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THE APPLICATION OF PRINCIPLES OF GENERATIVE
PHONOLOGY TO THE TEACHING OF READING
TO STUDENTS OF ENGLISH AS
A SECOND LANGUAGE

DISSERTATION

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

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This dissertation reports research into the problem of how to teach mastery of the English writing system (MEWS) to students of English as a second language (ESL). The problem involves the relatedness of English orthography and phonology. It also involves the generative phonological principles of abstract underlying levels of representation, derivational rules for surface realizations, and phonological alternation of related forms. Because of favorable applications of generative linguistics to first-language acquisition, these principles may have value in a methodology for teaching second-language acquisition.

The research had two purposes. First was development of classroom instructional materials for improving reading proficiency in ESL students by application of generative phonological principles. Second was use of the instructional materials in a pilot study of fifty-three ESL college freshmen. Subjects were randomly divided by classes into treatment and control groups. They received pretests of English nonsense words, also developed in the research,

consisting of a unit on vowels and a unit on consonants. They also received two reading tests, one standardized for native speakers and a second for ESL students. Use of the new materials in the experimental group was followed by a post-test, which was a readministration of the combined pretests. Mean gain scores on the post-test instrument were used with analysis of covariance to measure effectiveness of the pilot program. Scores on the Nelson-Denny Reading Test and MEWS pretests served as covariates.

The validity and reliability of tests and validity of materials developed in the research were established. Tests and materials were revised until they met objectives and content areas established in tables of specifications. The reliability of testing instruments was demonstrated by administration of pretests and the combined post-test to a try-out class similar to classes in the pilot study. Pearson r 's of 0.87 and 0.70 for tests on the two units indicated acceptable coefficients of stability. The administration of the English Reading Test for Students of English as a Second Language cross-validated scores on the Nelson-Denny. Total mean gain scores for all subjects who received both tests were the same, i.e., equivalent to sixth-grade level. After the treatment, materials were evaluated on the basis of the pilot study. Examples of revised materials appear in an appendix.

The dissertation contains six chapters. An opening chapter contains an overview of the research. A survey of literature on generative linguistics and of ESL materials on the writing system of English is reported in Chapter II. Chapter III reports theoretical foundations; Chapter IV, procedures; and Chapter V, analyses of data and materials.

A final Chapter VI summarizes principle findings and reports conclusions, recommendations, and implications of the research. A major finding was that subjects' reading proficiency was far below that of native speakers at the college level. Another was that the subjects had more difficulty with English vowels than with consonants. The subjects' scores on nonsense-word tests correlated significantly with five other criteria, including measures of ability to use ESL. A uniform disparity between ESL-student and native-speaker scores on tests of nonsense words was identified. Native-speakers generally had perfect scores, and ESL students had low scores. A chief implication is the importance of understanding orthography in reading English. Recommendations are that ESL proficiency be determined by nonsense-word tests and that the MEWS program be used by students of English as a second dialect.

TABLE OF CONTENTS

	Page
LIST OF TABLES	ix
LIST OF ILLUSTRATIONS.	xi
 Chapter	
I. INTRODUCTION.	1
Statement of the Problem	
Purposes of the Research	
Development of Teaching Materials	
Use of Teaching Materials	
Expected Effect of the Treatment	
Background and Significance	
Definition of Terms	
Explanation of Symbols	
Phonetic Transcription	
Phonological, Morphological, and Syntactic Symbols	
Orthography	
Delimitations	
Adult Classes	
Two Primary Units	
Student Improvement	
Limitations of the Study	
Population	
Native Languages	
Level of Teachers' Education	
Assumptions	
Language Is Rule Governed	
Reading English Involves MEWS	
Sentence Is Universal	
Procedures	
Procedures for Development of Teaching Materials	
Procedures for Use of Teaching Materials	
Procedures for Analysis of the Data	
Overview of the Study	

Chapter	Page
II. REVIEW OF THE LITERATURE.	40
Literature Relating to Generative Linguistics	
Research and Materials on English Spelling-Sound Correspondence	
The State of the Art in ESL Materials	
Source for Selection of Teacher Materials	
Sources for Selection of Student Materials	
Criteria for Teacher Materials	
Criteria for Student Materials	
Critical Annotations: Teacher Materials	
Critical Annotations: Student Materials	
Findings about the State of the Art in ESL Materials	
Reprise	
III. THEORETICAL FOUNDATIONS	100
The Role of Generative Phonology in a Grammar	
Generative Grammar	
Phonology in Generative Grammar	
English Phonology	
The Relationship between English Phonology and Orthography	
Generative Spelling Rules for English	
Methodology for Applying Generative Principles to MEWS	
IV. PROCEDURES.	139
Development of Preliminary MEWS Materials	
Pilot Study Using Preliminary Materials	
Subjects in the Pilot Study	
Experimental Treatment	
Nelson-Denny Reading Test	
MEWS Unit I Pretest	
MEWS Unit I Instruction	
MEWS Unit II Pretest	
MEWS Unit II Instruction	
Review of MEWS Units I and II	
Class Activities Not Related to MEWS	
MEWS Post-Test	

Second Reading Test	
Collection of Additional Correlates	
Preliminary MEWS Materials	
Teacher Material	
Teacher's Guide to MEWS Program	
Schedule for MEWS Program	
Teacher's Answer Keys	
Student Instructional Material	
MEWS Unit I	
The Sounds of General American English	
Alternating English Forms	
Relationship between Alternating English Forms	
Coming and Going from English Spelling to Sound	
Some Tense • Lax Alternations in English	
Practice with Alternations	
MEWS Unit II	
What Is "Spelling with One Sound"?	
Non-Vowel Spellings Which Have One Pronunciation	
Non-Vowel Spellings with Two Letters for a Sound	
Non-Vowel Spellings Which Have Alternating Pronunciations	
Practice with Alternations	
A Review of MEWS Units I and II	
The Sounds of General American English	
Vowel Spellings for Alternating Sounds	
Alternating Sounds for Vowels	
Examples of Vowel Alternating Forms	
English Spelling: Consonants with One Sound	
Spellings with "H" for One Sound	
Alternating Sounds for Consonants	
Examples of Consonant Alternating Forms	
Tests	
MEWS Unit I Pretest	
MEWS Unit II Pretest	
MEWS Post-test	
Test Answer Sheet	

Chapter	Page
V. ANALYSIS OF DATA AND MATERIALS	185
Statistical Analysis of Pilot Study	
Demographic Data	
132B Section	
Age	
Sex	
Language	
Higher Education	
ESL Training	
First Reading Test	
MEWS Tests	
Second Reading Test	
Correlations	
Evaluation of Preliminary MEWS Materials	
Effectiveness of MEWS Instruction	
Emphasis in Curriculum	
Test Discrimination	
Test Reliability	
Test Validity	
Materials Validity	
Materials Format	
VI. CONCLUSION	222
Summary	
Conclusions: Contributions of the	
Research	
MEWS Program	
Changes in Techniques	
Changes in Instruction	
New MEWS Instruction	
Recommendations and Suggestions	
On the Utility of Standardized Tests	
in ESL	
On the Use of MEWS Tests in ESL	
On the Further Development of MEWS Tests	
On the Use of MEWS Instruction for ESD	
On the State of the Art in ESL	
Implications	
On the Appropriateness of the MEWS	
Program for ESL	
On English Spelling and Psychological	
Reality	
On the Use of MEWS in Reading Programs	
for Native Speakers	

APPENDICES

A.	ESL Materials Examined in the State of the Art	235
B.	Evaluation of ESL Teacher Materials	236
C.	Evaluation of ESL Student Materials	237
D.	Tables of Specifications.	238
	I. Phonology	
	II. Orthography	
E.	Demographic Data on Subjects in Pilot Study.	240
F.	Attendance Register for Subjects in Pilot Study.	241
G.	Teachers' Daily Logs During Pilot Study.	242
H.	Scores and Grades of Subjects in Pilot Study.	243
I.	Formulas for Statistical Analyses Used	244
J.	Selected Revisions of MEWS Instruction.	247
	Saying "H" in English	
	Exercise in Pronouncing "H"	
	Alternations of T	
	Practice with Alternations of T	
	REFERENCES	253

LIST OF TABLES

Table	Page
I. Phonetic Transcription	21
II. Linguistic Symbols	23
III. Units Developed in the Study	24
IV. Types of ESL Material Examined	68
V. Underlying Representations of <EXTREME * EXTREMITY>.	115
VI. Major Rules of English Phonology	119
VII. Some English Orthographic Rules.	133
VIII. Experimental and Control Groups in Pilot Study	144
IX. Student Mean Grade Levels and Standard Deviations of Error on First Reading Test.	190
X. Mean-Total Raw Scores of ESL Students on First Reading Test, by Group	191
XI. Comparison of Groups on First Reading Test.	191
XII. Correlation of Grade-Level Scores by ESL Students on Parts of First Reading Test.	192
XIII. Selected Item Responses by ESL Students on Vocabulary Portion of First Read- ing Test.	193
XIV. Selected Item Responses by ESL Students on Comprehension Portion of First Reading Test.	195
XV. MEWS Scores by Native Speakers	197
XVI. MEWS Statistics for Pilot Subjects	198

Table	Page
XVII. Comparison of Experimental and Control Groups on MEWS Tests	198
XVIII. Group Means on MEWS Tests, Adjusted for MEWS Pretest and First Reading Test	199
XIX. Group Comparisons between Means on MEWS Tests, Using Tukey's Test	199
XX. Comparison of L_1 Groups on MEWS Tests.	200
XXI. L_1 Means on MEWS Tests, Adjusted for MEWS Pretest and First Reading Test	200
XXII. L_1 Comparisons among Means on MEWS Tests, Using Tukey's Test.	202
XXIII. Analysis of MEWS Tests for L_1 as a Factor in High Scoring	203
XXIV. Analysis of MEWS Post-Test for Control or Experimental Group as a Factor in High Scoring.	204
XXV. Item Means on MEWS Tests.	205
XXVI. MEWS Test Items Having High or Low Item Means	207
XXVII. Reading Test Scores of Subjects Taking Both Reading Tests.	209
XXVIII. Item Means on Second Reading Test	210
XXIX. Correlation of All Data in Pilot Study.	213
XXX. Significant Correlations between Native Language and First Reading Test Sections.	215
XXXI. Significant Correlations between MEWS Tests and Other Language Measures in Pilot Study	217

LIST OF ILLUSTRATIONS

Figure	Page
1. Language Acquisition by Native and Second-Language Learners of English	2
2. Relationship between English Pronunciation and Orthography	10
3. Vowel Shift in English	16
4. Rounding Adjustment in Generative Phonology	17
5. Backness Adjustment in Generative Phonology	18
6. Minimal Pairs in English	19
7. Transformational-Generative Models of a Natural Grammar	104
8. The Underlying Vowels of English	114
9. From Spelling to Sound in English, according to Venezky, 1967 and 1970.	130
10. From Phonology to Orthography in English, according to Griggs, 1976a and 1977d	131

CHAPTER I

INTRODUCTION

Among educational issues few are more controversial or seemingly irreconcilable than the relationship between English writing and sound. Many different pedagogical materials address the two-fold task of mastery of English writing, that is, success in recognizing and pronouncing written formatives and in representing phonetic surface structures in print. Generally, research on the effectiveness of such materials fails (a) to support proponents' claims for producing better student proficiency in mastering the writing system or (b) to show a high utility for their individual methods. Phonics, in the past the most prevalent of these methods, has a long and current history of use in instruction despite empirical evidence against it.¹

The problem of mastery of the English writing system (herein called MEWS) experienced in traditional American classrooms becomes even more onerous in those where students are learners of English as their second language. The

¹The research of Clymer (1963), Bailey (1967), Emans (1967), Burmeister (1968), and Smith (1975) provides evidence against the usefulness of phonics. Chapter II cites others and develops this point.

reason is that MEWS involves additional tasks for a person whose dominant language (L_1) is not English (L_2). Figure 1 depicts schematically the process involved for native and second-language learners. As the illustration shows, a native student of MEWS need not study the sound system of

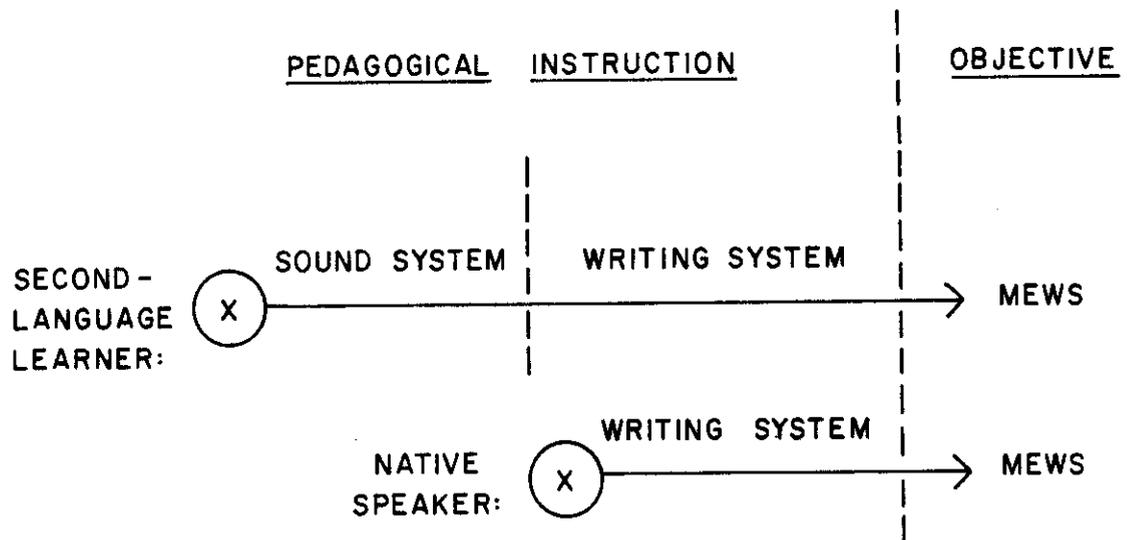


Fig. 1--Language acquisition by native and second-language learners of English.

English, for he has already learned it as a natural part of acquiring speech. A second-language learner, though, must study the sound system as well as the writing system of English. Moreover, a student of English as a second language (herein called ESL) also learns through a filter of his own language. His prior knowledge of L_1 causes linguistic interference because he judges grammaticality and distinctive sounds in English based on his competencies in

L₁. Thus, MEWS concerns all American pedagogically, with added problems for persons involved in ESL.

Statement of the Problem

The problem researched in this study is how to teach mastery of the writing system of English to students of English as their second language. The central question in this problem is the true nature of the relationship between English spelling and sound, and the role of this relationship in the reading process. The discussion on "Background and Significance" below defines and describes the problem in detail.

Purposes of the Research

The following are purposes of the research:

Development of Teaching Materials

The first purpose of the research reported was to develop, using generative phonological principles, MEWS classroom instructional materials for students in ESL classes. The methodology involved chiefly the concept that principles of phonology and morphology constitute essential information which an ESL student must have in order to read English. The curriculum materials, developed with this methodology, reflected and employed selected phonological rules and ordered orthographic rules for English. The objective was to teach ESL students selected rules of

English phonology and orthography, inasmuch as readers of English are reading phonological representations.

Use of Teaching Materials

The second purpose of the research reported was to use the instructional materials developed and to analyze results of a pilot study using the new MEWS instruction. The pilot study involved ESL students at North Texas State University (herein called NTSU) who received pretests and post-tests developed for the new MEWS program as well as standardized reading tests.

Expected Effect of the Treatment

The tangible result expected from the use of the new MEWS program is increased reading proficiency. In a longitudinal study employing a sound experimental design, it should be expected that students in the treatment group should show improved ability in reading English morphemes. The use of MEWS materials in the research reported here was specified, however, as a pilot study. This kind of research, by definition, is a short-range experiment for the purpose of trying out procedures so as to discover possible difficulties, and for the purpose of adding procedures which the trial may indicate as it progresses. Thus, the expected effect of the treatment in this pilot study was not the degree of increased reading proficiency that would be

expected in a replication over an expanded treatment period.

The designation of increased reading proficiency does not entail that experimental subjects should gain ability to produce English forms, but that they should recognize them. The aim in mastery of the orthographic system of English is not to derive an unfamiliar word, <BESTIAL>, for instance, from a familiar one, <BEAST>. This kind of ability to produce forms in actual use would be exceptional for even literate native speakers. Instead, the logical objective in carrying out this research is for students to gain ability in perceiving the relatedness of forms such as <BEAST •BESTIAL>. Recognition of this sort of relatedness serves as a key to the role, meaning, and sound of the unfamiliar longer form. In turn, such comprehension is an integral part of the reading process.

Background and Significance

The significance of the problem of how to teach MEWS is due partly to the increasing numbers of students who are filling ESL classes in the United States. Immigrants to America such as evacuated Indochinese refugees and ransomed Russian Jews are taking advantage of ESL instruction in large numbers. Native second-dialect learners are involved in a general trend in America toward continuing education,

particularly in communication courses such as ESL.² Additional enrollments in this kind of class are resulting from a 1974 United States Supreme Court decision holding that "students who do not understand English are effectively foreclosed from any meaningful education."³ This ruling is forcing school districts to remove language deficiencies which have tended to exclude non-nationals and minority groups from participating in mainstream American life.

For the purpose of teaching English to these non-native, non-standard, and bilingual speakers, a teaching speciality, ESL, has evolved with competencies, attitudes, and goals different from those of traditional English pedagogy. Notably, dissension exists in ESL theory as to the proper approach for making L₁ speakers proficient in English. Professionals are widely involved in colloquia such as these of the annual convention of Teachers of English to Speakers of Other Languages (TESOL 1977:1):

Teaching Reading Skills to Intermediate/Advanced
Adult Students of English as a Second Language

Language Learning Experiences for Teachers Inter-
ested in Language Teaching Methods

² Many theorists include English as a second dialect within ESL pedagogy.

³ Lau et al. vs. Nichols et al., quoted in full in Center for Applied Linguistics, 1974:6-7. Saville-Troike (1976:129-32,144-51) has a short historical and legislative overview and an annotated text of the relevant Court papers in this landmark decision.

Reading as Part of Language Teaching

Using Drama in ESOL [English for Speakers of Other Languages]

Affective Variables in Second Language Learning

Recent Research in ESL Reading Using Miscue Analysis

An Introduction to Some Aspects of ESL Reading

Language Arts Activities for Teaching ESL in the Elementary School

The Use of Simulation and Modified Gaming in Adult ESL Instruction

Language Development--Standard, Nonstandard, or Both: Its Implications

The symposia titles mirror a diversity of philosophical approaches and teaching methods.

Nevertheless, ESL educators have largely overlooked or avoided dealing with a central issue: the relationship between English writing, i.e., spelling, and sound. ESL texts widely used, for instance, do not even address the problem of spelling directly. Traditional ones available for ESL typically offer L₁ speakers lists of L₂ spellings for them to memorize. This lack of instruction in the English writing system reflects the impasse in traditional teaching of MEWS noted earlier in Chapter I as well as a preoccupation of language arts professionals with oral language skills. It also points up the inability of ESL educators to effect the kind of good results in reading

and writing skills which they can claim for listening and speaking. In turn, because of this inability and oversight, educators relegate MEWS to a position with little priority in an ESL program and neglect development of materials for instruction in English orthography.

In contradistinction, one of the most frequent requests from ESL students is for generalizations about English orthography to aid them in understanding or pronouncing what they see in print, and in perceiving or writing what they hear. In addition to a lack of educational materials to meet this need effectively, little theoretical discussion is available to assist ESL instructors who teach MEWS. Analyses centering on phonics, such as R. Hall, 1966, are typical of the few published attempts to recognize MEWS as an area of study per se in ESL.

Moreover, because phonic generalizations have limited utility, the state of the art respecting MEWS is wanting. Several research projects in the past two decades, reported in Chapter II, have demonstrated the limitations of phonic generalizations in accounting for pronunciations in General American English. Therefore, ESL pedagogy needs new teacher-training materials and new pupil-classroom materials to deal with MEWS. It also needs an evaluation of any forthcoming materials vis-à-vis strategies now in use.

Although phonics may be a popular approach to MEWS, more insight is probable within the framework of generative phonology. Figure 2, interpreting generative theories of Chomsky and Halle (1968) and Griggs (1976a; 1977d), represents graphically the contrast between phonic and generative approaches to MEWS. While evidence is sparse and inconclusive for assessing the relative effectiveness of approaches to ESL, favorable applications of generative linguistics to first-language acquisition suggest the possible worth of its assumptions to a methodology for teaching second-language acquisition.⁴

Definition of Terms

The following are definitions of basic terms used in the research and this report of it:

Standard American English--the written dialect of English described in usage guides such as E. White and Strunk, 1959, 1972; Hodges and Whitten, 1941, 1977; and Morris, 1969, 1975.

⁴Lees, 1963, 1968; Menyuk, 1969; and C. Chomsky, 1969, exemplify applications of a transformational-generative model to the question of language acquisition. Diller (1975:67) also discusses how transformational-generative theories have "undermined the empiricist-behaviorist basis for mimicry, memorization, and pattern drills as language teaching methods." He recounts current pedagogical applications of generative linguistics and research supporting the hypothesis "that grammatical explanations clearly facilitate the learning of the language" (68).

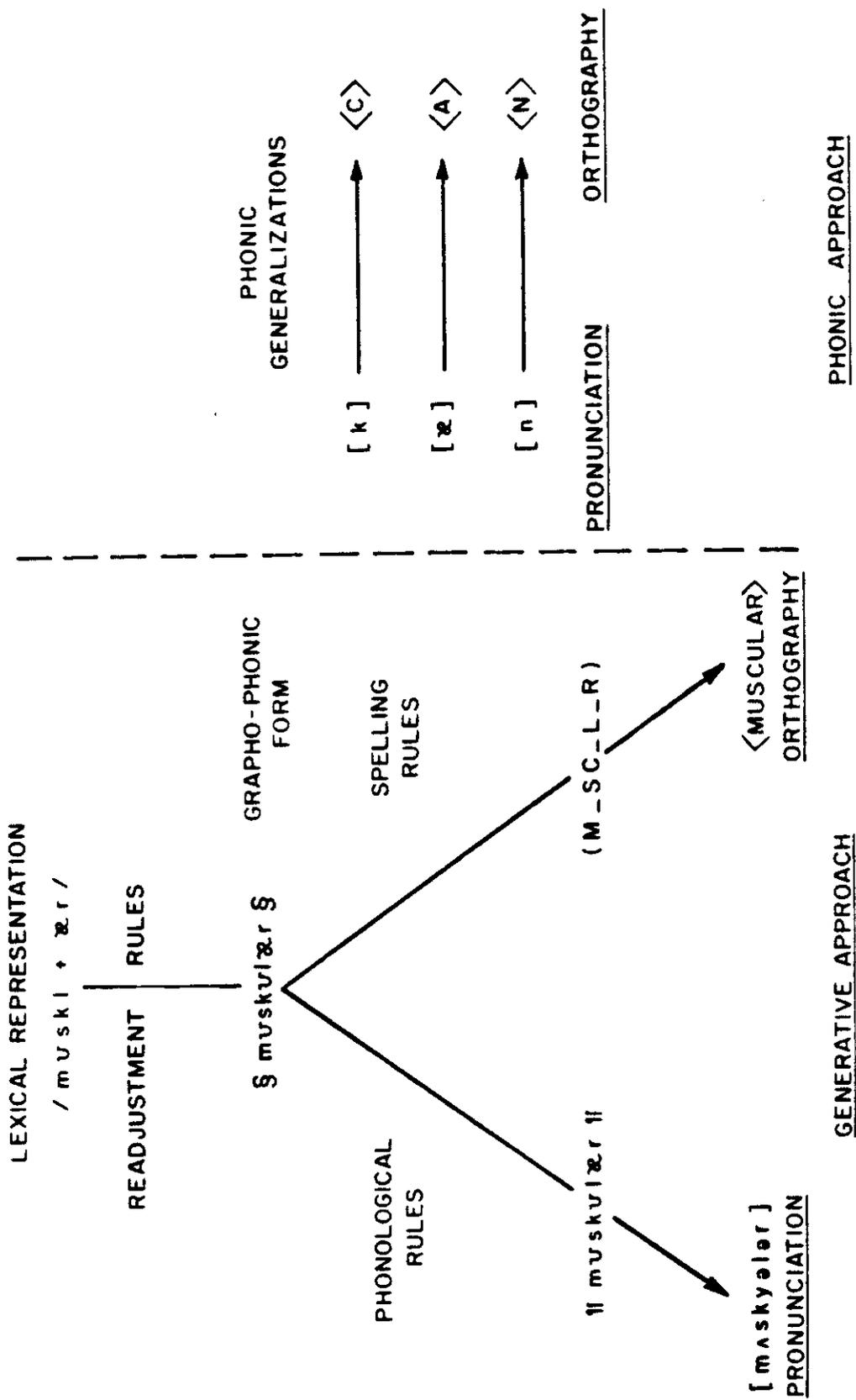


Fig. 2--Relationship between English pronunciation and orthography

General American English--the variety of spoken English whose pronunciation is described in Kenyon and Knott, 1944, 1953.

