

5. The subjects were to be willing to undergo extensive
training and to carry out the plans exactly as specified.

A list of ten graduate students meeting the specified
criteria was supplied by the head of the elementary education depart-
ment of a southeast Texas university. Four names were randomly
selected and contacted. All four agreed to participate in the study
and certified to the researcher that they met the specified criteria.
Table III on page 48 contains descriptive statistics of the special
instructors.

TABLE III

DESCRIPTIVE STATISTICS OF THE SPECIAL INSTRUCTORS

Instructor	Age	Sex	Strategy taught in project	Grade taught in project	Hours completed in graduate school	Grade in Student Teaching	Grades in Education Courses+	Years of teaching experience
A	26	F	Deductive	4	18	A	3.6	1
B	28	F	Inductive	5	6	B	3.2	1
C	24	F	Deductive	5	3	A	3.4	1
D	32	F	Inductive	4	12	A	4.0	0++

+Based on A equals 4.0

++Although instructor D had no experience as a regular teacher, she had one year of experience in substitute teaching.

SPECIAL INSTRUCTOR TRAINING

The instructors were randomly assigned to inductive or deductive strategy groups for the fourth or fifth grade. They were trained by the researcher in separate demonstration seminars. Each instructor was trained only in the strategy to which she had previously been assigned. Demonstration lessons were taught, strategies were fully explained and defined, and discussions were held with each instructor. Hours spent in training varied based upon the previous knowledge of the instructor and demonstrated ability to carry out the prescribed strategy involved.

The deductive strategy was identified as "a method in teaching that proceeds from rules or generalizations to examples and subsequently to conclusions or to the application of the generalizations (Good, 1959)." The following lists the criteria for teacher behavior in deductive strategy groups (Creswell, 1970):

    1. Use a well worked-out logical pattern.

    2. Point out logical steps in order.

    3. Allow children to ask questions.

    4. Answer questions and make statements; do not formulate questions.

5. Allow children to express their partial learning.

6. Allow children to express closure at whatever level.

7. It is important to comprehend that what is being measured in this experiment is not excellence in teaching per se, but whether one strategy of teaching is superior to another with given children. Thus, teaching until the whole group or a given percentage of the group understands is in conflict with measuring the effect of the strategy.

The inductive strategy was identified as "a method of teaching based on the presentation to the learner of a sufficient number of specific examples to enable him to arrive at a definite rule, principle, or fact (Good, 1959)." The following lists the criteria for teacher behavior in inductive strategy groups (Creswell, 1970):

1. Allow children to express their partial learning.

2. Allow children to pursue through questioning.

3. Allow children to express closure at whatever level.

4. Avoid giving the next logical step.

5. Ask questions after children have exhausted theirs.

6. Do not require final verbalization of principles.

7. It is important to comprehend that what is being measured in this experiment is not excellence in teaching per se,

but whether one strategy of teaching is superior to another with given

children. Thus, teaching until the whole group or a given percentage

of the group understands is in conflict with measuring the effect of

the strategy.

THE SPELLING PROGRAM

The plan for the teaching of the treatment groups was

discussed in detail with the instructors. It was decided that for

thirty minutes daily spelling would be taught, limiting procedures

to the inductive or deductive strategy as designated.

The Spelling Lessons

The basic spelling lessons were selected from Power to

Spell, Books 5 and 6 (Hanna and others, 1967). Lessons were

selected from Hanna's text in order to insure that appropriate words

would be used to teach generalizations as suggested by Project 1991.

Lessons were adapted by the researcher so that they could be completed

in one day and so that usually only one generalization was studied

per lesson. Since the study was conducted in the last month of

the school year, it was decided that generalizations would be

selected from the next higher grade level instead of from books

for the current grade level in school.

Words were selected on the basis that they demonstrated

specified generalizations or patterns in American English orthography

as identified by Hanna and others (1966). Spelling lessons were de-

signed to teach either inductively or deductively certain sound-letter

generalizations or patterns as suggested by the extensive computer

analysis of phoneme-grapheme relationships completed at Stanford

in Project 1991.

Daily Procedure

Each group had mimeographed lists of twenty words daily.

Appendix A contains examples of the word lists. Lessons were

planned in detail by the researcher. Appendix B contains examples

of daily lesson plans for each treatment group.

All efforts were maintained to foster equal teacher be-

havior except as a direct required consequence of the strategy

employed. Teachers were urged to remain pleasant, supportive, and

to encourage pupil participation in both strategy groups. Both treat-

ments included identical content and drill. Both groups stressed

meaning and used the words in sentences.

For the deductive treatment group, rules were printed on the mimeographed word lists. Rules were taught first and then students were given opportunities to apply the generalization to the list of words.

The inductive group was given identical lists except that no generalizations were stated. Pupils were led to search for patterns of regularity in the words presented. They were not required to verbalize the principles, however.

A period of approximately fifteen minutes was designated for teaching the generalization using the specified strategy. The next ten minutes were set aside for drill on the words which exemplified the generalization being studied. Appendix C contains examples of drills utilized in the project.

The final portion of the period was used for a test based on ten words from the total list of twenty words used to teach the day's generalization. Results from the daily tests were not used in the statistical analysis. Each pupil kept a record of his daily progress, however. Tests were marked immediately by the instructor, and pupils were informed of the number of words they spelled correctly at the end of their regular language arts classes. Appendix D contains a copy of the daily progress record as kept by each individual pupil.

The researcher met with the instructors daily to distribute packets containing materials for the next day's class, to collect graded spelling papers, and to answer any questions or assist with any difficulties that an instructor might have had. The researcher visited all of the classes involved in the study a minimum of three times. Instructors and pupils were not informed as to when the classes would be observed. In every instance, procedures were followed as prescribed for the designated strategy when the classes were observed. All four instructors appeared to be effective in conducting their classes using the designated strategy. The pupils were unaware of their part in a research study.

EVALUATING THE PROGRAM

On May 14, 1973, and on May 25, 1973, tests were administered to all subjects in the study. Pre- and post-test one consisted of random samples of the total list of words taught in the project. Pre- and post-test two consisted of the spelling portions of the Metropolitan Achievement Tests, Form F and Form G respectively. A third pre- and post-test score was derived from the test constructed by the researcher where only the graphemes corresponding to the phonemes in the generalizations taught were scored

regardless of the spelling of the rest of the word. These findings were treated as variables during the statistical treatment of the data from the study.