ESL--a set of initials for "English as a second language." ESL teaching is monolingual instruction of persons whose dominant language is not English. The design in ESL is to teach English by using it as both medium and subject of instruction.

MEWS--an acronym for "mastery of the English writing system." The acronym "MEWS" and the terminology "mastery of the writing system of English" are used in the research and this report as a means of referring to the spelling system of English.

L₁--the mother tongue of an ESL student.

L₂--Standard American English writing and General American English pronunciation.

ESD--a set of initials for "English as a second dialect." In ESD, the L₁ of a student is any variety of English other than Standard, General American English.

phonics--a system of letter-sound relationships based on the premise that English graphemes correspond directly with phonetic realizations.

phonetics--the study or science of sounds realized as speech, including their articulation, acoustic effects, and results on the ear, nerves, and brain of a listener.

phonology--the scientific study of the sound system and sound patterns of a language. It is one of three major divisions of language study, along with syntax and semantics.

generative phonology--a grammatical explanation for phonology based on rules which state structural indexes for each process or change. According to N. Chomsky (1966:41), "A generative grammar is simply one that gives explicit rules that determine the structure of sentences, their phonetic form, and their semantic interpretation." Generative phonology is concerned particularly with the second of these: phonetic form.

underlying form--the abstract phonological representation of a morpheme (q.v.) at any level of its derivation, from the output of the syntactic component of a natural grammar through the phonological component.

grapho-phonetic representation--the abstract form of a morpheme (q.v.) at the juncture of spelling and pronunciation origins. For example, the pronunciation [gōwl] and the spelling <GOAL> share the grapho-phonetic representation

§gōl§.⁵ A grapho-phonetic representation is also an underlying form.

morpheme, or formative--a syntactic or lexical form which is not further divisible without destruction or alteration of its meaning. The formatives [mæn] 'man' and [hvd] '-hood,' for example, cannot reduce further morphologically, but they can combine in [mænhvd] 'manhood.'

lexical representation--the abstract shape of a morpheme (q.v.) in the lexicon, and of a lexical item in the lexical string generated by the transformational component of a grammar. A surface-structure lexical string is the syntactic structure of a sentence into which lexical items have been inserted. Phonological rules have not yet operated on this kind of string.

phoneme--a label used by structural linguists in reference to a class of phonetic representations. For example, <BED>, representing grapho-phonetic §bɛd§, may be pronounced [bɛd], [bēy^əd], or [bɛ:d]. The pronunciations [ɛ[~] ēy^ə ɛ:] constitute a phoneme representing §ɛ§ in this case.

Readjustment Rules--early transformational rules in the phonological component of a generative grammar. Readjustment Rules convert lexical representations into forms

⁵Special symbols such as "§" are explained in Table II.

suitable for application of phonological rules. They may also express inherent properties of lexical representations in certain contexts.

The example of /rīd#d/, the underlying form of <RODE>, illustrates how Readjustment Rules function. Four Readjustment Rules⁶ apply to /rīd#d/ so as to (1) remove the internal word boundary "#," (2) delete the suffix "d," (3) change /ī/ to [ɔ̄], so that this vowel agrees in backness and roundness, and (4) adjust the lowness of [ɔ̄] so that it becomes [ō]. The output of these processes is [rōd] at the derivational level at which phonological rules thereafter apply.

spirantization--a sound change whereby certain stop consonants become spirants. The process can be exemplified in the case of <ALLUSION>. Spirantization changes the second /d/ in /æd=lvd+iVn/, the lexical representation of [əluwʒən], to the spirant [z].

identical consonant elision--a sound change whereby the first of two identical consonants elides. The form <ALLUDE> illustrates this process. At an intermediate phonological level in this derivation, the underlying representation [æ=līdɛ] changes to [æ=līdɛ] after application of this rule. In this case one of the pair [l=l] elides.

⁶According to the "Summary of Rules" in Griggs and Rulon, 1974:55-61, these are R1, R3, R9, and R10.

diphthongization--a sound change adding a glide after a vowel. The case of <RESIDE> is an example. In the derivation of [rəzāyd] this rule inserts ⟨y⟩ after ⟨ī⟩ in ⟨rɛ=zīd⟩. The result is ⟨rɛ=zīyd⟩, an intermediate phonological change.

vowel shift--a pervasive sound change in English whereby vowels shift according to the scheme in Figure 3.⁷ An example is <PROCEED>. This phonological process explains how ⟨prɔ=sēyd⟩ becomes ⟨prɔ=sīyd⟩. The ⟨ē⟩ shifts to ⟨ī⟩ at an intermediate level in the derivation of [prəsiyd].

rounding adjustment--a sound change in the roundness of back vowels, as shown in Figure 4. The case of <ALLUDE> illustrates this change. In ⟨ælyīwdɛ⟩ ⟨yūwdɛ⟩, ⟨ī⟩ undergoes this change at an intermediate level of representation in the derivation of [əlūwd].

backness adjustment--a sound change which converts low vowels into corresponding back ones when they precede a glide, as shown in Figure 5. An instance occurs in the case of <RESIDE>. In ⟨rɛ=zāyd⟩ ⟨rɛ=zāyd⟩ backness adjustment causes ⟨ā⟩ > ⟨ā⟩ in early derivational forms of [rəzāyd].

⁷Figures 3 through 5 interpret phonological theories of Chomsky and Halle, 1968.

palatalization--a sound change of certain consonants to strident, retracted counterparts. For example, this rule operates in the case of <RIGHTEOUS>. The rule causes $\text{[t]} > \text{ç}$ in an underlying representation of $[\text{rāy}^{\text{ç}}\text{əs}]$.

velar softening--a process which changes /k, g/ to strident, coronal [c, ʝ] , respectively, when they precede

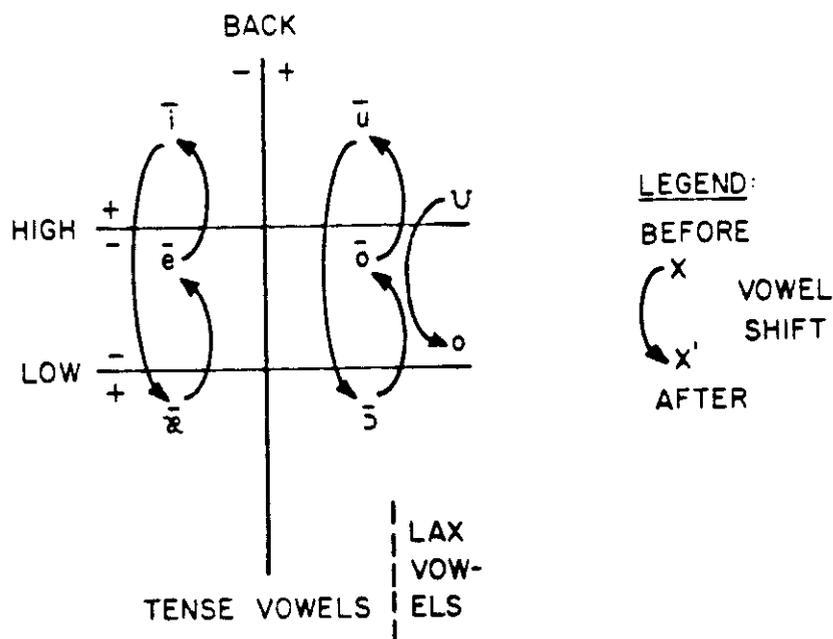


Fig. 3--Vowel shift in English

nonback, nonlow vowels. The anteriority of /k/ also changes value. To derive $[\text{rɛ}^{\text{ç}}\text{jəsāy}^{\text{ç}}\text{d}]$ 'regicide,' for example, this process causes $[\text{rēg}+\text{I}+\text{kīd}] > \text{[rē}^{\text{ç}}\text{j}+\text{I}+\text{cīd}]$.

schwa insertion--a late sound change which inserts the centering glide $[\text{ə}]$ between certain consonants. An example

occurs in [æŋgəl] > [æŋgəl] 'angle,' where a schwa is inserted between [g] and [l].

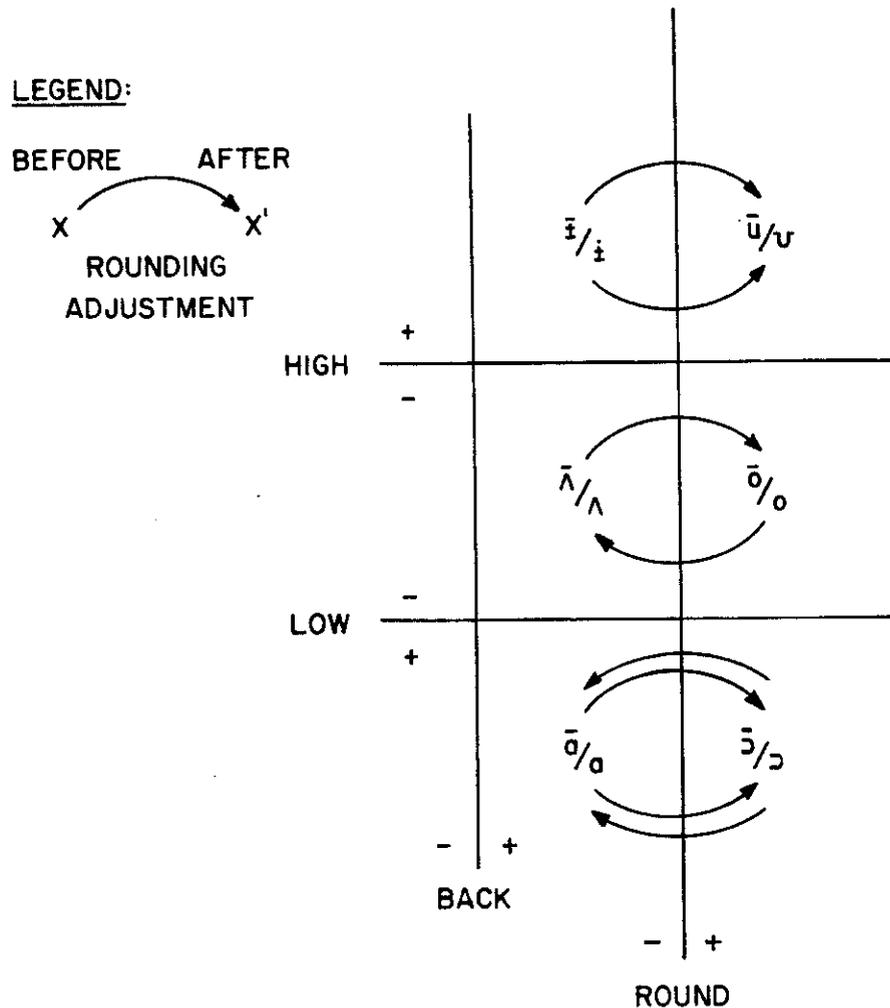


Fig. 4--Rounding adjustment in generative phonology

vowel reduction--a low-level sound change which reduces all unstressed lax vowels in English to schwa [ə]. The verb <PRODUCE> exemplifies the process. In the pronunciation of [prəd̩uːs], for example, an underlying /ɔ/ in the first syllable of its lexical representation reduces to [ə].

minimal pair--a set of forms alike in pronunciation except for one phoneme. For instance, each of sets (a) and (b) in Figure 6 contains the minimal pair (1) and (2). The sounds of (1) and (2) in set (a) are alike except that the

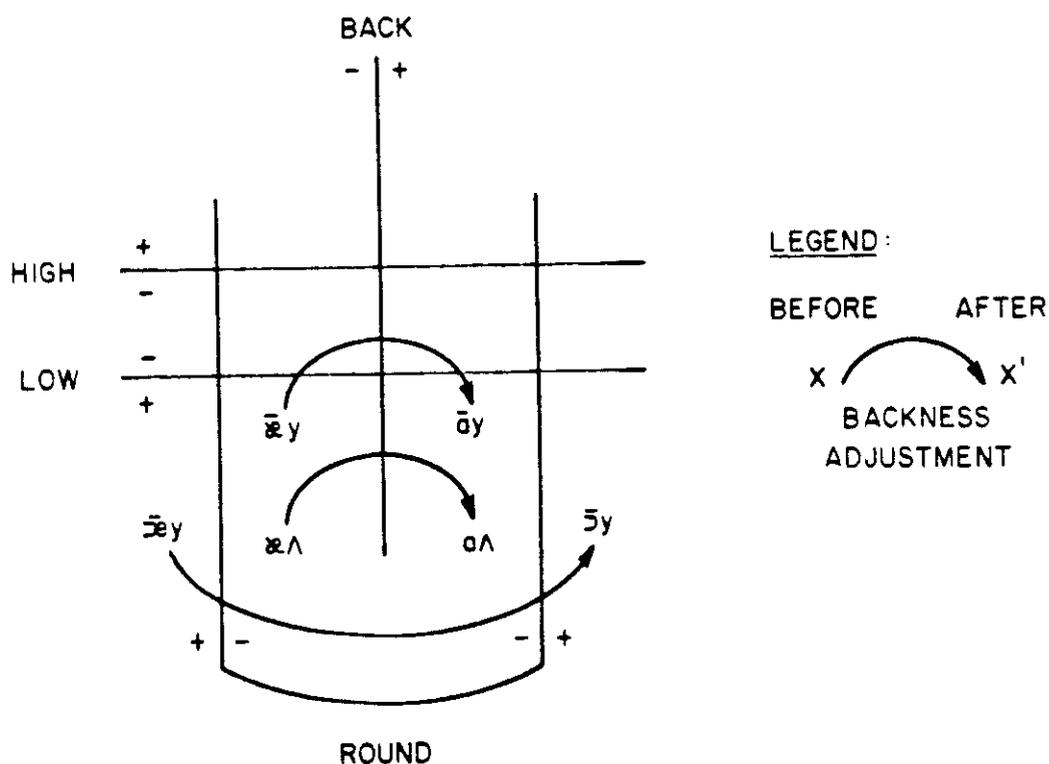


Fig. 5--Backness adjustment in generative phonology

initial consonant, [d], of (1) is different from the initial consonant, [b], of (2). Similarly, the sounds in set (b) are alike except that the vowel [æ] of (1) is different from the vowel [ɪ] of (2).

suprasegmental--a phonetic feature which transcends individual phonological segments. The features stress and junction are examples. Suprasegmental stress is the force

of the articulatory gesture in speech of two or more adjacent phonetic segments. Juncture is the boundary or pause between phonetic segments or groups of phonetic segments,

	(a)		(b)	
(1)	<DAD>	[dæd]	<DAD>	[dæd]
(2)	<BAD>	[bæd]	<DID>	[dɪd]

Fig. 6--Minimal pairs in English

including morpheme boundary, prefix boundary, word boundary, and sentence boundary.

allophone--a sound which alternates with other members of a phoneme. An example is the phoneme [l] represented by <L>. A clear or front allophone of [l] occurs in <LAMP>, and a dark or back allophone of [l] occurs in <OLD>.

nonsense word--a non-occurring linguistic form, possible because it suits the phonotactic constraints of a given language. For example, * [fr̄owb] is an English nonsense word which might be spelled * <FROBE>. Although it is not in the lexicon of English, it accords with the distribution of systematic phones in modern American English.⁸

Explanation of Symbols

Linguistic symbols are used in this dissertation for purposes of phonetic transcription and for notations of phonological, morphological, and syntactic forms. Some symbols used in this report of research are ones in common use, and others are nonce symbols needed to describe special matters. These are described below, along with representations for orthography. In addition, Chapter V cites and explains symbols used particularly to represent statistical concepts in analyses of data.

Phonetic Transcription

Representations for pronunciation are a modified International Phonetic Association Alphabet (IPA), as shown in Table I.

⁸According to rules in Griggs, 1976b.

TABLE I
PHONETIC TRANSCRIPTION

Vowels			Non-Vowels		
Symbol	To Represent Sound as in--		Symbol	To Represent Sound as in--	
[īy]	[mīyt]	MEET	[p]	[pɛp]	PEP
[ɪ]	[bɪt]	BIT	[b]	[bāb]	BOB
[ēy]	[bēyð]	BATHE	[t]	[tāt]	TOT
[ɛ]	[mɛt]	MET	[d]	[dɪd]	DID
[æ]	[bæθ]	BATH	[k]	[kɪk]	KICK
[ā, āh]	[klāt]	CLOT	[g]	[gæg]	GAG
[āy]	[bāyt]	BITE	[č̣]	[č̣ɛrč̣]	CHURCH
[āw]	[bāwt]	BOUT	[ʃ̣]	[ʃ̣ʌʃ̣]	JUDGE
[ōh]	[lōhst]	LOST	[f]	[fāyf]	FIFE
[ōy]	[tōy]	TOY	[v]	[vɛrv]	VERVE
[ōw]	[klōwð]	CLOTHE	[θ]	[θāy]	THIGH
[ʋ]	[fʋl]	FULL	[ð]	[ðāy]	THY
[ūw]	[lūwz]	LOSE	[s]	[sīys]	CEASE
[yūw]	[fyūwl]	FUEL	[z]	[zūwz]	ZOOS
[ɪ̣]	[wɪmɪn]	WOMEN	[ṣ̌]	[ṣ̌ʋṣ̌]	SHUSH
[ʌ]	[rʌt]	RUT	[ẓ̌]	[ēyẓ̌ə]	ASIA
[ə]	[əbāwt]	ABOUT	[h]	[hā]	HA
			[l]	[lʌl]	LULL
			[r]	[ræɹ]	RARE
			[m]	[mʌm]	MUM
			[n]	[nūwn]	NOON
			[ŋ]	[sɪŋ]	SING
			[w]	[wōw]	WOE
			[hw]	[hwāy]	WHY
			[y]	[yɛs]	YES

Phonological, Morphological and Syntactic Symbols

In addition to IPA, linguistic symbols in this dissertation are explained in Table II.

Orthography

Majuscules of the Roman alphabet are used to represent orthographic contexts throughout the dissertation.

Delimitations

Three delimitations restricted the research reported in this dissertation:

Adult Classes

The teaching materials developed and their use have been limited to ESL classes of adults.

Two Primary Units

The teaching materials developed have been limited to two primary units within a design which allows other units to be added. The MEWS units developed in this study cover the phonological and orthographic rules listed in Table III.

Student Improvement

The area of student ability which this research seeks to improve has been delimited to reading skill. There is no attempt to investigate the separate problem of student ability to spell English forms.

TABLE II
LINGUISTIC SYMBOLS

Symbol	To Show--
/ /	A formative in the lexicon
¶ ¶	An intermediate phonological form
§ §	A grapho-phonetic representation
[]	A phonetic form
()	An intermediate spelling derivation
< >	Orthography
#	Word boundary
+	Formative boundary
=	Prefix boundary
§	Alternation
»	Process of "becomes"
<	Process of "derives from"
-	Negative value (of a phonetic feature)
+	Positive value (of a phonetic feature)
V	Any vowel in a formative**
?	Questionable grammaticality
*	Deviation from grammaticality
-	Tenseness (of a phonological segment)

**Except in Tables V and VI.

Limitations of the Study

Three characteristics of the pilot study reported in this dissertation limit the generalizability of its research findings:

TABLE III
UNITS DEVELOPED IN THE STUDY

Unit I--Vowels		Unit II--Consonants	
Phonological Rules	Orthographic Rules	Phonological Rules	Orthographic Rules
Diphthongization	Main vowel mapping	Velar softening	<GE> from S ^Y S ^{**}
Vowel shift	Vowel biliteralization	Spirantization	Main consonant mapping
Rounding adjustment	Silent <E>: tense vowels	Identical consonant elision*	<H> biliteralization
Backness adjustment	Syllabic resonants	Palatalization	Spirantization
Schwa insertion*			
Vowel reduction			

*Except for these rules from Griggs and Rulon, 1974, the names of all Phonological Rules are from Chomsky and Halle, 1968.

**Except for this rule, the names of all Orthographic Rules are from Griggs, 1976a.

Population

One limitation is the case because the subject population reported in this study was a narrowly-defined one. The subjects were adult ESL students at NTSU. Therefore,

the results are generalizable only to second-language learners with at least some college education who met NTSU admission standards. Moreover, since the subjects had a background of prior training in English, perhaps results are generalizable only to nonbeginners in ESL.

Native Languages

Conclusions can be generalizable only to native speakers of the L_1 's represented in the pilot study.

Level of Teachers' Education

Findings may be generalizable only for settings where classroom teachers are as highly educated as college teachers.

Assumptions

Three assumptions governed the research reported in this dissertation:

Language is Rule Governed

An assumption underlying this research is that language is rule-governed human behavior. A related assumption is that a valid test of the writing or speaking proficiency of an ESL student is one which yields data about his knowledge of English sound patterns and orthographic system.

Reading English Involves MEWS

A second assumption of this study is that acquisition of reading in English largely involves MEWS. In other

words, perception and comprehension of the English writing system affords competence in reading.

Sentence is Universal

An assumption implicit in the standards of judgment for evaluating the state of the art in ESL (see Chapter II) is that the sentence is a linguistic universal. Other assumptions are related to the sentence. A primary one is simply that the teaching of ESL to adults should begin with sentences and, further, that it should begin with the development of all language skills from the outset of instruction.

Procedures

Procedures for Development of Teaching Materials

The following procedures were carried out in connection with the first purpose of this research, a report of development of MEWS classroom instructional materials for students in ESL classes by using generative phonological principles:

Examination of ESL Materials.--The dissertation reports on a critical examination of the state of the art in teaching MEWS to ESL students. The examination was based

on criteria established in the study.⁹ In order to insure a comprehensive array of ESL materials for this examination, five different ESL classes or programs were chosen from which to draw materials being used in such classes. These five classes and programs are the following:

ESL classes under the Adult Basic Education program of the Dallas Independent School District, Dallas, Texas

ESL class for continuing education at Mountain View College, Dallas, Texas

ESL class for continuing education at El Centro College, Dallas, Texas

NTSU college-credit English classes for international students, Denton, Texas

English 408, "Teaching English as a Second Language," a college-credit course for prospective teachers at NTSU, Denton, Texas

In the above list, the first four categories of classes used ESL student materials, and the last used ESL teacher materials. All materials were obtained and examined. Based on data from the examination, this dissertation reports nine major conclusions about the state of the art.

Formulation of a Theoretical Framework.--A theoretical framework was formulated, to be followed in the research.