Reliability of the Instruments

Reliability for the tests constructed by the researcher was established by conducting a pilot study using pupils who were not involved in the final study. Twenty-one fourth grade pupils and twenty fifth grade pupils were tested on the pre- and post-tests on successive days. A correlation coefficient was established between the two scores. Reliability for the fourth grade test was .82 and .78 for the fifth grade test. Appendix E contains complete figures on reliability for the tests constructed by the researcher.

Extensive data on validity and reliability has been published for the Metropolitan Tests. The reliability appears adequate (Dyer, 1965; and Dressel, 1965). According to Warren G. Findley (1965):

> ...this is a superior test series representative of the high quality and usability of modern achievement tests, with as fine an interpretative manual as is to be found.

The tests constructed by the researcher and the Metropolitan

Tests were easy to administer, score and interpret. The tests were

deemed suitable for use in the classrooms by the researcher and the

instructors employed to carry out the project.

COLLECTING AND PROCESSING THE DATA

The tests constructed by the researcher and the Metropoli-

tan Tests were hand scored by the instructors. Scores were then

verified by the researcher and the raw scores were recorded. The

tests constructed by the researcher were then rescored for generali-

zations only, regardless of the spelling of the rest of the word. For

example, in the lesson which taught the generalization--"The regular

spelling of /oi/ is oi at the beginning or in the middle of a syllable,

and oy when it comes at the end of a syllable," the underlined por-

tions only of the following words were scored: ointment, joint, em-

broidery, convoy, employment, and annoy. These raw scores were

also recorded and used in the analysis of data. These scores were

designated as pre- and post-test three scores.

Scores from the Metropolitan Tests were converted to

standard scores for use in the analysis of data. These scores

were designated as pre- and post-test two scores.

Scores from the spelling test constructed by the researcher

were designated as pre- and post-test one scores.

Twelve variables were used in the study. They were:
strategy, grade, sex, spelling pre-test score, spelling post-test
score, Metropolitan Form F score (pre-test), Metropolitan Form G
score (post-test), generalization pre-test score, generalization
post-test score, residual gain score for the spelling test scores,
residual gain score for the Metropolitan Tests scores, and residual
gain score for the generalization test scores.

Since the prime concern of this research has been the
relative effectiveness of two methods of teaching spelling, there has
been a need to control the initial skill in spelling of the students
who were subjects for this experiment. If a subject entered the
experiment with a relatively high skill in spelling, he would be
expected to exit training with a high level of skill. If a subject enter-
ed with a relatively low skill level, he should exit with a low skill
level. Therefore, the question dealt with the effects of strategies
upon students with equal initial skill levels. No reasonable way was
apparent to select students equal in skill on an experimental or
mechanical basis. A technique of statistical control has been pro-
posed by Tracy and Rankin (1967). The technique required computation
of residual gain scores that are unrelated to pre-test scores. It
equates each student on pre-test with respect to post-test scores by

removing the pre-test variance from post-test scores. This technique

was used here.

A data deck was prepared. Scores for the first nine variables

were grided in by the researcher. The data deck was processed by a

Univac 1108 computer at the University of Houston Computer Center

using correlation coefficient, mean, and standard deviation programs.

Based on these results, three regression equations were prepared;

one to predict post-test scores from pre-test scores on the spelling

test constructed by the researcher; another to predict post-test

scores from pre-test scores on the Metropolitan Tests, and a third

to predict post-test scores from pre-test scores on the generalization

test. Using these equations, post-test scores for each test were

predicted for each pupil and the predicted post-test scores were

subtracted from the observed post-test scores. The results of these

computations were three new scores for each child; a residual gain

score for the spelling test constructed by the researcher, a residual

gain score for the Metropolitan Tests, and a residual gain score for

the generalization test. These gain scores along with all other data

for each pupil were produced in a new card deck by the computer.

This final data deck was submitted to the computer with a

program to compute the distribution statistics for all variables, the

intercorrelations among all variables and three multiple regression

analyses. Each multiple regression analysis used one residual gain score as the dependent variable and strategy, grade, and sex as independent variables. Every variable was correlated with every other variable using Pearson Product-Moment correlation coefficients.

The five per cent level for acceptance or rejection of the null hypothesis was selected as being sufficiently rigorous for the conditions of this study. Thus, if the probability was at or less than five times in one hundred that the observed difference or one greater could arise by chance, the hypothesis was rejected; but if the observed difference was of such a magnitude that it or one greater might arise more than five times in one hundred through the operation of chance factors, the null hypothesis of no relationship was not rejected.

SUMMARY

Fifty-eight fourth and forty-eight fifth grade pupils from a single elementary school were selected to participate in this study. Four special instructors, one per class, were employed and trained to teach spelling lessons using the designated strategy. Classes studied spelling generalizations thirty minutes daily for a period of two weeks. Deductive groups were taught rules and inductive groups were led to discover rules for themselves. Common lists of words

were used to teach the generalizations for each grade level.

Three pre- and post-test scores were analyzed for each pupil: (1) a spelling test constructed by the researcher derived from the daily lessons; (2) the spelling portions of the Metropolitan Achievement Tests, Forms F and G; and (3) a spelling generalization test derived from the test constructed by the researcher where only the graphemes corresponding to the phonemes in the generalizations taught were scored regardless of the spelling of the rest of the word.

The three independent variables involved in the study were strategy, grade, and sex. A multiple regression analysis technique was used to analyze the data. Every variable was correlated with every other variable using Pearson Product-Moment correlation coefficients. All statistical analyses were done with a Univac 1108 computer at the University of Houston computer center.

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CHAPTER IV

ANALYSIS AND INTERPRETATION OF

THE DATA

The primary purpose of this research was to determine

the relative effectiveness of the inductive versus the deductive

strategy in teaching spelling lessons from a linguistically based

spelling program. The intention was to compare the two strategies,

to see whether one strategy of teaching was superior to the other

with given pupils.

Frequency analyses of the tests administered are con-

tained in Appendix F. Table IV, page 64, lists the variables, plus

the means and standard deviations for each variable. Table V, page

66, shows the intercorrelations of variables. These two tables may

be referred to for the discussion of the hypotheses.

TABLE IV

DISTRIBUTIVE STATISTICS

OF THE VARIABLES

Variable	Mean	Standard Deviation	Cases
Strategy, 0-Inductive	.52	.50	106
1-Deductive	.48		
Grade, 4	.55	.50	106
5	.45		
Sex, 0-Male	.48	.50	106
1-Female	.52		
Pre-test 1 Constructed by the researcher	8.28	3.83	106
Pre-test 2 Metropolitan, Form F	79.08	9.52	106
Post-test 1 Constructed by the researcher	15.18	4.24	106
Post-test 2 Metropolitan , Form G	82.36	10.65	106
Pre-test 3 Generalization test Constructed by the researcher	11.44	3.41	106

TABLE IV CONTINUED

Variable	Mean	Standard Deviation	Cases
Post-test 3 Generalization test Constructed by the researcher	17.43	2.67	106
Residual Gain Score for the test Constructed by the researcher	.00	2.01	106
Residual Gain Score for the Metropolitan	.00	7.30	106
Residual Gain Score for the Generalization test Constructed by the researcher	.00	2.12	106

TABLE V

INTERCORRELATIONS OF VARIABLES+

	Strategy	Grade	Sex	Pre-test 1	Pre-test 2	Post-test 1	Post-test 2	Pre-test 3	Post-test 3	Residual Gain Score 1	Residual Gain Score 2	Residual Gain Score 3
Strategy	1.00											
Grade	08	1.00										
Sex	-02	-11	1.00									
Pre-test 1	02	-41	17	1.00								
Pre-test 2	-20	00	17	57	1.00							
Post-test 1	24	-25	16	73	50	1.00						
Post-test 2	-11	16	21	48	72	49	1.00					
Pre-test 3	00	16	21	94	51	69	44	1.00				
Post-test 3	28	-46	11	63	48	89	42	61	1.00			
Residual Gain Score 1	33	16	04	00	13	69	21	02	62	1.00		
Residual Gain Score 2	04	23	12	09	00	18	69	09	11	18	1.00	
Residual Gain Score 3	34	16	-02	08	21	59	20	00	79	77	07	1.00

-.20 Significant at .05 level+, -.25 Significant at .01 level, Decimal Points omitted

TEST OF THE HYPOTHESES

Nine hypotheses were tested in the present study. In this section, the analysis for each is presented.

HYPOTHESIS I

There is no significant difference between the inductive group's residual gain score and the deductive group's residual gain score as measured by the test constructed by the researcher.

This hypothesis was rejected. There was a relationship (.33) between spelling test residual gain scores in favor of the deductive group.

HYPOTHESIS II

There is no significant difference between the fourth grade's residual gain score and the fifth grade's residual gain score as measured by the test constructed by the researcher.

Hypothesis II was rejected since the correlations were significant at the .05 level of confidence. The fourth grade scored significantly higher, an unexpected finding.

HYPOTHESIS III

There is no significant difference between the boys'
residual gain score and the girls' residual gain
score as measured by the test constructed by the
researcher.

The null hypothesis was not rejected at the .05 level of

confidence. The girls' residual gain score was slightly higher but

the difference was not significant.

HYPOTHESIS IV

There is no significant difference between the
inductive group's residual gain score and the
deductive group's residual gain score as measured
by the spelling portion of the Metropolitan Achieve-
ment Tests.

Hypothesis IV could not be rejected.

HYPOTHESIS V

There is no significant difference between the fourth
grade's residual gain score and the fifth grade's
residual gain score as measured by the spelling
portion of the Metropolitan Achievement Tests.

This hypothesis was rejected since the fifth grade's gain

was significantly greater (.23).

HYPOTHESIS VI

There is no significant difference between the boys'
residual gain score and the girls' residual gain score
as measured by the spelling portion of the Metropoli-
tan Achievement Tests.

Hypothesis VI was not rejected. There was no difference

at the .05 level of confidence.

HYPOTHESIS VII

There is no significant difference between the in-
ductive group's generalization residual gain score
and the deductive group's generalization residual
gain score as measured by the test constructed by
the researcher.

This hypothesis was rejected. There was a relationship

between residual gain scores on the generalization test with the

deductive group scoring significantly higher (.34).

HYPOTHESIS VIII

There is no significant difference between the fourth
grade's generalization residual gain score and the
fifth grade's generalization residual gain score as
measured by the test constructed by the researcher.

This hypothesis was not rejected since the correlations

between the spelling generalization tests for the fourth and fifth grades

were not significant at the .05 level of confidence.

HYPOTHESIS IX

There is no significant difference between the boys'
generalization residual gain score and the girls'
generalization residual gain score as measured by
the test constructed by the researcher.

This hypothesis could not be rejected.

MULTIPLE REGRESSION ANALYSES

Having completed a simple correlational analysis, multiple

regression analysis was applied to the data to analyze more compli-

cated questions. First, gain in spelling skill as measured by the test

constructed by the researcher was used as a dependent variable and

strategy, sex, and grade were used as independent variables. The

results of this analysis have been placed in Table VI, page 71. This

multiple regression analysis showed that strategy employed accounted

for almost all of the predicted variance. Sex and grade of the student

added only insignificant amounts of gain when the strategy was known.

TABLE VI

MULTIPLE REGRESSION ANALYSIS

FOR THE TEST CONSTRUCTED BY

THE RESEARCHER

Independent Variable	Beta	$\underline{F}$	p
Strategy	.3275	12.259	.01
Sex	.0595	.402	-
Grade	.0401	.182	-

$R = .34$, $R^2 = .11$

$F = 4.340, < .01$

$DF = 3/102$

In the second multiple regression analysis, gain in spelling skill as measured by the Metropolitan Tests was used as the dependent variable, with strategy, sex, and grade used as independent variables. The results of this analysis have been placed in Table VII, page 73. Between seven and eight per cent of the variance on the Metropolitan gain was accounted for by the grade the student was in, with the fifth grade scoring higher. Sex and strategy accounted for only insignificant variance.

In the third multiple regression analysis, gain in spelling generalization skill as measured by the test constructed by the researcher was used as the dependent variable, with strategy, sex, and grade used as independent variables. The results of this analysis have been placed in Table VIII, page 74. Strategy accounted for almost all 13.00 per cent of the predicted variance. Grade and sex did not add significantly. In each instance, the deductive strategy was more effective.