⁹Chapter II has two lists of "Criteria for Teacher Materials" and "Criteria for Student Materials."

It concerned a thesis about reading skill in English. The thesis was that a knowledge of English phonology is necessary for readers to arrive at the lexical representations which underlie English orthography. The thesis further was that this portion of English phonology is what ESL students lack. In the materials developed to teach MEWS to ESL students, instruction in rules of English phonology was seen as a prerequisite to morphological insights. Such insights follow knowledge about English phonology because of the way in which phonological segments, individually and sequentially, carry morphological information.

The theory also included a view that although native speakers of English have acquired this phonology as a natural acquisition in childhood, as readers some of them need further instruction. The reason is that underlying phonological forms must be psychologically real in order for their relationship to English spelling to be perceived. This sort of native speaker needs instruction for an awareness of his phonological competence.

The thesis concerned spelling competence, not spelling performance. Spelling competence involves knowledge about the systems of English orthography which reflect underlying phonological forms and processes. Students who have achieved spelling competence, i.e., mastery of the writing system of English, recognize morphological regularities which are

conveyed by spelling. These regularities afford lexical and phonological information essential to reading English. Spelling performance involves, among other skills, achievement in memorizing accepted spelling representations for English formatives. The research reported in this dissertation was concerned with the former, spelling competence, and not with the latter, spelling performance.

Stipulation of English Phonology.--The dissertation reports on a phonology for English specified in the study. No generally-accepted phonological framework exists, but the fundamental theory underlying the generative approach to English phonology is the transformational-generative grammar of N. Chomsky (1957; 1965). The phonological rules drawn in the study for this dissertation rely on Halle (1962), Chomsky and Halle (1968), Griggs and Rulon (1974; 1975), Griggs (1976c), plus others who have formulated generative grammars for the sound system of English. Their studies have roots in the 1957 and 1965 works of Noam Chomsky.

Establishment of Orthographic Rules.--This dissertation also includes selected generative orthographic rules for the English writing system. The discussion of these rules relies particularly on unpublished studies of Silas Griggs (1974, 1976a, and 1977a through 1977d). Griggs's papers are unusual in that they have a generative approach

to English spelling based on a fundamental concept of ordered rules.

Development of Methodology for MEWS Instruction.--

Using the stipulated framework and orthographic system of English, the research arrived at a methodology for applying generative principles to the teaching of MEWS in ESL. The methodology centered on the relationship between orthography and phonology in English, i.e., the concept that English spelling represents abstract phonological forms. The methodology also involved concepts of ordered spelling rules which relate spelling representations to this underlying level. Another concept was that ordered sound rules relate phonetic representations of speech to underlying forms. The methodology was formulated on the rationale that phonological principles of English constitute essential information needed by an ESL student in reading English.

Use of Tables of Specifications.--The dissertation cites "Tables of Specifications" drawn prior to the development of instructional materials for teaching MEWS in ESL. The tables cover the objectives and activities of both of the units shown in Table III. The specifications have a section for phonological rules and another for orthographic rules. Appendix D of this dissertation contains both tables of specifications.

Development of MEWS Materials.--The dissertation also reports development of curriculum materials for student instruction in MEWS. Including teacher's guides, student handouts, and practice exercises, the materials reflected the phonological and orthographic rules specified in the research. All of the classroom materials developed appear in Chapter IV of this dissertation.

Determination of Content Validity.--The dissertation reports the determination of content validity of curriculum materials developed in the study. Using the tables of specifications, a panel examined the content of the curriculum materials on the basis of whether the materials met the objectives in the tables. The material was modified until objectives in the tables were met in the teaching materials.

Procedures for Use of Teaching Materials

The following procedures were carried out in connection with the second purpose of this research, the use in ESL classes of the materials developed in this study:

Design of the Pilot Study.--The dissertation reports on a pilot study of fifty-three college students in four ESL classes at NTSU. The students were enrolled in 132B, "English for International Students," which is the second

semester of Freshman English at the University. The four classes were heterogeneous. Subjects were from both sexes, ranging from nineteen to fifty-three years of age. They represented twelve different native languages and eighteen foreign countries. In addition, the subjects had academic backgrounds varying from one to six-and-a-half years of higher education and from one to five years of English training beyond secondary school.

Three sections of 132B, with thirteen, sixteen, and twelve students, respectively, served as an experimental group. A fourth section with twelve students, members of a class randomly selected from among the four participating sections of 132B, served as a control group. Experimental subjects received the new MEWS instruction during a four-week pilot study involving a Unit I on vowels and a Unit II on consonants. During the pilot study, control subjects received the usual instruction in English 132B according to their instructor's pre-planned syllabus. Division of the classes in this way assured that at least thirty students would use the new materials.

Administration of First Reading Test.--The dissertation reports on a reading test administered to all subjects. Before receiving the special MEWS instruction, students in the experimental group, along with control subjects, took the Nelson-Denny Reading Test (Brown, Nelson, and Denny,

1973). The purpose of administering this standardized test was to determine whether treatment and control subjects were similar in their ability to read English morphemes. Otherwise, there might have been a question of whether the effectiveness of the MEWS materials varied with significantly different reading abilities between the two groups.

Administration of MEWS Tests.--The dissertation reports on the administration of tests developed in the study. All subjects in the pilot study took a pretest on each MEWS unit and a combined post-test over both units. These tests were developed to measure MEWS performance by all subjects. On the tests, students were asked to recognize likely pronunciations and spellings for nonsense words in English. Each test consisted of twenty-five multiple-choice questions having three possible answers. The post-test, composed of two sub-tests, was a readministration of the pretests over both units in a combined form. Reproductions of the pretests and combined post-test for units on vowels and consonants appear in Chapter IV of this dissertation.

Use of MEWS Materials.--The dissertation reports the use of the MEWS instructional materials. After the pretesting, the experimental subjects received several handouts for Unit I and several handouts for Unit II a week later. After distribution of the material, a one-hour

class period was spent in discussion, and a half hour practice session was spent on exercises. In addition to the total of two hours of study and review, one hour of practice exercises in the treatment classes, and several hours of pretesting and post-testing, the subjects received no other special attention. At other times the regular instructors of each section of 132B resumed their prepared syllabi.

Determination of Content Validity of MEWS Tests.--The dissertation reports the determination of content validity of each test developed in the study. The tests were cognitive measures reflecting the objectives and content listed in the Table of Specifications for Orthography and the Table of Specifications for Phonology. Thus, the tests had face validity by reflecting the tables. In addition, using the tables of specifications, a panel examined the tests on the basis of whether they tested for the objectives and content areas in the tables. The tests were modified until all objectives in the tables of specifications were met by the instruments.

Determination of MEWS Test Reliability.--The dissertation reports the method used for determining the reliability of testing instruments developed in the study. Pretests over both units were administered on separate dates, a

week apart, to a try-out class. The try-out class, English 131B for international students at NTSU, was similar to the classes involved in the pilot study. One week after the Unit II pretest, the combined post-test was administered to the try-out class. A Pearson r was run for the coefficient of stability. An r of 0.87 for Unit I and an r of 0.70 for Unit II indicated acceptable reliability of the testing instruments.

Administration of Second Reading Test.--The dissertation reports on administration of a second reading test. Since scores on the Nelson-Denny Reading Test were lower than norms for college freshmen, a second reading test seemed advisable. The purpose was to cross-validate the first set of reading scores. Accordingly, another standardized test, the English Reading Test for Students of English as a Foreign Language (King and Campbell, 1956), was administered after use of the MEWS materials. The first test was standardized for native speakers according to grade levels of American schools. On it the mean total score of all subjects was equivalent to the 7.26 grade level. For subjects who took both reading tests, the mean total score was equivalent to below the sixth grade on the Nelson-Denny Reading Test and also on the English Reading Test for Students of English as a Foreign Language.

Procedures for Analysis of the Data

Through the use of a computer, an accurate tabulation and statistical analyses of test results and demographic data were obtained. The statistical techniques are listed below under the categories of reliability study, first reading test, tests developed in the research, and second reading test.

Reliability Study.--Statistical techniques included the following:

Correlation coefficients for pretests and post-tests on Unit I and on Unit II

Item, test, and homogeneity analysis of pretests and post-tests on Units I and II

First Reading Test.--Statistical techniques included the following:

Correlation of the test with years of university education and with English training of the subjects

Correlation of parts of the reading test with each other, using grade-level equivalents

Distribution of grade-level frequencies, and means for each section of the test

Analysis of variance on total raw scores of control vs. experimental groups

Item, test, and homogeneity analysis

Correlation of grade-level scores with scores on second reading test

Tests Developed in the Research.--Mean gain scores on the pretest/post-test instrument for each unit of instruction served as criteria for the effectiveness of the pilot program. Since the classes were intact groups, analysis of covariance was used to adjust for initial group differences before final comparison of post-test scores. The 0.05 level was used as the criterion for significance. Statistical techniques included the following:

Analysis of covariance on Unit I post-test scores of control vs. experimental groups, using first reading test total raw score and the pretest on Unit I as covariates, and the same analysis for Unit II

Analysis of covariance on Unit I post-test scores of control vs. experimental groups, using native language and Unit I pretest scores as covariates, and the same analysis for Unit II

Analysis of covariance on Unit I post-test scores of control vs. experimental groups, using sex and Unit I pretest scores as covariates, and the same analysis for Unit II

Analysis of covariance on Unit I post-test scores of control vs. experimental groups, using years of English training and Unit I pretest scores as covariates, and the same analysis for Unit II

Item, test, and homogeneity analysis of pretests and post-tests on Units I and II

Second Reading Test.--Statistical techniques included the following:

Computation of mean, standard deviation,
high, low, and grade-level equivalency
scores

Item, test, and homogeneity analysis

In addition to the above techniques, a correlation matrix was run. The matrix consisted of twenty-five variables including all of the criterion measures. Data on a semester grade and an essay grade of the subjects were also used as variables.

Overview of the Study

This dissertation has six chapters. Chapter I has summarized the background and significance of the study, the procedures for developing and using MEWS materials, and analyses of the resulting data. Chapter II presents a survey of literature on generative linguistics, especially phonology. In addition, research and materials on English spelling-sound correspondence are reported in Chapter II. Also included is a survey of the state of the art in ESL materials with respect to MEWS. Chapter III discusses generative phonological and orthographic rules for English and reports a method of using them for teaching MEWS to ESL students.

The most salient parts of this dissertation are Chapters IV and V. Chapter IV reports procedures followed in applying the generative principles discussed in Chapter

III. These procedures include development of preliminary MEWS materials based on phonological and orthographic rules, and use of the MEWS materials in a pilot study. Analysis of the pilot project and of the preliminary materials follows in Chapter V.

The dissertation concludes with a sixth chapter. Chapter VI reports proposed revisions of MEWS materials and their implications. The closing sections of Chapter VI have conclusions, recommendations, and suggestions about the study. Numerous tables, illustrations, and appendices accompany the text throughout to facilitate reading of the dissertation.

CHAPTER II

REVIEW OF THE LITERATURE

Chapter I of this dissertation includes the suggestion that a transformational-generative model be applied to the question of second-language acquisition. The chapter defines generative grammar as an approach to linguistics which relies on explicit rules for sound, structure, and meaning of sentences. Transformational-generative literature concerning the writing system of English and its role in the reading process is accordingly reported in this second chapter of the dissertation. Chapter II also reports research and materials on the spelling-sound relationship in English. A final section reviewing the literature reports on the state of the art in ESL materials with respect to MEWS.

Literature Relating to Generative Linguistics

In connection with generative linguistics, the 1957 theory of transformational grammar by Noam Chomsky is a seminal work. Syntactic Structures (1957) and a later publication also by Chomsky, Aspects of the Theory of Syntax (1965), introduced and developed a view of language as a creative ability of humans. Chomsky's view is that language is based on rules. A speaker internalizes rules and uses

them for judging grammaticality of sentences and for producing sentences he may never have heard. According to Chomsky, a grammar of a natural language must describe what a native speaker knows about his language. The grammar must be able to generate all of the grammatical sentences in a language, and only grammatical ones, and must provide structural descriptions for them. From the outset of the development of transformational grammar, phonology has been a chief component. The phonology shared importance in the 1957 model with a syntactic component and in the 1965 model with syntactic and semantic components.

Development of a precise transformational-generative model, including processes of the phonological component, has been a subject of much ongoing controversy. The Aspects model has been substantively revised by Chomsky (1971; 1972), and the revision has come to be known as "extended standard theory." Maclay (1971:163-81) outlines how other linguists including James R. Ross, James D. McCawley, Charles J. Fillmore, Joseph Emonds, George Lakoff, Paul M. Postal, David M. Perlmutter, Ray Jackendoff, and others have advanced modifications of extended standard theory. Their revisions are controversial because they concern fundamental concepts of generative theory. These include restrictions on transformations and deep structure, constraints on surface-structure not imposed by transformations, the marking of

lexical items, and identification of structural indexes. Especially significant are questions about the relative status of the semantic and syntactic components.

In a definitive survey of these changes, Maclay (1971: 176,178) describes the "heterogeneous situation where an increasing concern with the status and function of meaning in a linguistic description" and "the autonomy of syntax" has caused transformational-generative linguists to become divided as to theory (176,178). These changes and questions underlie the discussion of the generative approach in this dissertation. They also provide a background for the theoretical foundations discussed in Chapter III.

With respect to phonology, generative linguists have worked out a scientific theoretical background, but there are many unresolved problems still. Writers such as Halle (1962), Chomsky and Halle (1968), Schane (1973), and Griggs and Rulon (1974; 1975) have developed and explicated a standard theory for English phonology based on a generative view of language. Nevertheless, their framework is inchoate because many inadequacies and exceptions have yet to be resolved. As a result, the standard theory is controversial.

A recent announcement for a conference on these problems (Dinnsen, 1977) lists the following phonological theories which have been advanced to perfect this framework:

Natural Generative Phonology
 Natural Phonology
 Revised Standard Theory
 Equational Phonology
 Autosegmental Phonology
 Upside-Down Phonology
 Atomic Phonology

The conference announcement describes these new theories as "remedies to specific inadequacies of standard generative phonology" as set forth in Chomsky and Halle's 1968 work, The Sound Pattern of English (herein called SPE). The conference announcement also describes an unsettled situation in current generative phonological theory:

Most of the theories are so new that they have not had the benefit of extensive discussion in an open and generally accessible forum. It has become exceedingly difficult to assess the relative merits of any given proposal against those of some other proposal. Moreover, there is no individual theory which provides a generally accepted framework to guide current research (Dinnsen, 1977).

Perhaps a look at just two generative phonological theories will illustrate why Dinnsen refers to the whole generative phonological theory as an inadequate framework. One current theory, "Upside-Down Phonology," is proposed by Leben and Robinson (1977:1):

In contrast to the traditional position, which has regarded phonological rules as a means of deriving a correct surface form from a more abstract underlying form, we propose that the rules serve an interpretive function: by processing surface forms, which are listed in

the lexicon, phonological rules permit the morphology to relate words that superficially are phonetically dissimilar. The basic proposal has already been made for phonology by Vennemann 1974 and for morphology by Jackendoff 1975. We differ from those writers to some extent in the types of rule we allow, and to a greater extent in the ordering relationships we posit.

As their major proposition reveals, Leben and Robinson take a position which is at odds with other phonological theories, albeit they all are generative. Venneman, whom Leben and Robinson mention, evidently feels that the grammar should be constrained in the abstractness of underlying forms (cited in Hooper, 1976:122).

Another current theory (Hooper, 1976) supports and elaborates Vennemann's position. Hooper (4-5) feels that the present transformational-generative model of phonology is too powerful:

The long-range goal of theoretical linguistics is to formulate a theory that is just powerful enough to describe correctly all the facts of natural language but, at the same time, is not so powerful that it describes systems or predicts phenomena that never occur in natural language. In keeping with this goal, generative phonology needs to be constrained.

To meet such a need, Hooper proposes a theory of "Natural Generative Phonology" which strongly constrains the extent to which underlying forms differ from surface forms. Accordingly, underlying representations in Hooper's theory are not as abstract as they are in standard theory.

In sum, generativists have agreements and disagreements, as "Upside-Down Phonology" and "Natural Generative Phonology" demonstrate. These linguists agree on the principle of underlying forms, but not necessarily on the exact nature or features of underlying representations. They agree that rules apply so as to change the shape of underlying forms into surface realizations, but they often differ on the ordering or direction of these rules. Many of them concur, for instance, on the existence of phonological rules for palatalization and spirantization, but they question the structural description for the rules and their position relative to other phonological rules. Moreover, as the example of Hooper (1976) shows, the controversy over abstractness of underlying forms continues unresolved.

Research and Materials on English Spelling-Sound Correspondence

In connection with phonological matters, little research or substantive application of the principles of generative linguistics has concerned the relationship between English phonology and orthography.¹ Griggs (1976a:1) observes that spelling

¹An instance in the literature is a research report by Simons (1975). Another is cited in a publisher's notice (Harcourt, 1977) representing Modern English, 2d ed. (Rutherford, 1968, 1975-77) as a text using generative principles to help ESL students with MEWS. Rutherford uses a structural approach, though, couched in the terminology of transformational-generative grammar. It, as well as Rutherford's text, is discussed here and later in Chapter II in greater detail.

"is related to the phonological component of English," and he offers some ordered spelling rules to map phonological segments into graphemes. His theoretical study is incomplete and unpublished.² Kreidler (1971, 1972), C. Chomsky (1970), and Schane (1970) have also done basic research on the relationship from generative points of view. Their articles are discussed in the state of the art, below, among works specifically addressed to ESL and reading specialists.

An exceptional instance of applied research on the SPE theory of English spelling-sound correspondence is Simons, 1975. Simons was interested in the Chomsky-Hallean theory proposed in SPE that English spelling corresponds to an abstract rather than a phonetic level of representation. In the transformational-generative view of SPE and of works such as C. Chomsky, 1970, mastery of the English writing system is seen as essential for skill in reading English orthography. Reading acquisition, according to these theories, involves learning the principles of morphological and phonological alternation which the lexicon undergoes.

Accordingly, Simons tested primary school children for their ability to read pairs of words morphologically related

²In addition to Griggs's work, the contributions of Venezky (1967; 1970) to a theory of English grapheme-phoneme relationships are discussed in Chapter III. Venezky's study is within a framework of structural linguistics.

and unrelated (called "REL" and "UNR" by Simons). He found that his "study did not offer much support for the predictions of transformational theory about reading acquisition" (49). Simons hypothesized that if SPE theory is correct, then all readers should perform better on morphologically related words than on unrelated ones. He used methods and analyses, however, which do not accord with the technical matters presented in SPE. Nevertheless, the Simons study is important as a test of Chomsky-Hallean theory and as an illustration of the imperfect state of knowledge in pedagogy about generative linguistics.

In the report of the Simons experiment, the following subjects do not accord with SPE theory: level of spelling origin, the concept of alternating forms, the lexicon, and morphology of formatives. Each of these subjects is explained and analyzed below. A reinterpretation of Simons's data supports generative theory on reading acquisition and prepares a context for the theoretical foundations presented in Chapter III. The analysis below is important with respect to the research reported in this dissertation. The reason is that Simons's findings, if correct, would refute basic positions on language acquisition adopted here.

Level of Spelling Origin

Simons repeatedly states that English spelling corresponds to lexical representation in the Chomsky-Hallean

system. Lexical representations in SPE theory, however, are minimally-specified ones. For example, the lexical "spelling" for the sound of orthographic <S> in <SIT>, pronounced [sɪt], is [m segment] under Chomsky and Halle's universal marking conventions (1968:403-407). Moreover, SPE (49-50, et passim) posits the level of orthographic origins as being much later than the lexical level. In the derivation of a linguistic form under SPE theory, orthography reflects a phonological level subsequent to the application of readjustment, stress, laxing, and some tensing rules. Simons, however, concludes from SPE that "In reading it is not necessary to engage in phonological processing. Readers can go directly from spelling to the meaning bearing lexical representation" (51).

On the contrary, reading does involve a mastery of English phonology in order to arrive at lexical representations underlying orthography. In fact, this portion of English phonology is precisely what a non-native speaker lacks. He must master the phonology in order to develop morphological insights. On the other hand, although a native speaker of English has already learned the phonology of English as a natural part of acquiring speech, he must be aware of his phonological competence in order to develop reading skill.

Alternating Forms

The Simons report also contains statements on alternation of sounds which do not accord with principles proposed by Chomsky and Halle in SPE. For example, the report states that according to this theory, in each of the pairs <HIDE--HID> and <PINE--PIN> "the underlying lexical form of the vowel is the same for both words of each pair" (52). It is true that the underlying lexical representation shared by <HIDE--HID> is /ī/, since they are morphologically related. The underlying mid-vowel of <PINE> is also /ī/, but of <PIN> is /ɪ/. Since the underlying vowel in one word is tense and in the other word is lax, <PINE> and <PIN> are unrelated, and their underlying forms differ.

The Lexicon

In addition to different interpretations about spelling origin and sound alternation, the Simons report cites conclusions, by extension of Chomsky-Hallean theory, which are nowhere implied in SPE. For instance, the research hypotheses are built on the behavioral notions that pairs such as <HIDE--HID> and <PINE--PIN> "differ in the proximity of storage in the internal lexicon" (52). Furthermore, the report states about the experiment "that both learning and reading tasks involved among other things retrieval of the word pairs from storage and that performance on these tasks reflected organization of the pairs in

memory" (55). Such views of verbal behavior are not compatible with the rationalist philosophical approach of SPE. They also reflect a preoccupation with performance, rather than competence, which is the SPE model of language capability. In short, SPE theory does not propose or entail precise storage locations for lexical items in a reader's memory.

Morphology of Formatives

Finally, perhaps the most unsound research method reported by Simons consists of a list of related word pairs and a list of "high frequency unrelated word pairs" (53). These constitute the whole treatment in the experiment. The list of "unrelated" words, however, actually includes at least two related pairs: <SEAT--SET> and <STRIPE--STRIP>. Since the UNR list included some of the same kinds of related pairs the REL list contained, it is not unexpected that findings showed no significant difference among good readers in ability to handle REL words or UNR words.

Compounding this lack of control of the treatment variable, Simons adds "distractors" to the tests given subjects. The distractor-word pairs lack content validity. They are word pairs which Simons considers irregular. According to Simon, since the distractors do not conform to the principles of alternating sounds in English, they do not contribute to the kind of knowledge which aids in better

reading. In their phonological derivations, however, the distractors are affected by an early phonological rule in English: ablaut. The process of ablaut is evident in underlying phonological forms of <SHINE--SHONE>. The mid-vowel represented by <I> switches backness for verb inflections so that the output agrees in backness and roundness. Since a native speaker knows ablaut, he has the capability of dealing with <SHINE--SHONE> just as well as he does with alternating tense lax pairs such as <HIDE--HID>.

The Simons Study: Conclusions

Simons's findings are consistent with SPE generative theory. First, Simons's prediction that performance on REL pairs would be significantly greater than on UNR ones was bound not to be supported. This outcome is the case because related pairs are on the unrelated list. In addition, Simons's conclusion that "on both measures REL was superior to UNR for the Hi readers while for the Lo readers the reverse was the case" (55) verifies generative position. Good readers exploit an awareness of English phonological alternation, whereas poor readers do not.

The 1975 Simons report warrants one more comment. In the discussion of reading acquisition Simons neglects two logical considerations. First, he declares that many English words which alternate have low frequencies and thus low priorities in current programs of basic reading. Simons

overlooks a major proposition of SPE. The characteristic of English spelling which makes it optimal for readers is not necessarily the frequency of discrete lexical items, but rather the pervasiveness of the principle of alternation throughout the entire lexicon.

Too, Simons relies on the classic but outdated Thorndike and Lorge word list (1944). Based on it, he concludes that "many of the words from which the child must extract letter-lexical level correspondences are of low frequency and do not occur often in the reading material presented to children" (58). In 1975, over thirty years after the compilation of this word list, a more valid source of contemporary American English would have been the Brown corpus (Kučera and Francis, 1967).

Simons's inference and the choice of words for the experimental treatment call for valid lexical data. The Brown corpus has a broader range of words from current popular texts, a larger number of lexical items, and a later compilation date than the Thorndike and Lorge list. Significantly, a cursory examination of the 194 highest-frequency words in the Brown list shows at least 27 subject to tense~lax alternation and likely to occur in basic readings. This count covers alternating, stressed tense

and lax forms.³ If unstressed lax forms are included in this count, virtually every English word is involved because of the pervasiveness of vowel reduction in American English.

English spelling-sound relationships, studied by Simon, have also interested traditional and structural educators and linguists. Indeed, the spelling-sound correspondence in English has been an issue in many reading and writing programs and research studies. In a headnote to an updated research report on the phonics approach, Johnson (1976:384) notes that it has been a concern of teachers and an influence on instruction since Noah Webster's time. Educators more recently than Webster have devised phonic applications such as the Phonovisual Method, Speech-to-Print Phonics, Functional Phonetics, Landon Phonics, and many others for use in reading acquisition.⁴

Phonics as an approach to English orthography has been pervasive. In a content analysis of spelling texts from nine schoolbook publishers, Cohen (cited in Graves, 1977:87-88) identified five categories of emphasis, of which the most common was phonics (33.6 per cent). Under Cohen's definition,

³Chapter III explains in detail the principle of alternation of English sounds and the differences between tense and lax forms and between stressed and unstressed forms.

⁴For the origins, backgrounds, and highlights of the chief phonic approaches of the 1900's, see Aukerman, 1971:9-227.

a phonics approach relies on exercises with homophones, silent letters, double letters, phonetic respellings, digraphs, vowel sounds, initial consonants and blends, and "phonograms." In phonics theory, units such as <ING> and <IGHT> are so called. In 1976 Graves replicated the Cohen study. Graves (1977:89) found that a large proportion of emphasis in spelling books (24.6 per cent) was still on phonics exercises. Increased attention on handwriting, etymology, and other language arts subjects constituted the difference of 9.0 per cent. Clearly, phonics has been and still is widely used in reading instruction.

The rationale which made the phonics approach pervasive is well known. A standard methods text by Cordts, Phonics for the Reading Teacher, contains an often-cited justification (1965:14):

If the beginning of the word does not at once reveal the word's identity, the reader works out the word or the unfamiliar parts of the word by associating the sounds with their letters; then by blending the sounds, he identifies the word and checks it against the context to see if it fits the sense of the sentence. If it does, well and good. If it does not, but if the reader came close enough to the word's identity, he has a good chance with the aid of the context of being able to guess the word.

Another explication of the rationale is that of Artley (1977:121) in "Phonics Revisited." Artley opposes phonics as a method of teaching reading because "the symbol-sound

relationships in English words are not sufficiently consistent to make it possible to use phonic generalizations with any degree of regularity" (122). He provides this ironic explanation for the rationale of a phonics approach:

Language is oral, so goes the reasoning [of proponents of phonics], and writing is a graphic representation of the spoken word. Reading, then, is the act of turning the graphic representation into its spoken counterpart. Since letters and letter combinations (graphemes) stand for spoken sounds (phonemes), reading reverses the process by associating the proper sounds with the letters, thus enabling the reader to pronounce the word and, hence, reconstruct meaning--a deceptively simple process (121).

That the grapheme-sound relationship in English is not simple is undoubtedly Artley's intended meaning, for Artley (122) adds that "the symbol-sound relationships in English words are not sufficiently consistent to make it possible to use phonic generalizations with any degree of regularity."

Indeed, research on phonic methods and rules shows that neither their correctness nor their utility is high. Described below in chronological order are empirical studies which provided this conclusion:

1963

Clymer (1963) applied phonic generalizations to vocabulary taught in basic reading programs for primary grades. He found eighteen of forty-five phonic generalizations

useful. "Phonics programs which present large numbers of generalizations," he concluded, "are open to question on the basis of this study" (255,258).

1967

Bailey (1967) extended Clymer's list of words and corroborated the 1963 findings in a study of first through sixth grades. More important, Bailey observed the increasing recognition of schwa in dictionaries and pointed out the incompatibility of the schwa sound with existing phonic rules.

Like Bailey, Emans (1967) replicated Clymer's procedures. In a study of intermediate-grade students using an expanded sample of words, Emans found that only sixteen of forty-five phonic generalizations had utility.

1968

Burmeister (1968) examined spelling occurrences of consecutive vowels. He classified pairs of adjacent vowels by their sounds. A random sampling from a larger corpus of vocabulary than the 1963 and 1967 studies was used to test students in intermediate grades. Based on his research, Burmeister (450) decided "that the vowel

digraph generalization has limited usefulness" in teaching the writing system of English.⁵

1969

In 1969 Cohen, mentioned above, tested the effectiveness of five approaches to teaching spelling. In a study of over five hundred fifth- and sixth-grade students, Cohen tested spelling ability under each approach. A major finding was that students taught with phonics showed significantly poorer spelling ability than ones taught with a word-meaning approach (as cited in Graves, 1977:88).

1975

Smith (1975) studied effectiveness of five methods of teaching English spelling. Her subjects were 359 high school students. Smith obtained significantly better scores from students using a whole-word, contextual approach

⁵Burmeister uses digraph to mean the written representation of a sound by two letters, such as <EA> in <BREAK>. This use of the term digraph is common among phonics practitioners. Linguists, however, use digraph to refer to a spelling, with two graphemes, for one distinctive sound in a language. With respect to <EA> in <BREAK>, the vocalic sequence [ēy] has two distinctive phonetic segments: [ē] and [y]. Thus <EA> is not a digraph. An example of a true digraph in English is <TH> for [θ].

than from students using phonics methods such as concentration on individual letters or "hard spots" (69).

The foregoing research shows a negative value for phonics approaches to MEWS. The five studies from 1963 to 1975 found a low utility for the phonics methods investigated. Still, such methods are widely used. As Clymer (1963:255) commented in reaction to his data, "some time-honored customs in the teaching of reading may be in need of revision."

Among educators, nevertheless, phonics has continued to influence research. Hanna and others (1966) used a computer to prepare lists of English phoneme-grapheme correspondences. Although their published results are useful for researchers and linguists,⁶ these materials are difficult for teachers to use. They consist of hundreds of pages of phonic generalizations and frequency tables. Moreover, methodology of this sort has been discounted by Noam Chomsky, who points out that the "listing of innumerable examples is neither difficult nor very interesting; it is quite

⁶For example, Burmeister (1968) used the Hanna data for an analysis of paired vowel spellings.

another matter to find rules that account for them, or a general theory of such rules" (1962:79).⁷

The State of the Art in ESL Materials

Phonics as an approach to the English writing system also has support among ESL specialists. In a standard article on the subject, R. Hall (1966:184) attempts to find "at least one regular, clear and consistent alphabetical representation" for each "phoneme" in English. He draws up numerous lists of "regular" representations.

⁷Many reading specialists cite the Hanna study in support of phonics as a favorable approach to MEWS. For instance, Aukerman (1971:108-109) states that Hanna "concludes that more than 80% of the 17,000 common words in the study were spelled correctly by the computer." On this basis Aukerman feels that "more than 80% of our language can be pronounced when adequate phonics generalization rules are established."

These interpretations, however, are apparently misfounded. The 84.15 per cent regularity determined by Hanna is the mean percentage of correspondence between all fifty-two phonemes, as individual units, and fifty-two graphemic options, using sound, position, and stress of phonemes to restrict their graphemic representation. That is, 84.15 per cent of phonemes in the corpus have graphemic correspondences when considered as separate phonemes. Since this is a mean percentage, the percentage in actual use is low for particular phonemes. Of the twenty-two vowel sounds, for instance, sixteen fall below 80 per cent. When words rather than discrete phonemes are considered, the power of the computerized rules is lower than for phoneme-grapheme individual correspondences. The result is that "Of the 17,009 words attempted, 8,483 were spelled correctly," according to Hanna (1966:114). This number of correctly-spelled words represents only 49.87 per cent of the total in the study. The lower percentage is a more valid indicator of the reading task since it covers phoneme sequences.

Hall (175) asserts, moreover, that the function of the letters of a writing system such as English is representation of its phonemes.

Similarly, Fries (1967) and Norris (1970) have addressed the ESL learner's task concerning MEWS. Fries (168,171) cites the writing system of English as a chief problem for second-language learners, and he recognizes a correspondence of "word-patterns with spelling-patterns." Fries insists on a primarily oral approach wherein students learn words orally and later associate the spoken words with written forms. Norris (192), on the other hand, feels that "the English spelling system was never intended to be more than superficially phonemic." Citing a major problem for ESL students, he observes that "written English differs considerably from spoken English." Instead of rules, after the manner of Fries, Norris offers exercises for practice in word-building. Presumably, an adult student must internalize the rules for himself,⁸ given sufficient practice.

In a lecture on "Teaching English Spelling and Pronunciation" in ESL, Kreidler (1971, 1972) perceptively observes the regularity of the English spelling system. He attributes the systematic nature of English orthography

⁸Internalizing rules, of course, is what a child does in acquiring language. Linguists and educators agree, though, that adult language learning is different in many ways from child language acquisition.

to a correlation between grapheme and phonetic realization, according to his own theory. His discussion, reprinted in the TESOL Quarterly in the following year, contains these strong assertions with reference to teaching MEWS in ESL:

We don't teach the elementary student about English orthography because we really don't understand the nature of our spelling system and how it works.

.....
 However, if one . . . says that a spelling system is regular if a graphic unit always represents the same phonic unit in a particular environment, then English spelling is close to regularity (4-5).

Kreidler concludes that word pairs having alternating sounds need to be presented to ESL students of English writing. This solution accords with the one developed in the research which this dissertation reports.

Kreidler's definition of "particular environment" for phonic or graphic units involves several variables. Kreidler proposes that the regularity of English spelling is the case because occurrences of particular graphemes depend on these variables. Rephrased from Kreidler's text (1971, 1972:6-7), they are as follows:

- Are the graphemes in initial, medial, or final word-position?
- What is their position relative to word-boundary?
- Are they in a stressed syllable or not?
- What is the morphological category of their linguistic form?
- What is the etymological origin of the word? Particularly, is it French or Greek?

The question of whether an English formative is a Romance derivative is of phonological import.⁹ Kreidler, however, fails to pursue that question or to rely on the relatedness of alternating forms as a determinant of pronunciation. Instead, using the questions listed above, Kreidler investigates reasons for "graphic sames which have different phonic values" (5). The following pairs, in which italics are added to show segments in question, are examples of Kreidler's "graphic sames":

SWALLOW

SIMPLY

DENIAL

ALLOW

IMPLY

MENIAL

In comparing each word to the other in its pair, Kreidler accurately points out that since morphology and stress patterns differ, pronunciations differ. The pronunciation of <SWALLOW>, for instance, has initial syllable stress whereas the pronunciation of <ALLOW>, with a different sound, has second syllable stress. Kreidler, though, does not investigate the result of an absence of stress on vowels. In any event, these word pairs are not alternations although the vowels in each pair of words do alternate in other English forms.

⁹A phonological rule may apply on the basis of whether a formative is a Romance derivative. Velar softening (Rule 13 in the "Summary of Rules" in SPE) is one.

Despite the unrelatedness of "graphic sames" such as the word pairs above, Kreidler attempts to generalize about their spelling configurations. For the pair <CHRISTIAN--CHRISTIANITY> he observes that <T> alternates phonetically in [krɪsʧən] 'Christian' and [krɪstɪjənətɪj] 'Christianity.' His explanation for the alternation [ʧ~t] is that <TI> "follows an s and precedes an unstressed vowel" for [ʧ] and a stressed vowel for [t] (11). Kreidler also notes that these alternations have a [ʃ] reflex in forms such as the verb [ənɪʃɪjēyt] 'initiate' because "ti is not preceded by s but is followed by a vowel with middle stress." Both explanations treat alphabetic characters instead of phonological segments, and phonetic realizations instead of graphemes of orthography.

In the meantime, SPE, a work on which Kreidler had relied, appeared in 1968. It is undoubtedly the "most widely discussed single work in linguistics today" (Goyvaerts, 1975:1). A major proposition of SPE which has implications for teaching ESL is that the phonology of a language is rule governed. Wayne O'Neil (1968, 1975:xxxv) has enunciated this new approach from a pedagogical point of view:

English orthography is nearly optimal, not at the level of phonetic or actual pronunciation, but at an abstract level, a psychologically significant level from which pronunciations can be predicted and to which they can be

referred. Moreover, quite aside from pronunciation, this orthography preserves information about the history and the meaning of words that is of great value in human communication.

.
 The phonological spelling represents a level at which a given item is assigned a single representation from which can be predicted by rule the various phonetic spellings that the item can assume.

O'Neil's view is the fundamental generative concept that English writing is a close approximation of phonological forms, and that pronunciation is rule-generated phonetic representation deriving from a more abstract level.

According to Diller (1975:67), the kind of observation made by O'Neil discredits the structural approaches of Hall, Fries, and Norris. If language is rule-governed, Diller reasons, then drills as teaching methods are useless, and ESL teaching needs instead to address "man's highly structured brain rather than the passive responses of the organism to outside stimulus." As an example in pedagogy which he can espouse, Diller (1971:67-80) cites the second-language teaching of the Berlitz Schools where all language skills, reading and writing as well as speaking and listening, receive attention from the start of instruction.

Even though Diller, Kreidler, and other theorists have investigated English orthography and its role in ESL, pedagogical materials reflect little influence of their

findings. Typically, ESL textbooks contain no advice for generalizing about English formatives so that students can match a spelling with sound, or vice versa, without mimicry. Kreidler (1971, 1972:7) does indicate that he is "working on devising materials to help advanced ESL students" with English orthography, and that "such materials will expose the student systematically to minimal pairs of words." This kind of audiolingual drill has proved helpful for pronunciation of difficult sounds such as [θ, ð]. As Diller (1971:49) points out, though, drill does not teach knowledge about a language.

Designed chiefly to improve pronunciation, the manual Patterns of English Pronunciation (Bowen, 1975) is an isolated instance of student instruction in orthography. This work consists chiefly of lists of words, displays of minimal pairs, and exercises on suprasegmentals. The exercises simply inventory stress and intonation patterns or contrast stress levels in similar words and phrases.

The title represents this text as one designed to aid pronunciation. Still, Bowen approaches the sound system of English through the spelling system of English and assumes that a literate student uses the manual. Therefore, the writing system of English is an intrinsic part of the instruction. Seen in this light, the manual might have been more insightful had it dealt with the effect of stress

on vowel tensing, laxing, and reduction instead of with the usual audiolingual concerns of minimal pairs, suprasegmentals, and word lists.

The audiolingual approach to ESL, supplementing traditional grammar and translation methods, has profoundly influenced curriculum materials relating to MEWS.¹⁰ This conclusion was the result of an evaluation of ESL materials in this study. The works examined were delimited to ones currently in use in the ESL programs mentioned below.

Source for Selection of Teacher Materials

In the part of this study concerned with evaluation of ESL materials, a comprehensive, up-to-date assortment for teachers was desirable. It was decided to select a college methods course on the teaching of ESL, and to examine the materials used in the course. Accordingly, a course at NTSU, English 408, "Teaching English as a Second Language," was selected. Books and articles read or discussed in this pre-service teacher-training course were examined for evaluation.

¹⁰In a survey of textbooks for adult ESL courses, the Indochinese Refugee Education Guides (National Indochinese Clearing House, 1975-76, Adult Education Series No. 2:2) summarizes the situation: "Almost all recent ESL textbooks use the 'audio-lingual' method. The basis of this approach is the imitation and repetition of model sentences patterns [sic] as they are spoken and used by native speakers of English."

Sources for Selection of Student Materials

Because student instructional materials in use undoubtedly vary from one type of ESL class to another, a broad range of materials was needed for a comprehensive survey. One way of assuring a representative and varied array was to delimit the materials evaluated to those used in several different specific ESL programs. This method was followed, and the classes listed below were chosen:

Daytime classes at Quebec House School, an ESL learning center in the Adult Basic Education program of the Dallas Independent School District

An on-campus ESL class at Mountain View College, Community Service Division, Dallas County Community College District

An off-campus ESL class at El Centro College, Community Service Division, Dallas County Community College District, meeting in north Dallas

Two freshman-level ESL college-credit classes at NTSU

The books, recordings, and other activities media used in the aforementioned ESL programs were examined along with the teacher materials described above. Table IV lists by type all works considered, including categories for teacher or student materials, theoretical or methodological works, books, articles, recordings, and other media. Supplementing Table IV is Appendix A of this dissertation, listing individually the items classified in the table.

TABLE IV
 TYPES OF ESL MATERIAL EXAMINED*

Format	Teacher Material			Student Material (4)	Total (3)+(4)
	(1) Theory	(2) Methodology	(3) Total		
Book	13	23	36	38	74
Journal Article	4	2	6	. . .	6
Cassette Recording	. .	. . .	. .	9	9
Activities Media	. .	. . .	. .	2	2
Total	17	25	42	49	91

*Some materials relate to more than one category.

In the evaluation of ESL materials, two types of judgment were adopted. Foremost, the study sought evidence in ESL materials of the application of generative phonological principles to the teaching of MEWS. Second, a list of detailed expectations was developed, based on credible publishing practices, a rationalist view of language acquisition, and dictates of research findings about foreign language teaching.¹¹ Listed below are the questions used in the

¹¹E.g., those set forth in Birkmaier, 1973:1280-96, and Blount, 1973:1079-1091. Since the criteria are objective measures, they should imply no inherent desirability or undesirability of the materials evaluated.

evaluation. Materials warranting a large number of "yes" answers to these questions received "high" evaluations under this procedure, and materials warranting few "yes" answers received "low" evaluations.

Criteria for Teacher Materials

1.--Does the approach reflect a generative view of language capability?

2.--Is the worth of linguistics in teaching MEWS acknowledged? Or, if it is not, does the material place linguistic science in a pejorative light?

3.--Is the argument free of over-generalizations, unsubstantiated claims, and patently false statements?

4.--Does the work address itself to worthwhile areas of study? That is, does it avoid items which are difficult even for native speakers or which are receding in usage?

5.--Does a work offer teaching methods other than lists of discrete items or exceptions which must be memorized?

6.--Do techniques employ linguistic illustrations whose structure and content are typical in communication?

7.--Does a work avoid techniques which might confuse students? For instance, does it avoid the use of negative examples?

8.--Does the methodology in a work rely on verification by empirical research?

9.--Does methodology in a work recognize dialect variation in American English and deal with its effects for ESL students? For example, do teacher-made tests have provision for responses resulting from dialect variation?

Criteria for Student Materials

1.--Do language-teaching techniques reflect a rationalist-cognitive approach to language acquisition?

2.--Do topics pertain to adult interests?

3.--Do illustrations show adult activities and interests?

4.--Do units of work require only proficiencies treated in earlier lessons or preceding levels of work?

5.--Are themes useful and topical?

6.--Is a text a good model of English orthography? For instance, are words divided correctly at the end of lines?¹²

¹²This criterion is important for second-language learners, especially if they are beginners. Such students deal first with symbols as symbols and second with meanings of symbols. An error in spelling can be crucial because, as non-natives, the students do not yet rely on textual redundancies to offset orthographic problems.

7.--Do exercises appeal to responses higher than mimicry, memorization, substitution, or permutation of surface structures?

8.--Are lexical items in everyday use?

9.--Does a work avoid metalinguistic labels and concepts likely to be unfamiliar even to native learners of English?

10.--Are directions for exercises simple, complete, and unambiguous?

11.--Are exercises clearly-worded and relevant to a single problem without distractions?

12.--Is a text free of misleading or false information?

13.--Are exercises free of questions calling for a single answer when, in fact, several answers are possible?

14.--In exercises and examples, are sentences representative of language in real life? That is, would the sentences be probable ones in everyday situations?

15.--Is a text free of printing errors and binding defects?

16.--Does a work avoid negative examples?

17.--Does a cassette recording have rates of speaking which students can comfortably follow while listening or reading?

18.--Does a listen-repeat cassette recording have pauses long enough to accommodate a student's rate of speaking?

Based on the foregoing criteria, critical annotations were prepared for ESL materials having significant mention of MEWS. Appendices B and C display the tabulated evaluations of all teacher and student materials examined, including the ones selected for annotation below. After the annotations of teacher materials, which follow, are annotations for instructional materials. Based on the data of the evaluation, several generalizations conclude this section of Chapter II.

Critical Annotations:
Teacher Materials

1.--Chastain, 1971, 1976. The methods text Developing Second-Language Skills: Theory to Practice is a comprehensive discussion of research on teaching and of the psychology of teaching. Its treatment of MEWS, however, is not particularly insightful. Chastain relies on phonics and suggests that instruction in phonic generalizations precede reading or writing activities (309). "The connection

between the sound and its written symbol" must first be established, he insists, and writing requires the same kind of readiness:

The first step that students should take in learning to spell what they hear is to learn the different graphemes possible for each sound and the context in which each occurs. The teacher should isolate these graphemes and present them one at a time in the early stages of writing (368).

Chastain assumes that English has a phonetic writing system. Thus, with respect to ESL, he offers only pedagogy which has proved wanting even for native students of MEWS.

2.--Chomsky, C., 1970. The article "Reading, Writing, and Phonology" by Carol Chomsky has been frequently cited in the literature. Because of its readable explanation of generative phonology and its application to the teaching of reading, the article is useful especially to non-linguists.

3.--Diller, 1971. Diller espouses the rationalist approach to language and asserts his propositions in strong terms. Overall, however, his theoretical work Generative Grammar, Structural Linguistics, and Language Teaching is disappointing because of its failure to provide supporting empirical evidence. Thus, it is more polemics than logic. The text has relevance to ESL teaching, though, as a succinct overview of the schism between structural and generative

approaches which has characterized and divided professionals. In regard to MEWS, Diller praises the "direct method," in which ESL students learn writing from the outset, based on the view that readers must have a productive command of language structures. The direct method involves the study of phonology as preparation for mastery of a writing system.

4.--Dixson, 1960b, 1975. In its treatment of MEWS, Practical Guide to the Teaching of English as a Foreign Language has several objectionable features. For instance, the text (89) contains an assertion on pronunciation not altogether true:

Ch in English clearly represents the initial sound in church and child. It is a sound not easily confused with any other.

Other potentially confusing sounds of <CH> are overlooked in this statement. In addition to [č̥] English has [ʃ̥], as in <MACHINE>, [məʃ̥iyn], and [k], as in <MECHANIC>, [mækænik]. Moreover, the sound [č̥], which the Guide states is clearly represented by <CH>, can also be represented by <T>, as in <NATURAL>, and by <TCH>, as <DITCH>. Since these other sounds for <CH> and other spellings for [č̥] are not infrequent in English,¹³ the statement needs qualification.

¹³Hanna and others (1966:738,820,1028) find 142 [k] words spelled with <CH> and 34 [ʃ̥] words with <CH>. With respect to the sound [č̥], 188 words of the Hanna corpus use <T> and 61 use <TCH> instead of <CH>.

Practical Guide to the Teaching of English as a Foreign Language also contains a questionable statement about <S> which confuses spelling principles and phonological processes. The instance occurs in closing remarks:

In many English words containing s in medial position, the s remains unvoiced and is pronounced as s. Examples are master [mæstə], last [læst]. In others, it is voiced and pronounced like z. Examples are busy [bɪzi], reason [rɪzən]. Since English spelling gives no indication in any of these words as to how the s is to be pronounced, the foreign student is naturally confused. . . . Most students need long and continuous drill (108).