SUMMARY

Four of the hypotheses were rejected: Hypothesis I, Hypothesis II, Hypothesis V, and Hypothesis VII. Hypotheses I and VII

TABLE VII

MULTIPLE REGRESSION ANALYSIS FOR

THE

METROPOLITAN TESTS

Independent Variable	Beta	$\underline{F}$	p
Grade	.24532	6.528	$<.01$
Sex	.15200	2.521	$>.05$
Strategy	.02720	.081	$>.05$

$R = .28$, $R^2 = .08$

$F = 2.82$

$DF = 3/102$

TABLE VIII

MULTIPLE REGRESSION ANALYSIS

FOR THE GENERALIZATION TEST CONSTRUCTED

BY THE RESEARCHER

Independent Variable	Beta	F	p
Strategy	.33185	13.026	$<$.01
Grade	.13272	2.083	$>$.05
Sex+	-	-	-

+Tolerance level insufficient for further computation

$R = .36, R^2 = .13$

$F = 8.02$

$DF = 2/103$

were rejected concluding that strategy did make a difference in how students scored on the test constructed by the researcher and on the generalization test constructed by the researcher. Conversely, strategy could not be shown to make a significant difference in how students scored on the Metropolitan Achievement Tests. Hypothesis II resulted in an unexpected finding when it was observed that the fourth grade scored higher on the test constructed by the researcher than did the fifth grade. Hypothesis V was rejected showing that the fifth grades' gain on the Metropolitan Tests was significantly greater than the fourth grades' gain. None of the other hypotheses could be rejected at the .05 level of confidence.

Three multiple regression analyses were conducted. The first utilized gain in spelling skill as measured by the test constructed by the researcher as the dependent variable with strategy, sex, and grade as independent variables. This analysis showed that strategy accounted for almost all of the predicted variance. A second analysis used gain on the Metropolitan Tests as the dependent variable with strategy, sex, and grade as independent variables. This analysis showed that grade, with the fifth grade scoring higher, accounted for significant amounts of variance. The third analysis used gain in spelling generalization skill as measured by the test constructed by the researcher as the dependent variable with strategy, sex, and grade

as independent variables. This analysis showed that strategy accounted for almost all of the variance with grade and sex accounting only for insignificant amounts of gain when strategy was known. In each instance, the deductive strategy group scored higher than did the inductive strategy group.

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CHAPTER V

SUMMARY, CONCLUSIONS, AND
RECOMMENDATIONS

SUMMARY

This research in teaching spelling generalizations was prompted in part by Hanna and others (1971) when they noted a need to compare the relative effectiveness of the inductive versus the deductive strategy "so that we can present an optimum mix of teaching-learning strategies (Hanna and others, 1971)." This statement of need was based upon extensive research which was triggered by Bloomfield (1933) and other linguists. Moore (1951) was responsible for basic research in the alphabetic nature of American English orthography. This early work prompted Hanna and others (1966) to more extensive and computerized analysis of 17,000 words. This study which was done at Stanford University and known as Project 1991, reinforced earlier work by Hanna, Moore, and others. Spelling:

Structure and Strategies (Hanna and others, 1971) was an outgrowth

of Project 1991. This book stressed the importance of how spelling

should be taught rather than what words should be studied.

Hanna and others (1971) stated that concepts about orthography

are grasped in one of two ways--inductively or deductively. This

research was designed to compare the relative effectiveness of these

two strategies, to determine whether either strategy was more effective

in teaching spelling generalizations to a given group of pupils.

One hundred six fourth and fifth grade pupils were selected

from a single elementary school for the study: fifty-eight fourth grade

pupils and forty-eight fifth grade pupils. Each pupil was a student

in one of four language arts classes from a total of nine language arts

classes in the school. The classes were randomly assigned by grade

to inductive or deductive strategy groups. Four special instructors,

one per class, were employed and trained to teach spelling generaliza-

tions utilizing the designated strategy. Spelling generalizations were

studied thirty minutes daily for a period of two weeks. Deductive

groups were taught rules and inductive groups were led to discover

rules for themselves. Common lists of words and drills were used

to teach the generalizations for each grade level.

Three pre- and post-test scores were analyzed for each

pupil: (1) a spelling test constructed by the researcher consisting

of a random sample of the words taught in connection with the general-

izations: (2) the spelling portions of the Metropolitan Achievement Tests,

Form F and Form G; and (3) a spelling generalization test derived from

the test constructed by the researcher where only the graphemes corres-

ponding to the phonemes in the generalizations taught were scored

regardless of the spelling of the rest of the word.

Three independent variables were involved in the study:

(1) strategy, inductive or deductive; (2) grade, four or five; and (3)

sex, male or female. Nine dependent variables consisted of: (1) pre-

test scores on the test constructed by the researcher; (2) post-test

scores on the test constructed by the researcher; (3) pre-test scores

on the Metropolitan Achievement Tests, Form F; (4) post-test scores

on the Metropolitan Achievement Tests, Form G; (5) pre-test scores

on the spelling generalizations derived from the pre-test constructed

by the researcher where generalizations only were scored regardless

of the spelling of the rest of the word; (6) post-test scores on the spell-

ing generalizations derived from the post-test constructed by the re-

searcher where generalizations only were scored regardless of the

spelling of the rest of the word; (7) residual gain scores derived

statistically by predicting post-test scores from pre-test scores and

then subtracting actual post-test scores from predicted post-test scores

in order to remove statistically any individual differences which may

have existed on the pre-test constructed by the researcher; (8) residual

gain scores derived statistically by predicting post-test scores from

pre-test scores and then subtracting actual post-test scores from the

predicted post-test scores in order to statistically remove any individual

differences which may have existed on the <u>Metropolitan</u> pre-test; and

(9) residual gain scores derived statistically by predicting post-test

scores from pre-test scores and then subtracting actual post-test

scores from predicted post-test scores in order to statistically remove

any individual differences which may have existed on the generalization

pre-test derived from the test constructed by the researcher.

Regression analysis was used to analyze the data. Every

variable was correlated with every other variable using Pearson Pro-

duct Moment correlation coefficients. Then three multiple regression

analyses were computed. All statistical analyses were done with the

use of a Univac 1108 computer at the University of Houston in the

computer center.