This sort of attack on English orthography has been invalidated by the findings in SPE (Chomsky and Halle, 1968:49, et passim) that English spelling, when considered with phonological rules, is, in fact, revealing of pronunciation. Especially predictable is the rule which voices [s], about which the author of Practical Guide seems unaware.¹⁴

5.--Finocchiaro, 1974. Finocchiaro, an indefatigable worker in the field of teaching ESL, presents an audio-lingual approach to methods and materials in the widely-used text English as a Second Language: From Theory to Practice. Although she calls for including rationalist-cognitive theory in language pedagogy (18), she uses

¹⁴In SPE (242) this is Rule 25, which voices [s] to [z] in three different contexts.

techniques which reflect a preoccupation with surface structures. For example, Finocchiaro (76) believes that "it is only after students can say material with reasonable fluency that they should be permitted to see it." Indeed, reading consists, she feels, "of making sounds in our throat. We read faster, therefore, if we know how to say the sounds." Such tenets are typically structural ones.

6.--Hale and Budar, 1970. In the article "Are TESOL Classes the Only Answer?" Hale and Budar (296) report their experimental research showing significantly greater success in ESL among students "totally immersed in the English language" and "isolated from speakers of their native tongue." Specifically relevant to MEWS is their finding of student difficulty with low-level phonological use of a second language after the age of puberty. The authors, however, make no concrete recommendations for teachers except that they should "not be too hasty" (298).

7.--Lado, 1964. A pioneer in ESL, Lado employs a thoroughly structural approach to language in the standard work Language Teaching. His philosophy of MEWS (132-35) involves "Fit," which is "associating the graphemes and the [spoken] language" (134) by means of phonic generalizations and lists of exceptions. Although Lado feels that "the fit of English writing is very poor," he offers no pedagogical

help other than the admonition that "nothing can be more deadening than having to recite all the exceptions to a rule" (136). As an example of poor fit, Lado cites the "irregularity" of [k] as both "K and CH as in king, chemis-try." This view overlooks the way that <KING> follows the English orthographic system¹⁵ and that <CHEMISTRY> reflects its Greek etymology.

8.--Mazurkiewicz, 1976. Teaching about Phonics is a methods text for teachers and prospective teachers. According to its preface, Chapters 2, 3, and 4 are useful in ESL. Using the phoneme as a group of related sounds, and emphasizing sounds as keys to meaning, Mazurkiewicz is typically structural. Thirty phonic rule-generalizations for print-sound relationships and a list of phonemes of English are proposed for ESL teaching of the writing system of English.

9.--Paulston and Bruder, 1976. Teaching English as a Second Language: Techniques and Procedures is authored by two well-known ESL educators. Paulston and Bruder advocate "word study," that is, practice in the recognition of derivational suffixes and lexical "word classes" as keys to "the decoding of words" (189). Thus, their concentration is not on the morphological relatedness of forms to underlying

¹⁵According to Rule 5 of Griggs, 1976a:2.

representations and to orthography. Instead, they isolate for discussion suffixes attached to related forms of a morphologically-related set. This pedagogy exemplifies a general trend in much of the literature: paying lip service to generative linguistics by using its terminology but not its conceptual referents.

10.--Saville-Troike, 1976. Saville-Troike's attention in Foundations for Teaching English as a Second Language: Theory and Method for Multicultural Education is largely on surface structures and representations. Accordingly, the discussion of phonology is structural. It covers phonemes, allophones, and the sounds of spoken English. This descriptive interest extends to a theory of the English writing system built on spelling-sound correspondence. For instance, Saville-Troike (34) says the following about orthography:

A student of any age learning English must learn to hear, and then produce, twenty-four distinctive consonant sounds. The symbol used for each of these phonemes is . . . sometimes different from the symbol which represents the sound in conventional spelling.

The author contends, for instance, that the spelling symbol for [č] in <NATURE> is <T> instead of <CH>, "the symbol which represents the sound in conventional spelling." Consequently, she suggests teaching phonics to ESL students as a key to reading (113).

Aside from the advocacy of such proven ineffective techniques, the text contains at least one provocative exercise for MEWS (112). The author suggests that ESL students, using a printed passage, search for all forms having a certain sound. Their lists are then analyzed for all alphabetic sequences of this sound, and "spelling regularities induced in class discussion" (112). Beyond suggesting a phonics approach, however, the author is never specific about what these "regularities" are.¹⁶

11.--Schane, 1970. Sanford Schane's paper, "Linguistics, Spelling, and Pronunciation," is an early notice of the interaction of generative phonology and ESL teaching. Schane's discussion seems sometimes to confuse phonological and orthographic matters. Still, it perceptively calls for the development of ESL instructional materials which apply the systematic nature of English spelling to the teaching of MEWS to second-language learners.

12.--Wardhaugh, 1974. Anyone involved in teaching ESL and MEWS should read Topics in Applied Linguistics, Parts 2 and 3 covering spelling and reading. Wardhaugh demonstrates a broad understanding of SPE and its theories concerning the

¹⁶An exercise in the revised MEWS program (see Chapter VI) might be developed along these lines. It should work from letters to sound, however, instead of vice versa, as suggested by Saville-Troike. Students would list occurrences of <G> in a reading passage, for instance, and then discuss the sounds in their word lists.

English writing system. Like Chomsky and Halle, he stresses the morphophonemic character of English spelling because "letters are used to represent sounds in ways which preserve important morphemic units" (25).

Wardhaugh's survey also contains a cogent and telling critique of phonics. Included is an explication of the well-known analysis of English spelling patterns by Venezky (1967). Venezky's analysis and, in turn, Wardhaugh's are noteworthy because they point out how phonics, if integrated with information on English phonology and orthography, can contribute to reading theory.

13.--Wilkins, 1972. In a text for ESL teachers, Linguistics in Language Teaching, Wilkins (62-67) succinctly describes for non-linguists the present standard theory of generative phonology. In dismissing this theory as having no pedagogical value, however, the author mistakenly restricts generative theory to pronunciation and fails to perceive its applicability to MEWS. Thus, he remarks on the use of alternating forms in teaching English, whereby "the learner might be required to repeat, with phonetic accuracy, sequences" such as <ALTERNATE ◊ ALTERNATIVE ◊ ALTERNATION> (66). Other than this kind of pronunciation drill, Wilkins has no suggestions for teaching MEWS except an insistence on extensive reading in English (132).

Critical Annotations:
Student Materials

1.--Ayer, 1975. In Gateways to Correct Spelling MEWS involves three phases of study--"seeing clearly, identifying, and memorizing" (3). Accordingly, Ayer provides drills and memory aids to accompany lists of words for memorization. "Few rules are of permanent help in learning to spell," the author feels (112).

2.--Clarey and Dixson, 1947, 1963. Clarey and Dixson's Pronunciation Exercises in English is a manual designed for "the correction of foreign accent" (7). Its exercises, however, are really reading drills. Each lesson teaches a "phoneme" of English by comparing members of unrelated word-pairs that have similar sounds. For instance, the authors advise that <WALK--WOKE> are "sometimes confused" since their only difference is their middle phoneme (128). This statement by Clarey and Dixson is potentially misleading for students because <WALK> and <WOKE> have many other differences, morphologically, lexically, and phonologically.

The authors of Pronunciation Exercises also sometimes confuse letters and sound. About the pair <CAR--CARE>, for instance, they give this advice:

Note how the addition of final e to the words . . . changes completely the pronunciation of the preceding vowel, even though this final e is not pronounced.

The spelling <CARE>, though, does not derive from <CAR> plus <E>, as the authors imply. Nor does an orthographic <E> cause phonological processes, although it does reflect them. This kind of statement, too, may tend to mislead ESL students.

3.--Dixson, 1948, 1971. The ESL text Easy Reading Selections in English is one of many works by Dixson containing readings and vocabulary-building exercises. In regard to MEWS, this book concentrates on student production of new forms, as a lesson accompanying a short story by Nathaniel Hawthorne illustrates (60):

Give the noun form for the following adjectives:

strong	safe
fortunate	possible
brave	

Of course, the correct responses are <STRENGTH, FORTUNE, BRAVERY, SAFETY, POSSIBILITY>, all of which derive by affixation. This is a process in which structuralists typically have been interested.

In the case of <STRONG * STRENGTH>, however, an additional phonological process applies, called "ablaut." This is an early Readjustment Rule in English affecting vowels in a number of irregular formatives. The vowels switch backness so that the output agrees in backness and roundness. Logically, the use of forms which undergo ablaut may be confusing to students who are working on affixation, for

they will probably wonder about the phonetic alternation [ʃh ~ ʒ] in <STRONG ~ STRENGTH>. Since there is no vowel change in <FORTUNATE ~ FORTUNE>, students may question a change in the other pair. Instead of potentially confusing students, perhaps the author should restrict the exercise to analagous forms.

In addition, Dixson's objective that students produce new forms seems less promising for MEWS than that they should learn to recognize them.¹⁷ The aim in mastery of the orthographic system of English should not be to derive an unfamiliar word such as <FORTUNE> from a familiar one, <FORTUNATE>, or vice versa. English has so many types of derivational suffixing and word-formation that the ability to produce the forms in actual use might be exceptional for even some native speakers. Instead, the objective in ESL probably should be perception of the relatedness of

¹⁷E.g., the following problem would aim at recognition:

Match each form in column 1 with a related one in column 2:

1	2
PROVOKE	SHOT
SHOE	PRODUCTIVE
SHOOT	SHOD
PRODUCE	PROVOCATIVE

For the familiar word <SHOE>, a student could learn to recognize related <SHOD>; for <SHOOT>, <SHOT>; for <PRODUCE>, <PRODUCTIVE>; and for <PROVOKE>, <PROVOCATIVE>. Instruction in this problem would rely on generative principles, such as those in Schane, 1970, and C. Chomsky, 1970.

pairs such as <FORTUNE • FORTUNATE> as a key to the meaning and pronunciation of the unfamiliar related form.¹⁸

4.--Dixson, 1955, 1972. The series of four books Complete Course in English is widely used in ESL. The descriptive title Complete Course, however, is a misnomer. Nowhere does the text deal with the spelling system of English, except for frequent reminders about plural spellings. Book 1 has the following information in this connection: "If a word ends in an s sound (s, sh, ch), we add -es to form the plural." This confusion of spelling, i.e., <ES>, and sound, [s, ʃ, tʃ], is typical of a phonics approach.

5.--Dixson, 1956-69. The old but still popular series Regents English Workbook, Books 1-3, is designed "to drill the student on certain basic points of grammar and usage" (1:3). The series also contains material on the writing system of English. For instance, an exercise entitled "Silent Letters" in Book 2 has the following directions (58):

In each of the following words there is one letter which is obviously silent (not pronounced). In the blanks to the right of each word, write this letter which is silent.

handsome	_____	knee	_____
Christmas	_____	wrestle	_____

¹⁸Chapters III and IV develop this point. The principle of alternation underlies the MEWS materials developed.

These directions are unclear and incomplete. They confuse letters and sounds, and they overlook an extra "silent" grapheme in each word of the exercise. Thus, <HANDSOME> has the graphemes <D, E> which are not pronounced in General American English; <CHRISTMAS> has an <H> and a <T>; <KNEE>, a <K> and one <E>; and <WRESTLE>, a <W>, a <T>, and final <E>. Because of these ambiguities, exercises and directions such as the ones quoted are likely to be confusing for a student to do and difficult for a teacher to explain.

6.--Dixson, 1972, 1971. Books 1-6 of Modern American English constitute a series which is widely used in teaching ESL. The preface to each book states that it is "designed as a complete course of study in English as a second language" (iii). The spelling system of English, though, is never taught. The opening statement about a pronunciation exercise in Book 4 is an example of how spelling is mentioned but not substantively dealt with:

When the letter s occurs within a word in English it is sometimes pronounced [s] and sometimes [z]. There are no rules governing this pronunciation.

Dixson says that the sound spelled <S> has no phonological systematicity. Of course, such a statement is not instructive.

7.--Doty and Ross, 1960, 1973. Volume II of the ESL schoolbook Language and Life in the U.S.A.: Reading English

is notable for its expressed purpose "where reading skill is a primary goal or where reading is used as a basis and model for writing" (vii). To this end the authors include word studies on related forms after each reading. Excerpts follow from lessons which accompany readings one and two (7, 87):

Here are the words to study before you read the following selection. . . . Words related to words you may already know:

	<u>Related words</u>	<u>Common prefix or suffix</u>
1. <u>temperamental</u>	temper, temperament	- <u>al</u> adjective ending
2. <u>generalization</u>	general, generalize	- <u>ation</u> noun ending
.		

List all the words you know that are related to each of the following words, and tell whether each is a noun, verb, adjective, or adverb.

<u>Tolerable</u> -- <u>toleration</u>	<u>tolerance</u>	<u>tolerate</u>
(noun)	(noun)	(verb)
1. adorable	3. admiration	
2. believe	4. disagreeable	

The first lesson above is a word-study exercise preparing for a subsequent essay. The second lesson requires a student to produce related forms for <ADORABLE> and for three other words, based upon the pattern for <TOLERABLE>. If these directions are followed, however, the results are *<ADORANCE> and *<ADORATE>.

Along with confusing directions, Language and Life in the U.S.A. has significant limitations regarding orthography. By confining their discussion to displays of word lists, the authors fail to exploit the morphological and phonological relatedness of words. Instead, they limit their interest to affixes. Since derivational affixation has been investigated previously from a structural approach and presented in many other ESL texts, Doty and Ross offer nothing new for instruction in the English writing system.

8.--Erazmus and Cargas, 1970. 1977. English as a Second Language: a Reader is a collection of essays with vocabulary and structural drills directed toward MEWS. The grade-level reading equivalency for each essay is a notable added feature:

Each piece is noted according to the degree of difficulty it presents for comprehension. This readability level of each selection has been worked out through the Dale-Chall [1948] readability formula and is so indicated opposite each in Contents III (xix).

Utilizing the formula cited, Erazmus and Cargas label the readability of each reading selection as "4th and Below," "5th," "6th," or some other grade level of American schools.

The labeling of reading selections in this way for students to see, however, is a questionable technique. For one thing, James E. Alatis (1977:5) has pointed out that

"classifying adult foreign speakers of English on the basis of children's school grades is inappropriate and damning." Moreover, ESL adult learners may develop a poor self-image where their performance is rated in juvenile terms. Research cited by Chastain (1971, 1976:255) shows that, instead, "students learn when they conceive of themselves as capable individuals."

9.--Lado, 1970-73. In the preface to Book 5 of the Lado English Series, Lado (n.pag.) states that most of his book combines "pronunciation activities with spelling rule mastery." In the text which follows the preface, instructions for activities are unclear and factually misleading at times. An exercise with Unit 10 exemplifies the kind of information on spelling offered students using Book 5 (215):

PRONOUNCE

Pronunciation of vowel combinations:

1. IE pronounced [ay]:

Examples: sciEntists Exception: skiEr [iy]
 allIES
 cliEnt

2. IA pronounced [ay]:

Examples: gIAnt Exception: territorIAI
 dIAI materIAI [iy]
 MIAMi

In part 1 above, only one of the examples, <ALLIES>, contains <IE> pronounced [āy]. The other two examples, <SCIENTISTS> and <CLIENT>, contain <IE> pronounced in another way: [āyə]. Moreover, a student following the examples in

part 2 would produce the deviate and questionable pronunciations listed on the left below. General American English pronunciations for each are shown in the middle column, for spellings in the third column:

*[jāynt]	[jāyənt]	<GIANT>
?[dāyl]	[dāyəɪl]	<DIAL>
*[māymīy]	[māyəmīy]	<MIAMI>

A phonics approach and Lado's unclear directions combine to afford these unintended results.

10.--Richards, I., and Gibson, 1973. The paperback elementary text English through Pictures, Book 1, deserves notice for its valuable displays of forty-one different writing systems, including that of English. These displays are juxtaposed by using the same text to illustrate each system. As a result, the book should be useful to ESL students who are unfamiliar with the Roman alphabet, and to teachers who are unfamiliar with the writing systems of certain L₁'s.

The approach of Richards and Gibson to the English spelling system, however, is not as helpful. The reason is that the text confuses spelling and sound. The following exercise from the text illustrates this point (74):

The i in icebox and the i in line are the same.
The i in thick and the i in high are different.

. . . Are the a's in bad and salt the same or different?

Apparently the intended response is that <A> is different in <SALT> and <BAD>. The <A> in these words, however, is an orthographic segment, whereas the vocalic distinctions in phonetic [sɔ̃hlt] 'salt' and [bæd] 'bad' are phonetic. Logically, the confusion of graphemes and phones (sound segments at a level before dialectal rules apply) is likely to puzzle and mislead students using this lesson.

11.--The two-volume textbook Modern English by Rutherford is intended for use in teaching ESL. In a review of Rutherford's text, F. Gomes DeMatos (cited in Harcourt, 1977:6) praises Rutherford's use of "generative-transformational grammar to help foreign students acquire fluency in both spoken and written English." While the exercises in Modern English, to which DeMatos evidently refers, cover sound alternations in English, they employ essentially structural techniques. Unit 6 contains an example (I:105):

There is a lot of sound-spelling correspondence that occurs with great regularity in English. One example of this is the presence or absence of written e, in association with a preceding written vowel, to indicate the tense or the lax form of that vowel.

Lax				Tense
<u>not</u>	+	<u>e</u>	=	<u>note</u>
/nɒt/				/nōt/
<u>plan</u>	+	<u>e</u>	=	<u>plane</u>
/plān/				/plān/
<u>quit</u>	+	<u>e</u>	=	<u>quite</u>
/kwɪt/				/kwīt/

This information is incorrect, for <E> in "not + e" does not represent a separate morpheme. Nor can the addition of an orthographic segment, <E>, create tense morphemes from lax ones. Phonological processes are involved for sound alternations such as tense \leftrightarrow lax. Moreover, none of the word pairs in the exercise exhibits morphological alternation. <NOT> and <NOTE>, for instance, are morphologically unrelated.

In another exercise on "Sound Patterns" Rutherford contrasts consonant clusters (125). In the excerpt below from Unit 7 in Book 1, italics are added to show consonants under consideration:

As you listen to the random pronunciation of the following items identify them as belonging to column one or column two. Then try pronouncing them yourself and let others identify. All the verbs in column one are in the simple past tense.

1	2
/-t/	/-ts/
She <u>cut</u> the bread.	She <u>cuts</u> the bread.
It <u>shut</u> down.	It <u>shuts</u> down.
It <u>cost</u> nothing.	It <u>costs</u> nothing.

While [kāst] 'cost' has a word-final [t] in General American English, [kās:] 'costs' in many dialects does not. The orthography retains the simple-past form <COST> and adds <S> in order to reflect the third person singular. The exercise quoted fails to take dialectal usage into account and mixes orthographic and phonological processes.

12.--White, O., and Martin, 1976. Learning English as a Second Language: For Secondary Schools and Continuing Education is a two-volume workbook with dialogues. A section devoted to spelling is unusual in that it does not have phonic generalizations. Instead, it provides structural descriptions for occurrences of plurals and final <Y>, doubled consonants, and <E>. The authors, however, attempt no connection between spelling and morphology or phonology.

Findings about the State of the Art in ESL Materials

Evaluations of ESL teacher and student materials, discussed above and shown in Appendices B and C, led to several conclusions, as follows:

1.--The impact of SPE on ESL student materials is virtually non-existent, and the application of its principles to teacher materials is low. Of seventeen materials exhibiting influence of generative phonology, only one is

a student text. Moreover, only 33.3 per cent of teacher materials and 2.5 per cent of student materials have any mention of generative linguistics. Works exhibiting an overall generative view of language are all teacher materials:

Allen and Campbell, 1965
 Burt and Kiparsky, 1972
 Chomsky, C., 1970
 Croft, 1972
 Diller, 1971
 DiPietro, 1971, 1976
 Jones and Spolsky, 1975
 Norris, 1970
 Schane, 1970
 Wardhaugh, 1974

2.--Ninety per cent of teacher materials covered worthwhile areas of study (see 4 under "Criteria for Teacher Materials"), used language typical in everyday communication, and avoided potentially confusing techniques.

3.--Only 46.6 per cent of teacher materials recognized dialect variation.

4.--The following teacher materials met six or more of nine criteria:

*Allen and Campbell, 1965
 *Burt and Kiparsky, 1972
 *Chomsky, C., 1970
 *Croft, 1972
 *DiPietro, 1971, 1976
 Duong, 1975
 Hale and Budar, 1970
 *Jones and Spolsky, 1975
 Joos, 1967

*Norris, 1970
 Oller and Richards, 1973
 Palmer and Spolsky, 1975
 Richards, R., 1972
 Saville-Troike, 1976
 *Schane, 1970
 *Wardhaugh, 1974

The materials in this list constitute over half of the teacher material examined. On this basis, a reasonable generalization may be that an assortment of satisfactory materials are available for ESL theory and methods of teaching. Sources marked with an asterisk (*) also reflect a generative approach to language.

5.--The following teacher materials did not meet at least half of the criteria:

Chastain, 1971, 1976
 Dixson, 1960b, 1975
 Hall, R., 1966
 Harris, 1969
 Mazurkiewicz, 1976
 Paulston and Bruder, 1975

Two of these works with low ratings are widely used in ESL: Developing Second-Language Skills: Theory to Practice (Chastain, 1971, 1976) and Practical Guide to the Teaching of English as a Foreign Language (Dixson, 1960b, 1975). The latter met only 11.1 per cent of all criteria.

6.--Over 87.5 per cent of student materials contained useful and topical subject matter for adults, employed good

orthography without any serious printing errors, and used language common in everyday communication.

7.--Four criteria (4, 7, 9, 12 of "Criteria for Student Materials") were met by less than half of all student materials. The following conclusions may be reasonable based on this finding: (1) Lessons in ESL texts frequently require proficiencies not developed by earlier lessons or preceding levels of work.¹⁹ (2) Less than 22.5 per cent of texts require levels of student response higher than mimicry, memorization, substitution, and rearrangement of surface structures. (3) Over two-thirds of student materials use metalinguistic terms and concepts potentially difficult for ESL learners. (4) Over half of student materials contain unclear or misleading information.

8.--The following student materials met at least twelve of sixteen criteria:

Ayer, 1975
 Dixson, 1949, 1971
 Dixson, 1950a, 1971
 Dixson, 1953, 1971
 Dorry, 1966

¹⁹Earlier, Chapter II contains the caveat that satisfaction of a criterion implies no inherent desirability of a work. In this instance, the finding is not necessarily a condemnation of the text, for anticipation of later lessons may provide diagnosis of students' weak or strong areas in English. Some teachers also use this technique to challenge and motivate learners.

Doty and Ross, 1960, 1973
 Hall, E., 1976
 Robertson, 1964, 1972

According to this evaluation, the list above covers texts which are ranked high for student use.

9.--The following student materials did not meet at least half of the criteria:

*Dixson, 1951, 1971
 Dixson, 1956-69
 Dixson, 1957b
 *Dixson, 1962, 1971
 Hall, E., 1969-73
 Hall, E., 1974
 *Stieglitz, 1970

Among these works with low ratings, materials marked with an asterisk (*) are widely used in ESL classes. Notably, various works by Dixson have low as well as high evaluations (see finding 8, above).

Reprise

As a survey of literature relating to generative linguistics shows, generativists propose a new approach to MEWS. It is based on the notion that the spelling of English, i.e., its writing system, is rule-related not to phonetic surface realizations, as it is in a phonics approach, but to abstract underlying forms in a systematic way. In short, from a generative viewpoint English orthography, while admittedly complex, is revealing of English morphology and phonology.

A survey of the state of the art in ESL relating to MEWS shows, however, that educators have generally not exploited the systematicity of English spelling. This conclusion is clear in Appendices B and C, which have data from an evaluation of ESL materials in this study. The critical appraisal of selected representative ESL materials regarding MEWS disclosed few applications of generative phonological principles. Indeed, ESL texts have little spelling instruction, phonic or otherwise.

Moreover, ESL materials generally treat reading and writing as discrete skills with separate needs. Authors have developed a hierarchy of presentation beginning with listening, then speaking and reading, and finally writing. Thus, they have not exploited the logical connection between English phonology and orthography.

Even phonics-oriented theorists recognize that the teaching of ESL requires research and development of new materials. These representative comments show the consensus among educators:

Learning to read well a foreign language, after the age of ten or twelve, presents a quite different set of problems from those of learning to read the first (or native) language. These problems deserve much more consideration than we have yet given them (Fries, 1967:173).

We have learned something about the teaching of reading, mainly from the three disciplines of education, psychology, and linguistics; but there appear to be almost no new developments

with special reference to second- or foreign- language reading except for some influence from current theories of transformational grammar. A check on current research by reading specialists does not turn up any work concerned specifically with second-language reading for adult students (Norris, 1970:194).

The Cohen data [the 1969 study of the value of word-study exercises in spelling textbooks, mentioned in Chapter II] . . . , point to the need for a reevaluation of spelling books and their contents. If books are to be used, more usage and application of spelling words is [sic] needed. The direct linkage between spelling and writing needs further exploration in both practice and in research (Graves, 1977:90).

A few educators and linguists are working to meet the need cited by Fries, Norris, and Graves. Kreidler, O'Neil, Diller, C. Chomsky, and Schane in both publications and research are extending generative theory to the field of ESL and to the problem of MEWS. Similarly, the research discussed in this dissertation relied on the foundation of generative linguistics established by SPE and its precursors. From it was constructed a framework for the teaching of the writing system of English. Chomsky and Halle (1968:x) describe this foundation as one which "has much deeper roots in an older, largely forgotten, and widely disparaged tradition," going back to the seventeenth-century ration-

alist Descartes.²⁰ Chapter III of this dissertation describes a theory of generative phonology for English based on that foundation and adopted in the research. It also discusses a theory of generative orthography which is compatible with phonological principles as a new approach to MEWS. From it instructional materials were developed which are reproduced in a subsequent chapter.

²⁰The preface of SPE alludes to the work of Jerrold J. Katz, Paul M. Postal, and G. H. Matthews. Earlier grammarians who have influenced generative theory are discussed by R. H. Robins (1967:231). These include the seventeenth-century Port Royal grammarians (Robins, 1967: 123-25), Wilhelm von Humboldt (174-78), H. S. Trubetzkoy (204), and Roman Jakobson (222-23).

CHAPTER III

THEORETICAL FOUNDATIONS

The Role of Generative Phonology in a Grammar

Chapters I and II of the dissertation have suggested that application of principles of generative phonology may be a means of providing MEWS instruction to ESL students. This third chapter turns attention to theoretical foundations for such an application. As earlier chapters have also indicated, no substantive instruction in the spelling system of English is available for ESL learners. Granted that many ESL texts contain spelling and reading exercises based on memorization, mimicry, pattern drill, substitution, or production practice, the state of the art is such that no real instruction exists concerning the systematic aspects of English orthography. Moreover, reading and spelling activities in present texts reflect a premise that language is totally learned behavior. Many linguists, however, feel that it is a creative faculty, governed by rules and activated by human exposure to a specific language.

A MEWS instruction program for use in ESL was designed in the research after formulation of a theoretical framework. With the role of generative phonology in a grammar

as a cornerstone of the theory, the nature of English phonology was examined. The relationship between the phonology and orthography of English also received attention as a basis for consideration of generative spelling rules. From this theoretical base, the research sought a methodology for applying generative principles to MEWS. Sections below recite these steps in detail, and Chapter IV contains the preliminary materials.

Generative Grammar

Perhaps the most telling argument for generative theory is an obvious one. All humans, when they begin to say phrases and sentences in childhood, speak ones they have never heard before. This linguistic behavior occurs in any language setting. The verbal constructions of children, though variations of ones overheard, are actually often new and original.

In fact, children's first words consist of more than just a combination of "invariant speech sounds," according to Jakobovits (1968:250). He reasons that "a description of phonological acquisition in terms of learning individual speech sounds which are then combined into words, must be false" (250). Moreover, Lenneberg (1964:166,174) has shown that "children with markedly lower intelligence" and children who "are not exposed to much talk, still develop language in all of its infinitely abstract characteristics."

Since a behavioral theory cannot fully account for the phenomena observed by Lenneberg, an alternative explanation may be that native speakers "generate" language based on internalized rules. As N. Chomsky (1968, 1972:11-12) points out, "the normal use of language is innovative, . . . not a repetition of anything that we have heard before." Moreover, "the number of sentences in one's native language that one will immediately understand with no feeling of difficulty or strangeness is astronomical." The language capacity, then, involves internalizing principles about the possible structures and forms of a language, and generating sentences based on them. Evidently, humans perform these abstract processes by inserting lexical items into syntactic structures. Theoretically, the possibilities for various surface sentences are infinite.

While evidence from research corroborates such a conclusion,¹ the precise components and details of processes involved in language acquisition are unclear and controversial. To investigate the question, a chief area of current research centers upon psycholinguistics, the study of events in the mind of a speaker using language. One linguist, Patricia M. Wolfe (1972:18), points out that a native speaker may not necessarily be able to intellectualize about the rules of his language or even be conscious of them.

¹See Chapter I, n. 4 for several references.

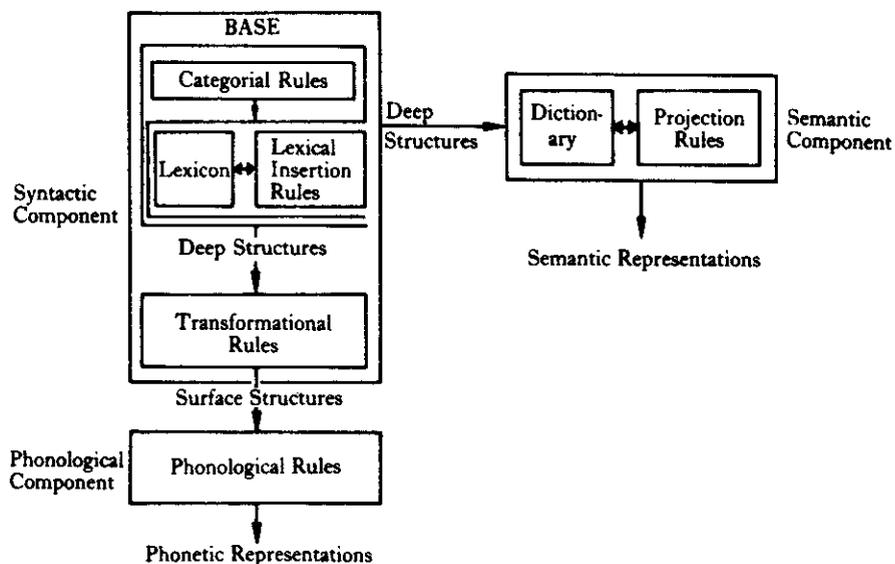
Still, "the competence, however unconscious, is there" (18). In generative linguistics a model of a grammar is a linguist's attempt to represent, in a concrete way, this abstract, often unconscious linguistic knowledge of a native speaker.

As a way of describing this remarkable ability of human beings, a diagram is useful. Figure 7 schematically depicts two versions of a transformational-generative grammar of a natural language. The diagrams show components and functions involved in the speech event. At the top of the figure is an early interpretation by Noam Chomsky (1965), and at the bottom, his revision to reflect changes in the semantic component (1971). In both versions, a sentence originates in the deep structure as a syntactic representation, into which lexical items are inserted. Along with morphological, syntactic, and perhaps semantic information, the lexical items have a phonological matrix, or bundle of distinctive phonetic features. The phonological content of language is thus apparent in the early derivation of linguistic forms.

After the base rules have formulated an initial phrase structure, or "tree," one of three major components operates on the tree to produce a surface string. This part of the grammar, the transformational component, rearranges, deletes and substitutes various constituents of the tree. During

Reprinted from Maclay, 1971:170,176.

N. Chomsky, 1965:



N. Chomsky, 1971:

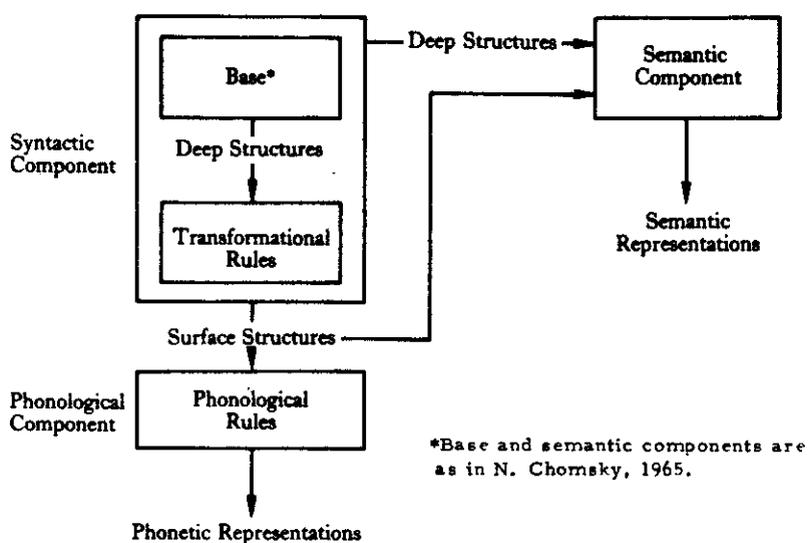


Fig. 7--Transformational-generative models of a natural grammar.

the transformational cycle, transformations such as passive, interrogative, or expletive can effect changes in the tree.

The second major component, the semantic component, is less clear. The 1971 model pictured in Figure 7 reflects one current theory that this component works on both deep and surface structures.² Evidently, the purpose of semantic processes is to "read," or interpret, morphological, syntactic, and phonological forms and structures in such a way as to produce readings of strings at successive levels. Called "projection rules" by some linguists, these processes seek out anomaly, ambiguity, and synonymy in an analytical attempt to achieve a coherent meaning in the final, or surface, structure.

Fillmore (1968) has proposed another generative theory called "case grammar," which places semantics, instead of syntax, at the deepest level. He calls the constituents of this abstract underlying level "cases":

The case notions comprise a set of universal presumably innate, concepts which identify certain types of judgments human beings are capable of making about the events that are going on around them, judgments about such matters as who did it, who it happened to, and what got changed (24).

According to Fillmore's description, deep structures are

²This has come to be called "extended standard theory." See Chapter II for further discussion.

role relationships. The roles, or cases, develop surface syntactic relationships after "selection of overt case forms by suppletion, affixation, addition of prepositions or postpositions, 'registration' of particular elements in the verb, subjectivalization, objectivalization, sequential ordering, and nominalizations" (1968:32).

The theory of case has attracted support from other linguists. Some of them are called "generative semanticists" in recognition of their insistence that "the role of transformations . . . is to relate semantic representations and surface structure" (Lakoff, 1971:232). Lakoff argues strongly against the autonomy of syntax and for the centrality of semantics. Another theorist, McCawley, insists that syntax and semantics, like syntax and phonology, are inter-related and not definable "in terms of the other with a minus sign in front of it" (1968:125).

On the other hand, many generativists hold out for the "trinity" of the base originally posited in N. Chomsky, 1965, and revised in N. Chomsky, 1971. Jackendoff (1972:xi) insists upon this position:

If rules of semantic interpretation can be formulated properly, their properties and the properties of the semantic representations they derive can be used to account for these semantic phenomena, leaving the syntactic component as free of semantic intervention as it was in Syntactic Structures [Chomsky, 1957].

In sum, the divergent views of Jackendoff, N. Chomsky, McCawley, Lakoff, and Fillmore demonstrate that the nature and role of the semantic component in generative theory are uncertain.

Contrary to the climate of opinion on semantics, research has provided a clearer picture of the third major component of a grammar, phonology. Linguists generally agree upon two of its characteristics: an abstract phonological matrix in lexical representations, and phonological rules to convert these lexical items in surface syntactic strings to phonetic representations. The output of these rules and matrices is the pronunciation of a given language. This portion of a grammar is the one with which the research reported in this dissertation is largely concerned.

Phonology in Generative Grammar

Phonology affords an area of language study in which there are particularly clear arguments for transformational-generative linguistic theory. For instance, the uniquely human "creative aspect of language use" (N. Chomsky 1968, 1972:11) is especially evident in the phonological component of natural grammar. A recent text on problems in phonological theory (Kenstowicz and Kisseberth, 1977:2) cites certain matters of pronunciation to support a view of linguistic competence. These are paraphrased below:

1. In second-language learning, a "foreign accent" results when a speaker extends a rule in his native language to the target language.
2. When native speakers encounter a new combination of familiar forms, such as nonsense words or new compounds, they pronounce them in similar ways. In English, for example, compounding may change the stress and tenseness of vowels in the combining forms. Consequently, native speakers extend a rule of English phonology in order to pronounce similarly the new compounds.

The principled way in which a speaker pronounces a second language and his recognition of appropriate sound patterns of nonsense words in his native language suggest the existence of phonological competence.

In this respect, Noam Chomsky (1968, 1972:6) in his classic work Language and Mind maintains that any specific language is "a cultural product subject to laws and principles partially unique to it and partially reflections of general properties of mind." Also called "universals," these general properties of the human mind are innate endowments of phonological and other grammatical principles, probably hierarchically arranged. Chomsky theorizes that speakers juxtapose the linguistic data they hear so as to

select the constituents and transformations necessary to create an individual grammar. David McNeill (quoted in Jakobovits, 1968:256) describes the concept of linguistic universals and their role for a native speaker of English in this way:

The role of a universal hierarchy of categories would be to direct the child's discovery of the classes of English. It is as if he were equipped with a set of "templates" against which he can compare the speech he happens to hear from his parents . . . We can imagine, then, that a child classifies the random specimens of adult speech he encounters according to universal categories that the speech exemplifies. Since these distinctions are at the top of a hierarchy that has the grammatical classes of English at its bottom, the child is prepared to discover the appropriate set of distinctions.

Numerous findings from linguistic research support McNeill's concept of innate universals. Bach (1974:25) points out that in studies of related and unrelated languages "the meanings of sentences were more nearly similar across languages than their surface structures." He also observes "that learners of languages behave as if they learn or know deep structures without ever apprehending them experientially" (260). Since deep structures are abstract, a theory based on experience or stimulus-response cannot fully account for this observation. Bach (260) also points out that the range of categories and base rules appears to be limited in language per se. Thus, he concludes, the

requirements "that certain categories be present in the deep structures of every language" and that there be "quite specific limitations on the base rules" constitute two similarities across languages.

In the study of phonology, hypotheses about universals have been especially well investigated. Kiparsky (1968:183 ff.) reports on these hypotheses in a frequently-cited article. From the basis of linguistic change, Kiparsky argues for a number of phonological universals:

- (1) morphophonemic, phonemic, and phonetic levels of representation
- (2) rules which relate these levels to each other
- (3) phonological change through reordering or revision of rules, or through addition of new ones
- (4) a finite set of distinctive phonetic features common to all phonological levels

Kiparsky (1972:190) also advocates the notational devices and simplicity measure of generative theory as means in themselves for advancing insight about universals. This formal statement of rules, he suggests, states generalizations "in a way which is empirically testable."

Regarding universals, the phonological component functions as a kind of lexical redundancy process, expressing the phonological qualities common to languages as human

speech and intrinsic in minimally-specified lexical items. Language-specific **rules of phonology** supplement the universal ones. Among them are additional redundancy rules, readjustment rules removing formative-internal irregularities, and phonological rules. The phonological component also includes low-level phonetic rules with respect to dialectal variation.

English Phonology

While generative linguists have constructed phonological rules to represent several languages, English generative phonological theory is especially well advanced. In particular, the Chomsky and Halle work cited frequently in this dissertation, SPE, posits a series of ordered phonological rules for English which is consistent with other aspects of extended standard theory. In SPE theory the transformational component generates a surface syntactic string containing lexical items. Universal marking conventions³ further specify these lexical representations. Finally, language-specific phonological rules derive phonetic realizations from the abstract underlying forms.

³See the Epilogue in SPE, Chapter 9, (Chomsky and Halle, 1968:400-435) for a discussion of marking conventions. Briefly, these are a set of rules attempting to make use of "the fact that the [distinctive phonetic] features have intrinsic content" (400). In effect, the conventions constitute a definition of a possible natural language.

The nature of underlying forms in English phonology is an issue on which much present speculation centers. The issue involves particularly the question of whether "a single abstract root," plus combining forms, represents longer forms related to a root (Wolfe, 1972:19). For example, the question involves whether the lexical representation for <CRIME> also underlies <CRIMINAL>. Advocates of a relatively abstract lexical level argue that a single root /krīm/ underlies <CRIME> and <CRIMINAL>. In the case of the longer form <CRIMINAL>, a lexical form representing <-INAL> is also attached to the root, according to this view.

Many linguists, however, argue against this theory. Among other reasons, they feel that it is implausible for a tense vowel in a root to be the representation for a lax vowel in a surface form. In the example of <CRIMINAL> this situation would be the case under an abstract theory where underlying /ī/ would represent phonetic [ɪ] in the first syllable of <CRIMINAL>.

In SPE the position of Chomsky and Halle regarding this controversy is that a single lexical form represents a root and that portion of a longer form derived from a root.⁴ In their view, combining elements have lexical representations

⁴This inference is a logical extension of the SPE discussion of invariance (1968:166), where the lexical entries for <ALGEBRA> and <ALGEBRAIC> are contrasted. Several linguists (see Steinberg, 1973, for instance) seem to have misconstrued this aspect of Chomsky-Halle theory.

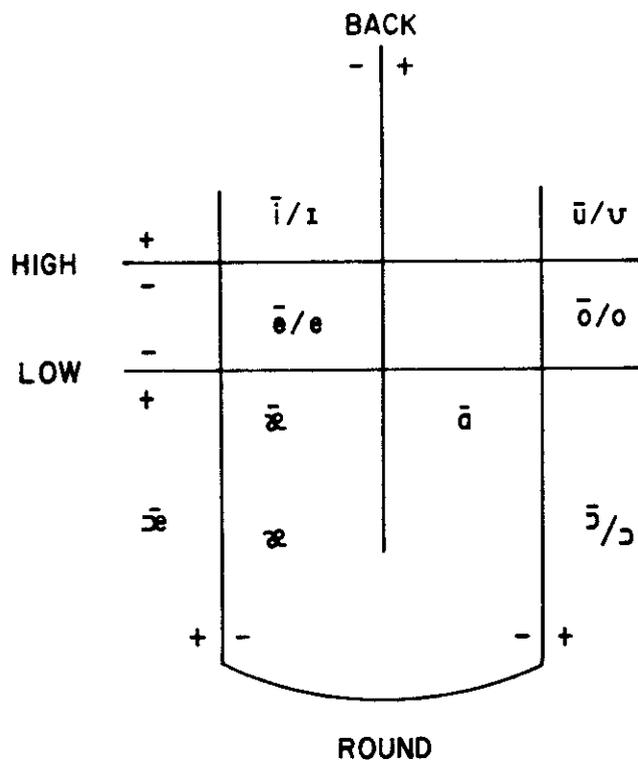
which are also part of the longer form in the lexicon. Thus, the <-INAL> in <CRIMINAL> would have a lexical representation joined to the root form for <CRIME> in the lexical representation of <CRIMINAL>.

With respect to underlying vowels, only fourteen lexical representations underlie the surface vowels of English phonetic forms. These are shown in Figure 8, "The Underlying Vowels of English." Under the theory depicted, the vowels of speech which are not also underlying representations are products of phonological processes. These processes apply to one or another of the fourteen underlying vocalic segments. For instance, no back non-low, non-high, unrounded vowel underlies English sounds. The ones which appear in spoken English, [ʌ] and [ə], derive variously from vowels shown in Figure 8. Application of phonological rules of English is necessary for their derivation.

Similarly, the Chomsky-Hallean framework provides for no underlying diphthongs in English. Such common American English sounds as [yūw, æw, ɔy] occur only as reflexes of the limited underlying set. As pointed out above, this disparity between underlying abstract vowels and surface phonetic ones is doubted by some linguists. They question the psychological reality of vowels which never appear in surface forms. One who is skeptical is Robert Krohn (1972: 395-412). Krohn has suggested a different set of underlying

vowels for English, together with diphthongs and a set of rules specifying the relationship between alternations of root forms and longer derived forms.

On a related subject, Krohn, Steinberg (1973), and



Adapted from Chomsky and Halle, 1968:236.

Fig. 8--The underlying vowels of English

other linguists have challenged the validity of the SPE vowel shift rule. This rule is a central process in deriving alternations of tense and lax forms in the Chomsky-Hallean framework. Steinberg's position is that the composition of underlying forms is close to that of surface forms (247,250).

The difference between the positions of Steinberg and Chomsky and Halle on this matter is illustrated by the comparisons in Table V. The table shows representations for the alternating forms <EXTREME ~ EXTREMITY>. In the Chomsky and Halle set of underlying representations, lexical spelling closely approximates orthography. The rationale is that readers who are native speakers of English pronounce <EXTREME> as [ɛkstrīym] and <EXTREMITY> as [ɛkstrɛm̄ətīy] because of their knowledge of English phonology. The sur-

TABLE V
UNDERLYING REPRESENTATIONS OF
<EXTREME ~ EXTREMITY>

Orthography	Pronunciation	Underlying Representations As in--	
		Chomsky and Halle, 1968	Steinberg, 1973:251
<EXTREME>	[ɛkstrīym]	/ɛks=tr̄em/	/ɛkstr̄im/
<EXTREMITY>	[ɛkstrɛm̄ətīy]	/ɛks=tr̄em+ɪ+ty/	/ɛkstrɛmit̄i/

face vowels [ī~ɛ] alternate as reflexes of underlying /ē/, which is represented in the spelling of both words by <E>. On the other hand, Steinberg's lexical set closely reflects the phonetic realization of these underlying forms and, according to Steinberg (252), "approximates a truly psychological level." In a subsequent article co-authored with

Krohn, Steinberg continues to hold his 1973 position by proposing lexical representations "closer to the phonetic level of representation, than they are in the C & H [Chomsky and Halle, 1968] analysis" (1975:255).

An additional example from the Chomsky-Halle analysis may make clear the position taken in the research reported in this dissertation. The words <DECIDE> and <DECISION> have lexical representations of /dɛ=kīd/ and /dɛ=kīd+ɪVn/, respectively.⁵ The root form /dɛ=kīd/ appears in the lexical representation of the related longer form. Ordered phonological rules of English apply differently to the underlying representations of the two forms, generating [dəsāyd] and [dəsɪzən]. Because of the processes listed below, the second /d/ in the underlying form becomes [z̥]:

1. In the case of /dɛ=kīd+ɪVn/, the following /ɪ/ in /ɪVn/ causes spirantization of /d/ to [z̥].
2. [z̥] then undergoes palatalization to [ʃ̥].

The relationship between an underlying form, /d/, and its phonetic reflexes, [d̥ʃ̥], is called a "derivation." The phonetic realizations [d̥ʃ̥] are said to be in "alternation."

⁵Here "y" is a symbol for any vowel which will undergo vowel reduction.