The general hypotheses of this study were three-fold: to

investigate the relationship between inductive and deductive strategies;

to assess the relationship between fourth and fifth grades; and to

examine the relationship between males and females. The spelling

portions of the <u>Metropolitan Achievement Tests</u>, Forms F and G, and

a test constructed by the researcher were used to measure the

relationships.

Hypothesis I stated that there would be no difference between spelling gain for the inductive strategy group and the deductive strategy group when measured by the test constructed by the researcher. This hypothesis was rejected since there was a significant relationship favoring the deductive strategy group.

Hypothesis II stated that there would be no difference between gains scores for the fourth and fifth grade as measured by the test constructed by the researcher. This hypothesis was rejected since the fourth grade did score higher on both the pre- and post-test, and on the residual gains, an unexpected finding.

Hypothesis III predicted a relationship between boys' and girls' scores as measured by the test constructed by the researcher. This hypothesis could not be rejected, although the girls did score slightly higher.

Hypothesis IV predicted a relationship between gain scores for the inductive group and the deductive group as measured by the Metropolitan Achievement Tests. This hypothesis could not be rejected. The inductive group scored higher on the pre-test, but there was no difference on the post-test.

Hypothesis V predicted that there would be a relationship between fourth and fifth grades' scores as measured by the Metropolitan

Achievement Tests. This was rejected since the fifth grades' gain
was significantly higher.

Hypothesis VI predicted a relationship between boys' and
girls' gain scores as measured by the Metropolitan Achievement Tests.
This was not rejected since there was no difference although the girls
did score higher on the post-test.

Hypothesis VII predicted a relationship between strategy
involved and generalization gain scores. This hypothesis was rejected
since there was a relationship detected. The deductive group scored
significantly higher.

Hypothesis VIII predicted a relationship between generali-
zation gain scores and grade level. This hypothesis was rejected since
the correlations between scores for the fourth and fifth grade were
not significant.

Hypothesis IX predicted a relationship between sex and
generalization gain scores. This hypothesis could not be rejected.
The girls did score significantly higher on the pre-test, but there
was no difference in post-test scores.

Three multiple regression analyses were conducted.
The first used gain in spelling skill as measured by the test con-
structed by the researcher as the dependent variable with strategy,
sex, and grade as independent variables. This analysis showed that

strategy accounted for almost all of the predicted variance. A second

analysis used gain on the Metropolitan as the dependent variable with

strategy, sex, and grade as independent variables. This analysis

revealed that grade accounted for the variance, with the fifth grade

scoring higher than the fourth grade. The third analysis used gain in

spelling generalization skill as measured by the test constructed by

the researcher as the dependent variable with strategy, sex, and grade

as independent variables. This analysis showed that strategy accounted

for almost all of the variance with grade and sex adding only insignifi-

cant amounts of variance when the strategy was known. In each instance,

the deductive strategy group scored higher than did the inductive

strategy group.

CONCLUSIONS

Within the limitations of this study, there are some

conclusions which may be drawn from the results of the analysis.

It was shown statistically that strategy did make a significant dif-

ference in spelling gain scores on the test constructed by the research-

er and on the generalization test constructed by the researcher. In

both instances, the deductive strategy group scored significantly high-

er than did the inductive strategy group. This study supports the

findings of Marie (1963), who also found the deductive group superior to the inductive group in spelling gain. No difference could be detected favoring either strategy treatment group on the Metropolitan Tests, however.

The fourth grade scored significantly higher than did the fifth grade on the test constructed by the researcher. This was an unexpected finding and no reasonable explanation is apparent for the difference.

The fifth grade scored significantly higher on the Metropolitan Tests as would normally be expected. No difference was found favoring either grade on the generalization test constructed by the researcher.

No difference was found favoring either sex on any of the three tests analyzed. This is an interesting fact since girls have traditionally scored higher than boys on tests of spelling skill (Rice, 1897; Anastasi, 1960, and Yee, 1969). Yee found that pupils' sex was the most potent source of variance in his study designed to help settle the phonetic generalization question. He pointed to the conclusion that teachers often do not adequately fulfill the cognitive needs and abilities of boys and tend to punish them for resisting feminine-oriented behavior and interests (Yee, 1969). The present study does not support this conclusion.

This study showed that strategy does have an effect on gains in the spelling skill. The deductive strategy group, in two out of three tests analyzed, was superior to the inductive strategy group. That sex and grade have an impact on the basic relationship between strategy and gain was not shown statistically. Sex and grade did add a small amount to the predicted variance, but the amount in each case was statistically insignificant.

The results of this study seem to indicate that children need more experience with inductive strategies. The children who participated in this study appeared to be more familiar with deductive strategies. Sister Evangelist Marie (1963) concluded that pupils may lack sufficient training in formulating generalizations. This research would appear to support her conclusion.

The fact that the deductive group was shown to be superior on two of the three tests utilized seems to indicate that children do reason deductively and with some success. Although most authorities (Hanna and others, 1971; Anderson and Anderson, 1964; Horn, 1969; Benthul and others, 1968; Glim and Manchester, 1967; Kottmeyer and Claus, 1968) cited have stressed inductive strategies in connection with teaching generalizations in spelling, it appears that deductive strategies should be utilized also.

RECOMMENDATIONS

During the process of conducting the research and in analyzing the results, facets of the problem which require further study have presented themselves. The research generated more questions which should be explored.

The most apparent need is that of conducting a similar study where a post-test is administered which requires transfer of the generalizations studied to novel situations instead of merely testing on words that have previously been studied. Inductive groups have traditionally proven to be superior in transfer of learning situations (Hendrix, 1947; Kersh, 1958; Haselerud and Meyers, 1958; Rowlette, 1960; Rizzuto, 1971; and Weisner, 1971). Such transfer is of ultimate importance in learning how to spell (Hanna and others, 1971). The idea of building spelling power is based upon developing the ability to transfer generalizations to novel situations.

Delayed recall tests may have strengthened the study. It would be interesting to note whether results obtained after delaying for a period of time would have been similar to those obtained at the conclusion of this short-term research.

A longitudinal study which compares the relative effectiveness of the inductive versus the deductive strategy would be a valuable

contribution to spelling research. Such a study would probably more closely parrallel spelling lessons as they are usually taught in most school situations.

Even though most spelling authorities appear to favor inductive strategies when teaching spelling generalizations, this study appears to support deductive strategies. Instead of planning "pupil discovery" or "teacher telling" instruction, it seems to be more realistic to determine priority among strategies in spelling programs after specific objectives have been stated and evaluated in terms of what comprises efficient spelling behavior (Yee, 1969).

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APPENDIX A:

EXAMPLES OF THE WORD LISTS

THE WORD LISTS

Mimeographed lists of twenty words were given to the pupils in both strategy treatment groups daily. The deductive group's list stated the generalization and then listed twenty words which were governed by the generalization. Inductive group's lists gave no generalizations. These merely listed the twenty words which were governed by the generalization. Pages 94, 95, 96, and 97 contain examples of the word lists for each strategy treatment group.

UNIT 1

Generalization

　　　　Sometimes when a suffix is added to a root word, the consonant sound that ends the root word and the consonant sound that begins the suffix combine to form a different consonant sound. /zh/ is formed this way.

1. televise
2. television

3. confuse
4. confusion

When sion is added to some verbs ending in de, the de is dropped before adding sion.

5. provide
6. provision

7. collide
8. collision

9. conclude
10. conclusion

11. decide
12. decision

13. erode
14. erosion

15. divide
16. division

17. persuade
18. persuasion

19. explode
20. explosion

(Grade 4 - Deductive Strategy Group)

UNIT 1

1. televise
2. television

3. confuse
4. confusion

5. provide
6. provision

7. collide
8. collision

9. conclude
10. conclusion

11. decide
12. decision

13. erode
14. erosion

15. divide
16. division

17. persuade
18. persuasion

19. explode
20. explosion

(Grade 4 - Inductive Strategy Group)

UNIT 1

Generalization

The regular spelling of /oi/ is oi at the beginning or in the middle of a syllable, and oy when it comes at the end of a syllable.

1. ointment
2. joint
3. pointer
4. rejoice
5. coin
6. avoid
7. poison
8. embroidery
9. appoint
10. appointment

11. convoy
12. corduroy
13. coy
14. annoy
15. employ
16. employment
17. decoy
18. royal
19. loyal
20. buoyant

(Grade 5 - Deductive Strategy Group)

UNIT I

1. ointment
2. joint
3. pointer
4. rejoice
5. coin
6. avoid
7. poison
8. embroidery
9. appoint
10. appointment

11. convoy
12. corduroy
13. coy
14. annoy
15. employ
16. employment
17. decoy
18. royal
19. loyal
20. buoyant

(Grade 5 - Inductive Strategy Group)

APPENDIX B:

EXAMPLES OF DAILY LESSON PLANS

THE DAILY LESSON PLANS

The researcher made detailed lesson plans for each group. All efforts were maintained to foster equal teacher behavior except as a direct required consequence of the strategy employed. Teachers were urged to remain pleasant, supportive, and to encourage pupil participation in both strategy groups. Both treatments included identical content and drill. Both groups stressed meaning and used the words in sentences.

Pages 100 through 104 contain examples of the daily lesson plans for each treatment group.

FOURTH GRADE DEDUCTIVE STRATEGY GROUP

LESSON PLAN FOR UNIT 1

The first fifteen minutes of the period will be used to teach the generalization in today's lesson. Use the following procedure:

1. Distribute the mimeographed lists to the class.

2. Read the generalization to the group. Have them read silently as you read orally. Be sure that the group understands the word "suffix." Explain that /zh/ represents a phoneme which is a sound.

3. Write televise and television on the board. Use these words in simple sentences. Then show the class how the generalization applies to these words.

4. Write confuse and confusion on the board. Use these words in simple sentences. Show how the generalization applies to these words. Avoid asking questions. Remember the criteria for teacher behavior in the deductive strategy treatment group.

5. Read the second part of the generalization to the class. Tell them that it is an extension of the first generalization. Write provide and provision on the board. Use these words in simple sentences. Then show how the generalization applies to these words.

6. Follow the same procedure using the remaining groups of words on the list.

The next ten minutes of the period will be used for drill on the words. Distribute the word search puzzles. Read the instructions to the class and encourage them as they work on the puzzle.

The last five minutes of the period will be used for a daily test. Distribute papers numbered 1 - 10 to the class. Have them write their names on the papers. Dictate words slowly and distinctly. Use the following words: television, confusion, provision, collision, conclusion, decision, erosion, division, persuasion, explosion.

FOURTH GRADE INDUCTIVE STRATEGY GROUP

LESSON PLAN FOR UNIT 1

The first fifteen minutes of the period will be used to lead the pupils to generalize the rule in today's lesson. Use the following procedure:

1. Distribute the mimeographed lists to the class.

2. Have volunteers from the class read the words on the list and use them in sentences.

3. Write televise and television on the board. Ask the class how these words are alike. Elicit the fact that -ion is a suffix. Ask if they can see a letter used in both words that represents a different sound in each word. Elicit that s has the sound of /z/ in televise and /zh/ in television.

4. Write confuse and confusion on the board. Ask the class how these two words are alike. Ask if they can see any relationship between these two words and the first two (televise and television). Ask how the /z/ is spelled in televise and confuse. Ask how /zh/ is spelled in television and confusion.

5. Write provide and provision on the board. Ask the class what the root-word is in provision. Ask what happens to the de when -sion is added to provide.

6. Write collide and collision on the board. Ask how these words are like provide and provision. Ask if anyone can think of a generalization that governs this group of words. Continue to lead the class to generalize about the spellings of the pairs of words on the list. Lead them to state the generalization in their own words, but do not force anyone to verbalize a rule.

The next ten minutes will be used for drill. Distribute the word search puzzles. Read the instructions to the class and encourage each pupil as he works on his puzzle.

The last five minutes of the period will be used for a daily

test. Distribute papers numbered 1 - 10. Have the class write their names on the papers. Dictate the words slowly and distinctly. Use the following words: television, confusion, provision, collision, conclusion, decision, erosion, division, persuasion, explosion.

FIFTH GRADE DEDUCTIVE STRATEGY GROUP

LESSON PLAN FOR UNIT I

The first fifteen minutes of the period will be used to teach the generalization in today's lesson. Use the following procedure:

1. Distribute the mimeographed lists to the class.

2. Read the generalization to the group. Have them read silently as you read orally. Be sure that the group understands the term syllable. Explain that /oi/ is a phoneme which is represented by two graphemes, oy and oi in particular positions in words.