Although alternation as proposed by Chomsky and Halle is the subject of much present controversy, the research discussed in this dissertation relied on their "Summary of Rules" (1968:236-45) as a description of present-day American English.⁶ True, questions have arisen about the extent to which lexical, underlying, and phonetic representations can differ and still have psychological reality.⁷ Nevertheless, SPE theory provides generalizations about a native speaker's competence which other theories lack. Thus, the Chomsky-Hallean series of phonological rules affords a framework within which this research might develop and apply a way of teaching the English writing system. As Chapter IV shows, the methodology arrived at centered on the relationship between orthography and phonology in English.

Certain phonological rules in SPE receive emphasis in the report to follow because of their pervasiveness in deri-

⁶The SPE summary apparently requires addition of more lexical redundancy rules (Sims, 1973), modifications and reordering of stress rules (Halle, 1973), and feature revisions in the structural description and structural change of at least one rule (see discussion of SPE Rule 42 later in Chapter III). The basic framework of the rules in SPE, however, seems viable.

⁷Steinberg (1973:244-45), for instance, offers evidence in opposition to the vowel shift rule which, in turn, requires simpler underlying forms much like phonetic representations. Also, the proposal that the grammar be constrained so that underlying forms are not as abstract (Hooper, 1976: 4-5) has been recounted in Chapter II. Kenstowicz and Kisseberth (1977:1-62) discuss the abstractness controversy in detail.

vations of English forms. These rules are shown in Table VI. They include Rules 13, 26, 28, and 37, affecting consonants, and 31, 33, 34, 35, 42, and 43, affecting vowels (SPE 239-45).

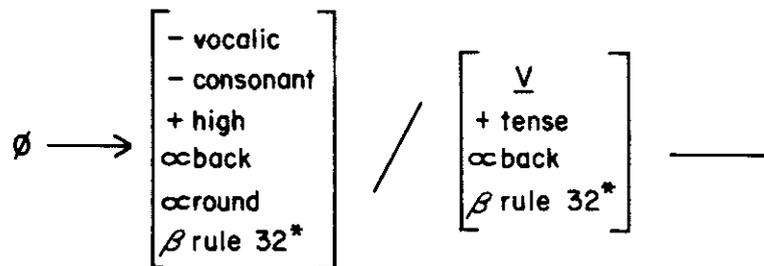
A few introductory comments on the phonological rules in Table VI are necessary. In Rule 33 one context for vowel shift, providing for application of the rule to certain idiosyncratic forms, was omitted since these forms are not relevant in this report.⁸ In Rule 42 for schwa insertion, the feature "[+consonant]" was added to the segment marked "[+sonorant]." The reason was that evidently the rule in SPE is incorrect. The word-final consonant on the right of the arrow must not be a sonorant non-consonant, i.e., a glide or a vowel. In the rules of Table VI, "V" is a cover symbol for any vowel, and "C" for any consonant. The symbol "ε" stands for the voiced glide epsilon.

The Relationship between English Phonology and Orthography

In a technical way, Table VI captures the knowledge of a native speaker about selected portions of English phonology. This information is the essence of this research, for phonological principles constitute essential information needed by an ESL student in reading and writing English. Unfortunately, the form of the phonological rules in Table

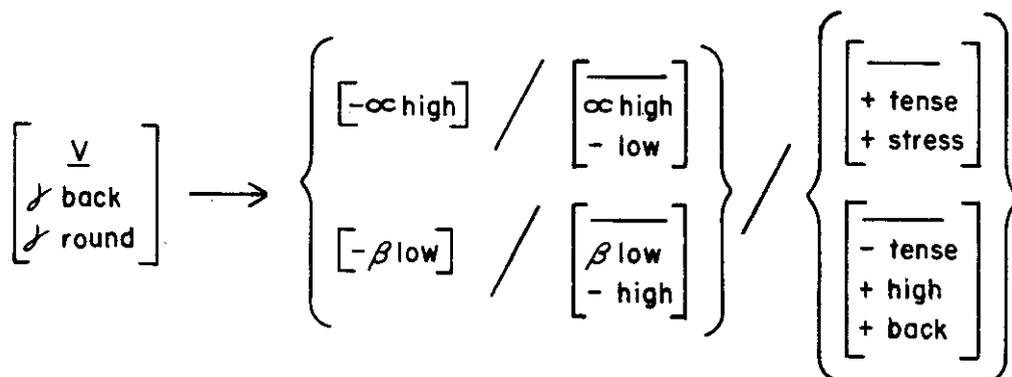
⁸This is the context $\left[\begin{array}{c} \text{---} \\ +F \end{array} \right]$, providing for forms such as <SIT> and <SING>.

RULE 31 DIPHTHONGIZATION

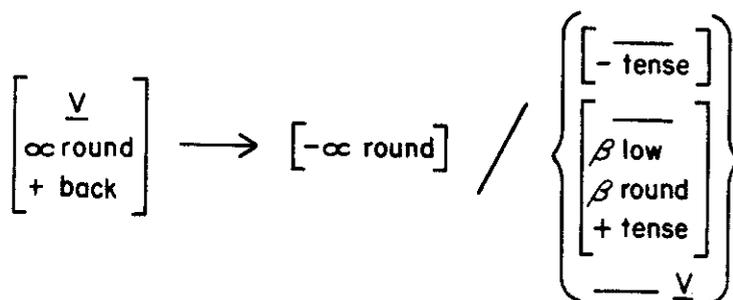


* Rule 32 in SPE (243) is Glide Vocalization.

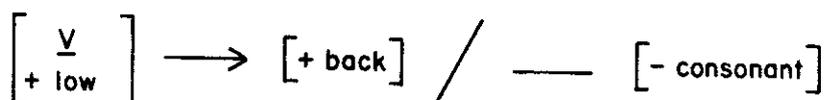
RULE 33 VOWEL SHIFT



RULE 34 ROUNDING ADJUSTMENT



RULE 35 BACKNESS ADJUSTMENT



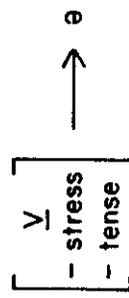
RULE 37 PALATALIZATION



RULE 42 SCHWA INSERTION



RULE 43 VOWEL REDUCTION



VI is too technical for direct use in teaching ESL because of the notational format. Instead, this information must be applied to the teaching of ESL by some other means.

Among ESL professionals, phonological principles of English have not been fully exploited for their potential use in teaching the writing system of English. Little pedagogical application of generative principles concerning the relationship between phonology and orthography is available in ESL materials (see Chapter II). Several linguists have noted the relationship, though, in research and publications about the role of spelling-sound relationships in the reading process. During the past decade Chomsky and Halle (1968:49-50), C. Chomsky (1970:322-28), and Wardhaugh (1974:25-35) have pointed out the relatedness of English spelling and phonology and have suggested its potential usefulness in reading acquisition.

A way of helping ESL students with MEWS by means of these generative phonological principles is possible. Apparently no one has developed such a format for this purpose. Of course, an objective of this research was to do so. A description of this methodology follows, and Chapter IV contains pedagogical materials based on it.

A few linguistic examples may help to illustrate more specifically the spelling-sound correspondence relied upon in the methodology. A preceding section recounted how the

lexicon of English consists extensively of roots and related forms derived from roots. Another term for a root is "underlying" or "short form." A related form derived from a root is called a "long(er) form." For example, <PART> is a short form. <PARTIAL> and <DEPARTURE> are longer forms derived from <PART>, plus affixes <-IAL>, <DE->, and <-URE>. In phonetic transcription for sounds of actual speech, these formatives may be represented as [p̄ärt], derived from underlying /pært/; [p̄ars̄əl], from /pært+r+æɫ/; and [dəp̄ärc̄ər], from /dɛ=pært+vɾɛ/.

The extraordinary characteristic of the English writing system is that orthographic spellings closely reflect phonological spellings of short forms, just as <PART> reflects /pært/. Each segment in <PART> corresponds to a phonological segment in the underlying or abstract representation /pært/: <P> for /p/, <A> for /æ/, <R> for /r/, and <T> for /t/. When a short form combines with an affix to make a longer form, phonological rules may affect a long form in many ways, such as stress, palatalization, or vowel reduction, to change its underlying phonetic features. Still, the orthography of English largely maps a phonological spelling, not a phonetic one. In the instance of /pært/, the derived form /pært+r+æɫ/, [p̄ars̄əl], is not orthographically represented as *<PARSHUL> or some similarly phonetic correspondence. Instead, the longer-form spelling

<PARTIAL> closely reflects underlying /part+ɪ+æɪ/. This orthography retains valuable information. In the orthography of the short form <PART> and the suffix <-IAL> are reflected "significant regularities which exist at a deeper level of the sound system of the language" (C. Chomsky, 1970:97).

Obviously, since related [pār^ʷɛɪ] and [pärt] are differently pronounced, phonological rules have changed several phonetic features of the root in the longer form. A literate native speaker of English can be expected to know these changes. In reading aloud, he will invariably pronounce <PARTIAL> in the correct way, rather than in some graph-to-phone correspondence such as *[pärti^ɪɪɪ]. He has internalized this pattern as a part of learning English phonology as a child. Later, when he learned to read, he superimposed his new knowledge about the writing system upon his knowledge of phonology. Consequently, he alters some features in /pært+ɪ+æɪ/ to achieve the pronunciation [pār^ʷɛɪ]. He also recognizes the relatedness of <PART ~ PARTIAL>, in which palatalization replaces the longer form /t/ with [ʷ] before [ɪ] (from /ɪ/), and glide deletion and vowel reduction delete [ɪ] and change [æ] to [ə].

Where sound rules of English predictably account for changes such as [t^ʷɪ], orthography retains the spelling of the underlying form. Thus, /pært+ɪ+æɪ/ has the ortho-

graphic spelling <PARTIAL>, wherein each letter reflects an underlying phonological segment, as follows:

Orthographic Spelling	Underlying Phonological Segment
P	p
A	æ
R	r
T	t
I	ɪ
A	æ
L	l

As already noted, English spelling, such as <PARTIAL> for /pært+ɪ+æɫ/, conveys important information by mapping underlying segments. The letters <PART> can remind a reader of the root /pært/, and the letters <-IAL> retain morphological features of /ɪ+æɫ/.

English spellings, however, do not necessarily reflect the deepest level of phonological forms. This aspect of the spelling system has desirable effects. One is to retain the morphological unity of related forms, which a phonetic representation tends to obscure. This advantage has been pointed out above. Second, in the case of exceptional phonetic forms which phonological rules cannot handle, the spelling system captures idiosyncratic sound changes by closely reflecting actual speech.

An example may clarify this systematic nature of English spelling. English has a few nouns with irregular

plurals. <MAN/MEN> and <SHEEP/SHEEP> are two instances where singular forms do not have <-S> or <-ES> plurals. In the lexicon, the singulars of these nouns may have representations of /mæn/ and /^{v̄}šep/, and, depending on how plurals derive, these nouns probably have intermediate phonological plurals ¶mæn+z¶ and ¶^{v̄}šep+z¶. Phonological rules, however, cannot convert ¶mæn+z¶ to the idiosyncratic [mɛn], or ¶^{v̄}šep+z¶ to [šīyp]. Instead, the rules of English phonology would produce *[mænz] and *[šīyps]. In such cases, the spelling system does not assign to ¶mæn+z¶ the representation *<MANS> or to ¶^{v̄}šep+z¶, *<SHEEPS>, as it would if all spelling represented underlying forms. Instead, the orthographic <MEN> closely reflects a pronunciation [mɛn], and <SHEEP> reflects [šīyp], each of which is not predictable from phonological rule.

Because there is little or no change in the original mapping of grapho-phonetic forms for much of English orthography (see Figure 2), readers of English must have a knowledge of English phonology. The reason is that they are reading phonological, not phonetic, representations. As an example, the alternation /rēg+æ1~rēg+ɪ+kīd/ is spelled <REGAL ~ REGICIDE>. The orthography of <REGICIDE> matches the underlying /rēg+ɪ+kīd/, and not its phonetic realization [rɛjəsāyd], because the alternation ¶g> j¶ in the context of a following ¶ɪ¶ is predictable under English phonological

rules. Thus, there is no need for the spelling system to map the /g/ as *⟨J⟩. Instead, the orthography of <REGICIDE> contains <G>, just as does the mapping of the root. Literate native speakers of English know and exploit this kind of phonological predictability when they read.

The crucial problem for ESL students should now be clear. Second-language students of English must learn about the alternation ⟨g⟩^y before they can read <REGICIDE> aloud as [rɛ^yʒəsāyd]. In addition, for developing reading proficiency, they must realize that spellings such as <REGICIDE> are symbolic not of phonetic structure but of root structure, i.e., "the linguistically significant system underlying ordinary speech" (Chomsky and Halle, 1968:50). This awareness can also afford insight into the related meanings of derived forms. Moreover, this is insight which ESL learners must have in order to perceive readily the sounds of English pronunciations by other speakers.

Consequently, just as ESL learners need to master English phonological rules in order to pronounce what they read, so also they need to master English spelling rules in order to understand what they read. The problem in achieving this mastery is that English orthography does not always have a matching grapheme-phoneme correspondence. Like the phonology, generative rules often alter preliminary spelling representations. This function has only recently been

pointed out by Silas Griggs in a number of unpublished papers (1976, 1977b, 1977c, 1977d). Since much of the English lexicon consists of alternating forms affected by phonological and orthographic rules, obviously ESL students must know these relationships and processes before they can readily comprehend what they read. The next section reports details and examples which demonstrate this point.

Generative Spelling Rules for English

Perhaps the two most insightful treatments of the orthographic system of English are Venezky (1967; 1970) and Griggs (1976a; 1977d). Both linguists provide data and formalism valuable to this study, although their goals differ.

Venezky takes the position that spelling is a process mapping pronunciation from graphemes, based on morphological and phonological environment. Accordingly, correct pronunciations of orthographic forms by means of ordered pronunciation rules are the focus of Venezky's work. Griggs, while assuming the same abstract representation for the juncture of spelling and pronunciation origins, takes the opposite position that English spelling is mapped from sound by a series of ordered rules. He seeks to represent the spelling rules of English, based on phonological roots. In a sense, Venezky goes from orthography to surface sound; Griggs, from underlying sound and underlying spelling to orthography.

An example from Griggs and from Venezky illustrates their focus and relevance to this study. Venezky (1967:94) describes in the following way his model of "all that the orthography holds and advances [about] an understanding of spelling-to-sound relationships":

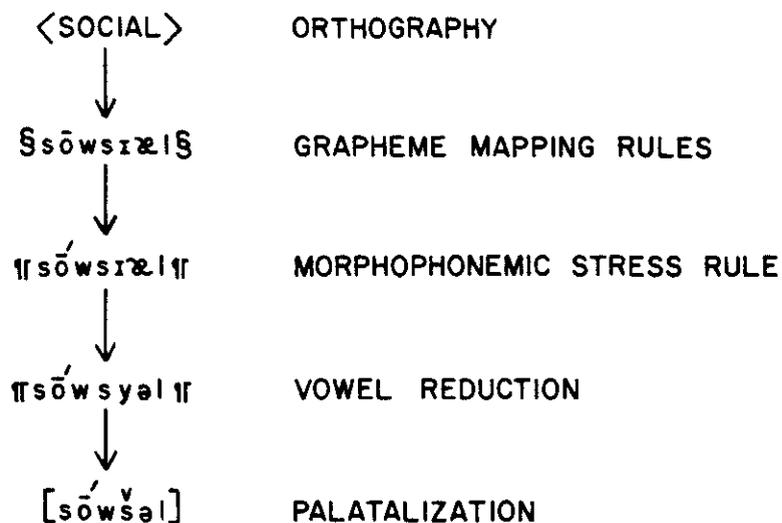
In this model, graphemic words are divided into their graphemic allomorphs and, then, these allomorphs are related to intermediate (morphophonemic) units by an ordered set of rules. Other rules then relate the morphophonemic units to phonemic forms.

Accordingly, Venezky's model has the orthographic forms of English as givens. True, his 1970 monograph (16-29 et passim) investigates historical spelling origins. Except for a few alternations and graphemic substitutions with historical provenance, however, he builds pronunciation rules upon orthographic data.

Venezky (1968:93) is concerned to show, for instance, that the letter <A> in <SOCIAL> has a predictable pronunciation. In this view stress, adjacent phonological segments, and morphological information about <-IAL> constitute a pattern which relates the spelling <SOCIAL> to sound correspondences. Figure 9 adapts Venezky's derivation for [sōwšə^ˈl] from <SOCIAL>. As the bracketed forms at various levels show, Venezky posits a level of spelling and pronunciation origins, shown by "< . >"; levels of intermediate, abstract forms, indicated by "\$. . \$"; and a surface phonetic realization, represented by "[. . .]". Since the

rules of stress, vowel reduction, and palatalization are phonological processes which apply initially to orthography, Venezky's findings are crucial to the link between English phonology and orthography, which is the focus of the present study.

Different from Venezky's approach, the Griggs effort



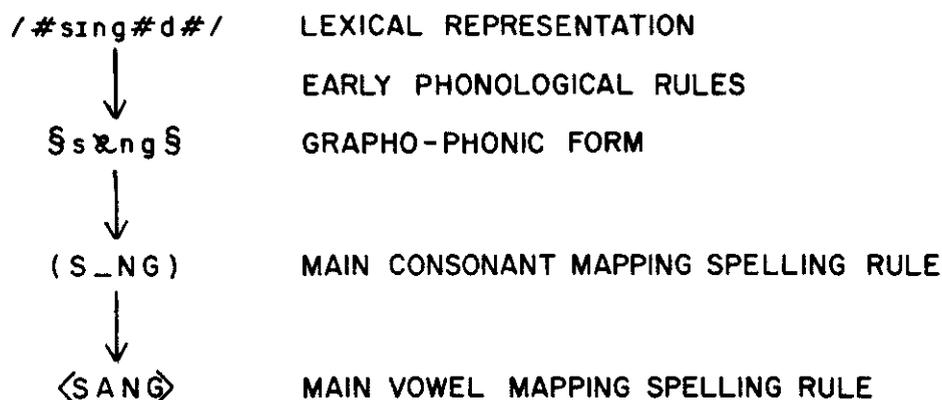
Adapted from Venezky, 1967:94. Special symbols are added.

Fig. 9--From spelling to sound in English, according to Venezky, 1967 and 1970.

is exemplified by a derivation for <SANG>. Griggs (1976a:1) offers a "set of ordered rules of English orthography . . . related to the phonological component of English," much like the derivation illustrated in Figure 10. The example in the figure applies orthographic rules from Griggs, 1976a, to an intermediate phonological representation, §sæng§. This form is the output of early phonological rules of

SPE.⁹ As Griggs (1976a:1) points out, orthographic and phonological rules apply at an abstract phonological level. The grapho-phonetic form \$sæŋg\$ is a phonological representation which undergoes further phonological rules before becoming [sæŋ], and \$sæŋg\$ is also the origin of spelling processes which result in <SANG>.

Since the rules which produce <SANG> are ordered, they



Adapted from Griggs, 1976a; 1977d. Special symbols are added.

Fig. 10--From phonology to orthography in English, according to Griggs, 1976a and 1977d.

cannot look ahead. The spelling rules are generative and sequential respecting orthographic forms, just as Chomsky and Halle's rules are ordered for phonological forms. In his rules, Griggs shows that while spelling is sensitive to

⁹In this study the juncture is a grapho-phonetic form. Figure 2 in Chapter I indicates schematically the level at which spelling originates with respect to underlying phonological levels.

phonological processes such as stress and originates at a phonological level, English orthographic rules are not replications of phonological ones. Indeed, "English Orthography for Readers" (Griggs, 1976a) has forty ordered spelling rules for consonantism and vocalism, including seven for morpheme-final silent <-E>, as well as rules for inflection, laxing, spirantization, and cluster simplification. Griggs (1977d) reorders and revises several of the consonant and vowel rules. The series explains and justifies the polysystematic processes of English orthography.

A few spelling rules may illustrate Griggs's approach to mapping systematic phonemes into graphemes. Table VII, "Some English Orthographic Rules," adapts for display several Griggs spelling rules from his 1976a and 1977d papers. One of these rules, Rule 5 for "Native \$k\$," states that native English graphophonic forms are spelled with <K>, just in case \$k\$ precedes (1) \$n\$ followed by any vowel, (2) any unstressed word-final segment(s), or (3) any nonlow front vowel or glide. Examples for each case are (1) <KNOW>, (2) <ANKLE>, and (3) <KEEN>. In another tabled spelling rule, Rule 13, a previously-mapped <K> becomes <C> just in case it precedes another <K>. An example is <TACK>.

Along with Rules 5 and 13, Table VII shows other spelling rules relied upon in materials developed in the research.

TABLE VII
SOME ENGLISH ORTHOGRAPHIC RULES

RULE 1 <GE>

$$\rightarrow \text{GE} / \S \left\{ \begin{array}{c} \underline{v} \\ \underline{j} \\ \underline{z} \end{array} \right\} \# \S$$

RULE 3 UNDERLYING S f S (MINOR)

$$\rightarrow \left\{ \begin{array}{l} \text{PH} / \S f / \left[\begin{array}{l} \underline{\quad} \\ + \text{ Greek} \\ + \text{ derivative} \end{array} \right] \\ \text{UGH} / \S f / \left[\begin{array}{l} \underline{v} \quad \underline{\quad} \end{array} \right] \# \end{array} \right\} \S$$

RULE 5 NATIVE S k S

$$\rightarrow \text{K} / \S \left[\begin{array}{l} \text{k} \\ - \text{ derivative} \end{array} \right] / \left\{ \begin{array}{l} \# \quad \underline{\quad} \quad \underline{n} \quad \underline{v} \\ \underline{\quad} \quad \left[- \text{ stress} \right]_o \# \\ \underline{\quad} \quad \left[\begin{array}{l} - \text{ consonant} \\ - \text{ low} \\ - \text{ back} \end{array} \right] \end{array} \right\} \S$$

RULE 6 CONSONANT

§ p b f v θ t d s z ^vc ^vj ^vs ^vz k k^wg^w x m n l r y w §
 → P B F V TH T D S Z CH J SH G C Q G H M N L R Y W

RULE 7 <H> BILITERALIZATION WITH <W>

HW → WH

RULE 8 <H> BILITERALIZATION WITH <G>

∅ → G / _____ H / v _____ § x §

RULE 9 GREEK <H> BILITERALS

∅ → H / { R
T
C } _____ / § [{ r
t
k }
+ Greek
+ derivative] § _____

RULE 13 <CK>

K → C / _____ K

RULE 17 VOWEL MAPPING

→ § \bar{i} \bar{i} \bar{e} \bar{e} $\bar{\alpha}$ \bar{a} \bar{a} \bar{o} \bar{o} \bar{u} \bar{u} §
 I E A O U

RULE 23 SILENT <E>: TENSE VOWELS

→ \exists / # # (X C) \underline{V} \underline{C} ——— $\left\{ \begin{array}{c} + \\ \# \end{array} \right\}$

where \underline{V} = § \bar{i} \bar{e} $\bar{\alpha}$ \bar{o} §

RULE 29 SYLLABIC RESONANTS

→ \exists / $\left\{ \begin{array}{c} \underline{C} \quad L \quad \text{---} \quad | \\ \underline{C} \quad \text{---} \quad R \quad | \end{array} \right\}$

RULE 39 SPIRANTIZATION

(a) (MINOR)

T → $\left\{ \begin{array}{c} C \\ S \\ SS \end{array} \right\}$

(b) D → S

LEGEND

| = word-internal
morpheme boundary

\exists = silent <E>

The only rule which is used in the MEWS materials but not shown in the table is the rule for vowel biliteralization (Rule 19 in Griggs, 1977d:2). The reason is that Griggs lists a general rule to cover a series of processes which result in vowel biliteralization. He also uses a chart to show the effects of these processes, and says that "tense vowel biliteralization occurs only in this context: [\bar{V} C₀#]." The general rule is as follows:

$$\emptyset \text{ — } \underline{v} \ / \ \bar{V} \ \underline{\quad} \quad (\text{or } \underline{\quad} \ \bar{V})$$

The above rule states that in the context of a tense vowel, a vocalic graph is inserted after or before the vowel. Since this rule and the processes shown in Table VII capture symbolically the orthographic system of English, Griggs's work, along with Venezky's, is essential to the phonology-orthography relationship reported in this dissertation.