3. Write ointment, joint, and pointer on the board. Use these words in sentences to be sure that the class understands the meanings of these words. Point out the sound of /oi/ in these words. Say that /oi/ is at the beginning or in the middle of the syllable in these words, so it is spelled oi. Say that the use of today's rule makes the spelling of these words easier.

4. Continue through word 10 in the same way.

5. Write convoy and corduroy on the board. Say that the /oi/ sound is at the end of the syllables in these words so it is spelled oy.

6. Continue through word 20 in the same manner.

The next ten minutes of the period will be used for drill on the words. Distribute the word search puzzles. Read the instructions to the class and encourage the pupils as they work on the puzzle.

The last five minutes of the period will be used for a daily test. Distribute papers numbered 1 - 10 to the class. Have them write their names on the papers. Dictate words slowly and distinctly. Use the following words: ointment, pointer, coin, poison, appoint, corduroy, annoy, employment, royal, and buoyant.

FIFTH GRADE INDUCTIVE STRATEGY GROUP

LESSON PLAN FOR UNIT 1

The first fifteen minutes of the period will be used to lead the pupils to generalize the rule in today's lesson. Use the following procedure:

1. Distribute the mimeographed lists to the class.

2. Have volunteers from the class read the words on the list and use them in sentences.

3. Write ointment, joint, and pointer on the board. Elicit from the class that they all have the phoneme /oi/ in common. Ask where the /oi/ occurs in each word, in which part of the syllable.

4. Continue through the list to word 10. Ask the group if they can generalize about the spelling of /oi/ when it occurs at the beginning or in the middle of a syllable.

5. Write convoy and corduroy on the board. Ask what sound these words have in common with the first ten even though the phoneme is spelled differently. Ask where the /oi/ sound occurs in these words.

6. Continue through the list to word 20 in the same manner. Ask the group to generalize about the spelling of /oi/ when it occurs at the end of a syllable.

The next ten minutes of the period will be used for drill on the words. Distribute the word search puzzles. Read the instructions to the class and encourage the pupils as they work on the puzzle.

The last five minutes of the period will be used for a daily test. Distribute papers numbered 1 - 10 to the class. Have them write their names on the papers. Dictate words slowly and distinctly. Use the following words: ointment, pointer, coin, poison, appoint, corduroy, annoy, employment, royal, and buoyant.

APPENDIX C:

EXAMPLES OF DRILLS

THE DRILLS

Mimeographed drills were distributed to the pupils in both strategy treatment groups daily. Drills for both treatment groups were identical. The following pages contain examples of each type of drill utilized in the project.

WORD SEARCH PUZZLE

1. Look for the words given in the spelling word list for Unit 1. Find them by reading forward, backward, up, down, and diagonally. The words are always in straight lines and they never skip letters.

2. Draw a circle around the word in the diagram once you've found it and cross it off the word list in Unit 1. Words overlap and letters are used more than once. However, you will never use up all of the letters in the diagram.

H	P	E	R	S	U	A	S	I	O	N	C	D
I	T	E	L	E	V	I	S	I	O	N	O	E
E	E	S	P	R	O	V	I	S	I	O	N	C
N	L	U	I	D	E	C	I	D	E	I	C	I
O	E	F	A	E	D	O	R	E	L	S	L	S
I	V	N	N	O	I	S	O	R	E	U	U	I
S	I	O	I	X	L	O	V	E	K	F	S	O
O	S	C	O	L	L	I	S	I	O	N	I	N
L	E	D	I	V	O	R	P	H	O	O	O	O
P	I	C	O	N	C	L	U	D	E	C	N	O
X	D	I	V	I	S	I	O	N	L	O	K	O
E	D	O	L	P	X	E	D	I	V	I	D	L
E	X	P	E	R	S	U	A	D	E	E	V	O

(Grade 4 - Unit 1)

JUMBLES

Unscramble the twenty Jumbles, one letter to each **square**, forming your twenty spelling words.

TOISMEN

TOISM

SOOLEN

SOOLE

TASHEN

TASHE

GOTFORTEN

GOTFOR

TLAFEN

TLAF

SCHOEN

SCHEO

DAEDEN

DAED

TREATHEN

TREATH

SAFTEN

SAFT

(Grade 4 - Unit 2)

WORD PUZZLE

Each clue is a key to one of your spelling words. Fill in the blanks with the spelling word from Unit 3 suggested by the clues. Be sure that the spelling word fits the blanks given at the left.

__ __ __ __ __ __ __ __ __   a motor driven vehicle

__ __ __ __ __   audible portion of a TV show

__ __ __ __   mineral in sea water

__ __ __ __ __ __   a fraction, $\frac{1}{4}$

__ __ __ __ __ __ __   opposite of inward

__ __ __ __ __ __   the fall

__ __ __ __ __ __ __   for the reason that

__ __ __ __ __ __ __ __ __   self acting

__ __ __ __ __ __ __ __   group of hearers

__ __ __ __ __ __   prize for merit

__ __ __ __ __ __   remember

__ __ __ __ __ __ __ __   clapping

__ __ __ __ __ __ __ __ __   large room

__ __ __ __ __ __ __ __   genuine

__ __ __ __ __ __   sway

__ __ __ __ __ __   loud cry

__ __ __ __ __ __ __   can be heard

__ __ __ __ __ __   part of a sentence

__ __ __ __   an error

__ __ __   a part of the face

(Grade 5 - Unit 3)

LADDER GAME

For a partner, call out the spelling words beginning with the one on the bottom rung of the first ladder. See how high your partner can climb. When he misses a word, it is your turn to spell. Try to climb both ladders by spelling all 20 words correctly.

exercise	excellent
explain	examine
explore	example
except	express
excite	explode
extra	expert
taxi	expect
next	excuse
text	exact
six	exist

(Grade 4 - Unit 4)

WORDO

W ordo is played like BINGO.   Look at the words carefully.
Listen as a leader calls out the words. Place a marker on words
as they are called out.   The first person to get a full line across,
down, or diagonally wins.   The winner will spell each word orally
which he has covered in order to win.

seven	seventy	seventieth	ninety	free
six	seventh	sixth	free	ninetieth
sixteen	sixteenth	free	eighty	eightieth
sixty	free	sixtieth	seventeen	seventeenth
free	eight	eighth	eighteen	eighteenth

(Grade 4 - Unit 5)

APPENDIX D:

DAILY PROGRESS RECORD

DAILY PROGRESS RECORD

Results from the daily tests were not used in the statistical analysis. Each pupil kept a record of his daily progress, however. Tests were marked immediately by the instructor, and pupils were informed of the number of words they spelled correctly at the end of their regular language arts classes. They were then allowed time to fill in their progress charts. The pupils appeared to enjoy keeping a record of their grades and the chart seemed to be an incentive for some pupils to make a better score.

An example of the daily progress record follows on page

--	Mon.	Tues.	Wed.	Thurs.	Fri.	Mon.	Tues.	Wed.	Thurs.	Fri.
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										

DAILY PROGRESS RECORD

COLOR ONE BLOCK FOR EACH CORRECTLY SPELLED WORD

APPENDIX E:

RELIABILITY FOR THE TEST CONSTRUCTED BY

THE RESEARCHER

RELIABILITY FOR THE TEST CONSTRUCTED BY THE RESEARCHER

Reliability for the test constructed by the researcher was

established by conducting a pilot study using pupils who were not in-

volved in the final study but who were similar to pupils involved in

the final study. Twenty-one fourth grade pupils and twenty fifth grade

pupils were tested on the pre- and post-tests on successive days.

A correlation coefficient was established between the two scores.

Reliability for the fourth grade test was .82 and .78 for the fifth

grade test.

Reliability data in full is given on the following page.

RELIABILITY FOR THE TEST CONSTRUCTED BY

THE RESEARCHER

Subjects	Scores			
	Fourth Grade		Fifth Grade	
	Pre-	Post-	Pre-	Post-
Number 1	2	5	3	2
Number 2	13	12	3	2
Number 3	4	4	3	7
Number 4	2	4	9	8
Number 5	3	6	10	12
Number 6	6	6	11	12
Number 7	3	5	9	8
Number 8	7	8	6	10
Number 9	2	2	3	2
Number 10	2	7	5	8
Number 11	3	4	10	9
Number 12	3	4	5	4
Number 13	7	3	9	9
Number 14	8	8	6	5
Number 15	9	10	14	13
Number 16	6	7	11	10
Number 17	3	4	6	10
Number 18	7	7	11	7
Number 19	8	7	5	6
Number 20	8	10	9	7
Number 21	–	-	11	13
N	20		21	
ΣX	106		159	
ΣX^2	738		1423	
$(\Sigma X)^2$	11, 236		25, 281	
ΣY	120		166	
ΣY^2	862		1, 516	
$(\Sigma Y)^2$	14, 400		27, 556	
ΣXY	765		1, 421	
$(\Sigma X)(\Sigma Y)$	12, 720		26, 394	
r	.82		.78	

APPENDIX F:

FREQUENCY ANALYSES OF TESTS ADMINISTERED

FREQUENCY ANALYSIS OF THE TEST CONSTRUCTED BY THE

RESEARCHER

Score	Pre-test Frequency	Percentage	Post-test Frequency	Percentage
0	2	1.9	0	0
1	2	1.9	0	0
2	3	2.8	1	.9
3	6	5.7	0	0
4	4	3.8	0	0
5	8	7.5	3	2.8
6	8	7.5	2	1.9
7	12	11.3	1	.9
8	13	12.3	2	1.9
9	9	8.5	3	2.8
10	9	8.5	2	1.9
11	9	8.5	7	6.6
12	4	3.8	8	7.5
13	8	7.5	4	3.8
14	3	2.8	5	4.7
15	1	.9	7	6.6
16	4	3.8	9	8.5
17	1	.9	12	11.3
18	0	.0	10	9.4
19	0	.0	18	17.0
20	0	.0	12	11.3

Mean   8.28   15.18

Standard Deviation   3.81   4.22

Number Responding   106

FREQUENCY ANALYSIS OF THE METROPOLITAN TESTS

Score	Pre-test (Form F) Frequency	Pre-test (Form F) Percentage	Post-test (Form G) Frequency	Post-test (Form G) Percentage
58-59	1	.9	0	.0
60-61	0	.0	2	1.9
62-63	2	1.9	0	.0
64-65	3	2.8	1	.9
66-67	4	3.8	3	2.8
68-69	6	5.7	4	3.8
70-71	5	4.7	3	2.8
72-73	2	1.9	4	3.8
74-75	6	5.7	2	1.9
76-77	15	14.2	15	14.2
78-79	19	17.9	13	12.3
80-81	13	12.3	9	8.5
82-83	9	8.5	10	9.4
84-85	3	2.8	6	5.7
86-87	4	3.8	8	7.5
88-89	1	.9	8	7.5
90-91	4	3.8	5	4.7
92-93	2	1.9	0	.0
94-95	2	1.9	1	.9
96-97	0	.0	2	1.9
98-99	0	.0	0	.0
100-101	0	.0	2	1.9
102-103	0	.0	2	1.9
104-105	0	.0	2	1.9
106-107	0	.0	1	1.9
108-109	0	.0	0	.0
110-111	0	.0	0	.0
112-113	0	.0	0	.0
114-115	2	1.9	1	1.9
116-117	0	.0	0	.0
118-119	0	.0	0	.0
120-121	0	.0	0	.0
122-123	0	.0	0	.0
124-125	0	.0	1	.9
Mean	79.08		82.36	
Standard Deviation	9.47		10.60	

Number Responding   106

FREQUENCY ANALYSIS OF THE GENERALIZATION TEST

Score	Pre-test Frequency	Percentage	Post-test Frequency	Percentage
0	0	.0	0	.0
1	0	.0	0	.0
2	2	1.9	0	.0
3	0	.0	0	.0
4	0	.0	0	.0
5	2	1.9	0	.0
6	2	1.9	0	.0
7	6	5.7	0	.0
8	11	10.4	0	.0
9	5	4.7	1	.9
10	15	14.1	2	1.9
11	8	7.5	2	1.9
12	14	13.2	4	3.8
13	14	13.2	1	.9
14	7	6.6	7	6.6
15	9	8.5	3	2.8
16	3	2.8	7	6.6
17	2	1.9	15	14.2
18	5	4.7	16	15.1
19	1	.9	22	20.8
20	0	.0	26	24.2

Mean   11.46   17.41

Standard Deviation   3.41   2.66

Number Responding   106