Methodology for Applying Generative Principles to MEWS

With respect to the relationship between English phonology and orthography, the research adopted the Venezky and Griggs position on the morphophonemic origin of spelling, and amalgamated the interests focused on by each. Venezky (1970:127) asserts that English spelling must "be described in terms of patterns of graphemic, morphemic, syntactic, and phonotactical processes." Griggs would add phonological

processes to the description. In this connection, the dissertation has recounted how English spelling represents an abstract, deeper, and more significant level than a phonetic one, containing lexical and syntactic information.

Accordingly, when adult native speakers read English orthography, they relate the letters of spelling to pronunciations by using internalized knowledge of the phonology of English. ESL students, however, as C. Chomsky (1970:325) points out, lack the advantage of this ability:

The written form photograph, for example, is convertible into a particular phonetic configuration, with primary stress on the first syllable, lesser stress on the third syllable, second syllable unstressed, reduced sound vowel, and full vowel quality expressed by the first and third vowel. The adult speaker of English is able to utilize elementary letter-sound correspondences to recognize the basic morphological components of the word foto-græf, and then to superimpose all the above phonetic information on these components because he knows the language and can apply its phonological rule system. Add the written suffix -y to this form, photography, and the phonetic information which he superimposes is radically different: primary stress on second syllable, first and third syllables unstressed, reduced first and third vowels, full vowel quality of second vowel. He converts to different phonetic configurations in the two cases because of phonological knowledge which he brings to the reading situation, not because of anything that is explicit in the orthography. He does not have to be told how to apply stress and change vowel quality in these forms because he already knows.

On the other hand, a foreigner who knows no English but has learned the elementary letter-

sound correspondences of the English alphabet will be unable to do this. Knowing nothing of the language, such a foreigner finds himself in a very different position when he tries to pronounce these two words.

As Carol Chomsky indicates in this quotation, an ESL student needs to learn more than the "elementary letter-sound correspondences of the English alphabet." Phonics approaches teach these, it is true. Phonics, though, cannot handle forms such as <PHOTOGRAPH> and <PHOTOGRAPHY>. The processes which apply to these forms are ones which a native speaker brings to the reading task. As described by Chomsky, they are the processes involved in phonological derivation and alternation.

These matters need to be incorporated into ESL classroom materials so as to supplement existing phonics instruction in the English writing system. In accordance with this rationale and plan, a preliminary MEWS program was developed in the research. Since one of the purposes of the research was to use the materials developed, Chapter IV reports on a pilot study involving the preliminary MEWS program and also includes reproductions of the materials.

CHAPTER IV

PROCEDURES

This chapter describes procedures applying generative principles to MEWS for use in teaching ESL. The first section concerns development of classroom instructional materials. The second section reports the use of preliminary MEWS materials in a pilot study involving ESL students. The third section contains reproductions of the materials developed in the research.

Development of Preliminary MEWS Materials

Based on theoretical foundations reported in Chapter III, a preliminary MEWS program was developed. In the preparation of materials, there was an attempt to incorporate the concepts of underlying phonological representations and ordered rules relating them to surface realizations. An effort was also made to include the concept of a juncture of spelling and pronunciation on a grapho-phonetic level where spelling originates. Specifically, the aim was to develop materials which would teach students the phonological processes of derivation and alternation in English, and in the orthographic systems of English representing phonological forms. Simple language was used in an attempt for the

materials to be appropriate for ESL college students and graphically appealing to their interests.

Another step in the development of the MEWS program was the establishment of validity of the curriculum materials. In this respect, the research was delimited to selected rules out of the many possible phonological processes and orthographic systems of English. As Appendix D of the dissertation shows (see Table III in Chapter I, also), the following rules were the ones considered:

Phonological rules:

- Diphthongization
- Vowel shift
- Rounding adjustment
- Backness adjustment
- Schwa insertion
- Vowel reduction
- Velar softening
- Spirantization
- Identical consonant elision
- Palatalization

Orthographic rules:

- Main vowel mapping
- Vowel biliteralization
- Silent <E>: tense vowels
- Syllabic resonants
- <GE> from \$j\$
- Main consonant mapping
- <H> biliteralization
- Spirantization

These rules served as content areas of instruction in "Tables of Specifications" drawn covering objectives and activities in the materials developed. Instruction was

divided into two units, a Unit I on vowels and a Unit II on consonants. Phonological and orthographic rules over both units were listed in the tables. Appendix D contains the table prepared for phonological rules on both units and the table prepared for orthographic rules on both units.

Since the materials reflected the objectives and presented the content set out in the tables of specifications, the materials had face validity. In addition, a panel using the tables of specifications examined the content of the curriculum materials on the basis of whether the materials met the objectives in the tables. The materials were modified until the objectives in the tables were met.

The validity and reliability of tests developed in the research were also established. Since the tests were cognitive measures reflecting the objectives and content listed in the tables of specifications, the tests had face validity. In addition, a panel examined the tests for content based on whether each instrument tested for material appropriate to the objectives and content areas in the tables. The tests were modified until they met the objectives in the tables.

The reliability of the tests was also demonstrated. On separate dates a week apart, a try-out class of fifteen international students received each of the two MEWS pre-tests. The try-out class, English 131B for international students at NTSU, was similar to the classes involved in

the pilot study. One week after the Unit II pretests, the combined post-test was administered to the try-out class. A Pearson r statistic for the coefficient of stability was obtained by computer analysis, according to the following formula:

$$r = \frac{\sum z_x z_y}{N}$$

where z_x is the z -score for a student on the pretest; z_y is the z -score for the same student on the post-test; and N is the number of students in the reliability study. An r of 0.87 for the Unit I test and an r of 0.70 for Unit II indicated acceptable reliability of the instruments.

Pilot Study Using Preliminary Materials

As mentioned earlier in this chapter, a primary purpose of the research was to use the preliminary MEWS materials. Accordingly, a pilot study of fifty-three ESL students, assigned to control and experimental groups, made use of the MEWS program as an experimental treatment. This section of Chapter IV gives detailed procedures of the trial use. The subsections which follow cover first, a description of the subjects in the study and their selection, and second, a description of the pilot use of MEWS materials.

Subjects in the Pilot Study

The pilot study reported in this dissertation involved college students in four ESL classes at NTSU. All of the students were enrolled in English 132B, "English for International Students," a second-semester course in Freshman English at the University. The four classes were heterogeneous in that students were from both sexes and varied in age from nineteen to fifty-three years. This information appears in Appendix E, "Demographic Data on Subjects in Pilot Study." The appendix also shows that the subjects came from eighteen different home countries and spoke twelve native languages. Other figures show that the subjects had varying educational backgrounds. Their schooling varied from one to six-and-a-half years of college education and from one to five years of post-secondary school training in ESL.¹

The four classes of ESL students served as experimental and control groups. Three sections of 132B made up an experimental group with forty-one subjects. The fourth section, randomly selected from among the four classes, served as a control group with twelve subjects. Table VIII shows the makeup of groups according to section and enrollment.

¹No attempt was made statistically to differentiate types of previous ESL training. Study of English at an intensive institute, of course, would likely afford more ESL skill than the same period of study in college classes meeting three times weekly.

During the pilot study, activities varied between control and treatment groups. Throughout the four weeks from

TABLE VIII
EXPERIMENTAL AND CONTROL GROUPS IN PILOT STUDY

132B Section	Number of subjects	
	Experimental	Control
1	. . .	12
2	13	. . .
3	16	. . .
4	12	. . .
Total	41	12

April 11, 1977, through May 6, 1977, the control subjects received instruction according to their instructor's pre-planned syllabus. Subjects in the treatment group received MEWS instruction. When time permitted, treatment classes also received instruction usual in English 132B according to instructors' prepared syllabi. Appendix F, "Attendance Register for Subjects in Pilot Study," records attendance in all classes during the four-week period. Appendix G, "Teachers' Daily Logs during Pilot Study," enumerates specific activities of every daily session.

Experimental Treatment

In the use of MEWS materials in the pilot project, there was strict adherence to the guidelines and schedule shown in the "Teacher's Guide to MEWS Program" (see extract

quoted later in Chapter IV). During the treatment period, in particular, exact records were maintained of all classroom activities which followed the pretesting of the subjects. Information about these activities appears in the "Teachers' Daily Logs" (Appendix G). The entire pilot project is described below under these categories:

- Nelson-Denny Reading Test
- MEWS Unit I Pretest
- ✓ MEWS Unit I Instruction
- MEWS Unit II Pretest
- ✓ MEWS Unit II Instruction
- ✓ Review of MEWS Units I and II
- Class Activities Not Related to MEWS
- MEWS Post-test
- Second Reading Test
- Collection of Additional Correlates

Captions marked with a check (✓) pertain only to the experimental group.

Nelson-Denny Reading Test.--After an overview of the pilot study during the first class session, control and experimental groups were given a description of the Nelson-Denny Reading Test (Brown, Nelson, and Denny, 1973). They were advised that the reason for administration of this test was to determine whether students in treatment and control groups had similar abilities to read English morphemes. The acceptance level to be used was specified as ≥ 0.05 for the difference between the mean raw-score totals of control and experimental groups. Without such a measure a question

might have arisen later as to whether the treatment results had been influenced by different reading abilities. Since the test was designed for native speakers, students were told that they should expect it to be difficult. They were also advised that they would receive personal records of their reading profiles after the test. In addition, students were assured that test results would be anonymous. To insure anonymity student code numbers were used (see Appendix E).

Thereafter, all subjects received the Nelson-Denny Reading Test at the third class meeting. Administration of the test took the entire hour, and no subject finished all test items during the timed portions of the test. Standardized for a variety of grade levels and adult populations, this test has the following features according to its authors (1973:3):

[The revised versions] provide a measure of all three major elements of reading ability: vocabulary, comprehension, and reading rate. Each form contains one hundred items to measure vocabulary and thirty-six to measure reading comprehension. The comprehension score is given double weight in arriving at a total score. This total score is the best single index of reading ability obtained through the use of this instrument.

These new forms are designed for use in grades 9 through 16. They are readily administered in a single class period. The normal working time is thirty minutes, plus whatever time is needed to distribute and collect the test materials and to give directions.

Subjects used printed "Self-Marking Answer Sheets," which were later hand-scored. The scores were then transferred to Fortran computer forms for further analysis. The individual reading profiles, prepared from the test results, were distributed to the students at the second class session after the test.

MEWS Unit I Pretest.--In the intervening class session, all subjects received a pretest on vowels developed in the research (see "MEWS Unit I Pretest" among reproductions of Tests). The test administration consisted of oral recitations of phonetic transcriptions similar to the ones shown in the "Teacher's Answer Keys" (quoted in Teacher Material). Students used printed IBM answer sheets, which a computer scored later. Although no time limit governed any test administration, each pretest took about thirty minutes. The tests were conducted similarly in every class, and the test administrator was never an instructor of a class involved in the project.

The formulation of the MEWS tests was built on an underlying philosophy about language acquisition. Chapter III of this dissertation presented this theoretical foundation. It involves an approach to ESL in which reading skill requires knowledge of phonological and morphological forms and patterns. In the approach, this kind of knowledge is more relevant to the reading process than is knowledge of

lexical meanings. The reason is that lexical meaning includes knowledge of the world. Knowledge of English phonology and morphology, on the other hand, involves knowledge of the language. With this rationale in the research, the MEWS tests were developed using English nonsense words. The tests minimize prior familiarity with subject matter and emphasize mastery of the systematic structures of the language.

Nonsense words are linguistic forms which are possible in a specific language but which do not actually occur. For example, *[blɪf] 'blif' is possible in English according to phonotactics of the language. Since it is not a formative in the lexicon, it is a nonsense word. Although *[blɪf] lacks semantic content, it has phonological and morphological features and sequences permissible in English. Native speakers of English, since they know the phonology and morphology, are likely to pronounce and spell *[blɪf] in the same ways even though they have never seen or heard it before.² This ability to make correct judgments about nonsense words can serve as a useful standard of comparison against which to rank the relative performances of ESL students. Such a comparison is valid, obviously, because the highest goal of an ESL student is native-like proficiency.

²On the MEWS tests, for example, teachers who received the tests had perfect scores or missed only a single item. Chapter IV discusses further this remarkable faculty of native speakers and its implication for ESL testing.

Specifically, the MEWS Unit Pretest had twenty-five multiple-choice items over two question areas about nonsense words. In the first part, each item on students' test forms showed a spelling for a nonsense word and three blanks numbered "1," "2," and "3." Students selected an appropriate pronunciation, from among three given by the test administrator. They then marked the number which matched the pronunciation. In the second part of the test, each test item consisted of three possible spellings of a nonsense word. The test administrator pronounced only the probable one, and students selected the appropriate spelling.

√ MEWS Unit I Instruction.--During the three class sessions which followed the Unit I Pretest, the experimental group received instruction on vowels by using materials developed in the research. On the first of these days, students received handouts covering Unit I (see Student Instructional Materials at the end of this chapter). The weekend assignment directed students to study the handouts and prepare questions about them for the next lesson. In addition, students were asked not to discuss the materials with students in the control group.

On the second and third class days following the Unit I Pretest, experimental classes discussed the Unit I handouts. Chalkboard interpretations and overhead transparencies of the MEWS materials served as visual aids. Students

were free to ask questions about the handouts, and their questions varied slightly from class to class. Among the Unit I materials was a "Practice with Alternations" (see among extracts), on which students worked during the second of the two days spent on Unit I instruction.

MEWS Unit II Pretest.--Since the concluding exercise on Unit I involved only ten minutes, the pretest on consonants (see "MEWS Unit II Pretest" at the end of Chapter IV) was administered at the same time. Control subjects also received this pretest. The test administration was the same as that described for Unit I. Computer scoring and analysis of test answer sheets followed the test.

✓ MEWS Unit II Instruction.--During the three class sessions which followed the Unit II Pretest, the experimental group received instruction on consonants by using materials developed in the research. On the first of these days, students received handouts covering Unit II (see Student Instructional Materials later in this chapter). The weekend assignment directed students to study these handouts and to bring their questions to the next lesson. The students were asked not to discuss the handouts with control subjects. On the second and third days following the Unit II Pretest, experimental classes discussed these handouts in the same manner as for Unit I. A "Practice

with Alternations" on consonants (see among quoted materials) followed the instruction.

✓ Review of MEWS Units I and II.--Among the final materials developed and used for student instruction in experimental classes was a nine-page booklet on vowel and consonant units (see "Mastery of the English Writing System," quoted among student materials). Experimental subjects examined and discussed the material in the booklet.

Class Activities Not Related to MEWS.--Although the pilot study extended over a four-week period, not all of each class session was spent on the MEWS project. Control subjects in Section 1 of 132B continued to follow their syllabus of 132B instruction during times when treatment classes received the MEWS instruction. The daily logs kept by the teachers of all four sections (see Appendix G) show occasions when individual section activities supplemented the pilot project. In addition, to avoid unnecessary disruption of the semester curriculum, all sections frequently engaged in activities unrelated to MEWS. These activities included work on idioms or written compositions. The teachers' logs contain detailed descriptions of "unrelated" activities according to sections of 132B.

MEWS Post-Test.--At the end of the treatment, all classes took a combined MEWS Post-test over Units I and II

(see among quoted Tests). The post-test consisted of a re-administration of MEWS Units I and II Pretests, combined under a single title. Sub-test one was parts A and B of the post-test and contained twenty-five items on Unit I. Sub-test two was parts C and D of the post-test and contained twenty-five items on Unit II. The manner of administering the test was the same as for the pretests. Answer sheets and test scoring were also similar. At the final class session of the four-week pilot study, classes received and discussed the test results.

Second Reading Test.--The administration of a second reading test seemed advisable for cross-validation of the first reading test. This addition to the project was carried out after results on the first test, the Nelson-Denny Reading Test, showed scores to be far below norms for college freshmen.³ The English Reading Test for Students of English as a Foreign Language (King and Campbell, 1956) was selected for this purpose. It is designed and normed for second-language learners. Thus, scores on this test might indicate the appropriateness of the first reading test, designed for native speakers. The second reading test consisted of fifty multiple-choice questions about students' knowledge of English grammar and vocabulary.

³See Chapter V for a further discussion of test scores.

In June, following the MEWS Post-test, subjects who were available received the second reading test. Analysis of test results failed to show a significant correlation at the 0.05 level between raw scores on both reading tests. For all subjects who took both first and second reading tests, the mean total scores were identical, i.e., below the sixth-grade level in American school-grade equivalents. Appendix H recapitulates these and other test scores from the pilot study.

Collection of Additional Correlates.--To supplement the added correlate of a second reading test score, further criterion measures on the subjects were needed to aid in interpretations of test scores. The basis for this decision was that "a valid test of the writing or speaking proficiency of an ESL student is one which yields data about his knowledge of English sound patterns and orthographic system" ("Assumptions," Chapter I). Accordingly, semester grades were obtained from another class at NTSU, EDIP 198.001, "Education Interprofessional Studies: Experimental Course in Educational Psychology for Bilingual Teachers." Members of this class were Saudi-Arabians who were also enrolled in 132B sections of the pilot study. Grades on a written essay in the same course, dealing with the philosophy of language acquisition, were also obtained in connec-

tion with these students.⁴ The essay grades are listed in Appendix H.

Preliminary MEWS Materials

The tests developed in the research and all other MEWS materials appear below. First is Teacher Material for the preliminary program, including teacher's guide, class schedule, and answer keys to all MEWS tests. Student handouts and practice exercises follow under Student Instructional Material. These begin with "MEWS Unit I: The Sounds of General American English," and continue in chronological order of use through "Examples of Consonant Alternating Forms." Materials cover a unit on vowels, another unit on consonants, and a nine-page review booklet over both units.⁵ The final portion of the quoted material, Tests, includes pretests and post-tests over both units of instruction, and the form of answer sheet for all MEWS tests.

⁴The essay involved content covered in the course. Students were told ahead of time the exact questions and content areas to be covered in the essay.

⁵The phonetic transcription in Unit I is a modified Smith-Trager system, whereas the transcription in the review booklet is modified IPA. The reason for this change in medias res is that the subjects proved more familiar with IPA than with the Smith-Trager system.

EXTRACTS OF
PRELIMINARY MEWS MATERIALS

Teacher Material

TEACHER'S GUIDE TO MEWS PROGRAM

Materials

1.--An attached schedule shows class activities during the four weeks involved for the program.

2.--Each student receives a folder with materials on Unit I near the beginning of the program and additional Unit II materials midway in the study. Students should bring the folders to class throughout the program.

3.--The chart of phonetic transcription among the materials is for student reference, not for memorization. Since several of the student handouts rely on symbols for sounds, the chart is necessary to an interpretation of the symbols.

Instruction

1.--Using the handout "The Sounds of General American English," the teacher should pronounce each entry in the chart for the class during the session at which the folders are distributed.

2.--The teacher should ask the students to study their folder of materials during the weekend following distribution of each unit.

3.--At the next class session after distribution of a unit, the class discusses the folder materials on that unit.

4.--A final lesson concludes the program with a return of all tests and discussion of them with students in class.

Testing

1.--The teacher should administer a standardized reading test at the outset of the program for use as a covariate in analyzing student performance on MEWS.

2.--Prior to the distribution of MEWS materials, students receive a pretest on Unit I.

3.--During the second class period after distribution of Unit I materials, the students receive a pretest on Unit II.

4.--A final post-test covering Units I and II at one administration follows during the second class period after distribution of Unit II materials.

SCHEDULE FOR MEWS PROGRAM				
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
		DESCRIBE READING TEST AND MEWS PROGRAM.		ADMINISTER READING TEST.
		ADMINISTER MEWS UNIT I PRETEST.		RETURN READING TEST. DISTRIBUTE MEWS UNIT I HANDOUTS.
DISCUSS MEWS UNIT I HANDOUTS.		DO MEWS UNIT I PRACTICE EXERCISES. ADMINISTER MEWS UNIT II PRETEST.		DISTRIBUTE MEWS UNIT II HANDOUTS.
DISCUSS MEWS UNIT II HANDOUTS.		DO MEWS UNIT II PRACTICE EXERCISES. ADMINISTER MEWS POST-TEST.		RETURN AND DISCUSS MEWS TESTS.

TEACHER'S ANSWER KEYS

MEWS Unit I Pretest

A. Example:	1	2	3
	[hāməs	√hēymz	hæmz]

Pronunciations*		
1	2	3
1. [sēyt	kīyt	√sīyt]
2.√[frēys	fræs	frəs]
3.√[fræs	frēys	frəs]
4. [kāf	kæf	√kōwf]
5.√[nōwl	nāl	nʌl]
6. [nōwlək	√nālək	nōwlək]
7.√[klɪt	klāyt	klʌt]
8.√[klāyt	klɪt	klʌt]
9.√[rīys	rəs	rəs]
10. [ræs	√rəs	rīys]
11. [wærb	wɛrb	√wārb]
12. [kʌs	kōws	√kōhs]
13. [trēy	√trōh	trāw]
14.√[mʌnɚ	myūwnɚ	mōwnɚ]
15.√[myūwn	mʌn	mōwn]

*Correct answers are checked.

B. Example: [nēyt] = NATE

Pronunciation	Spelling
16. [sūwm]	SOOM 1
17. [drīyt]	DREAT 3
18. [strēys]	STRACE 3
19. [bāyv]	BIVE 1
20. [tōwf]	TOAF 1
21. [rəliym]	RELEME 2
22. [klōwp]	CLOPE 3
23. [kʌč]	CUTCH 1
24. [krāt]	CROT 1
25. [lɛθ]	LETH 3

MEWS Unit II Pretest

A. Example: 1 2 3
 [fɛsiyən √fɛʃən fɛsāyən]

Pronunciations*			
1	2	3	
1. [lækətīy	√læsətīy	læʃətīy]
2.√[āpčərəl	āpsərəl	āpsurəl]
3. [ʃəlēysən	ʃəlēytiyən	√ʃəlēyʃən]
4.√[træŋ]	træŋ	træŋgə]
5. [trāydənk	√trāydəns	trāydənsʃ]
6. [dārtiyəl	√dārʃəl	dārčəl]
7. [klædtiys	klædičəs	√klædʃəs]
8. [nārtɔsiyən	√nārtɔʃən	nārtɔkiyən]
9.√[liʃən	liʃiyən	liʃiyən]
10.√[ɪmpiyjər	ɪmpɛdyūr	ɪmpɛʃər]
11. [ækrɔsāyz	√ækriʃāyz	ækriʃkāyz]
12. [lætər	lætyūr	√lēyčər]
13. [rōwtāyən	√rōwʃən	rōwčən]
14.√[rōwtəv	rōwčəv	rōwʃəv]
15. [læʒəltiy	√lēyziyælətiy	lēyʃiyælətiy]

*Correct answers are checked.

B. Example:
 [bæʃər] = BADURE

Pronunciation	Spelling	
16. [riʃətīy]	RICITY	1
17. [krōw]	CROGE	2
18. [lēyʃəl]	LASIAL	3
19. [plōwčər]	PLOTURE	2
20. [grātəŋ]	GROTTING	1
21. [myūwʃən]	MUSION	2
22. [miyjər]	MEDURE	3
23. [lūwdənʃəl]	LUDENTIAL	1
24. [lūwdənsiy]	LUDENCY	2
25. [nāytriʃən]	NITRITION	1

MEWS Post-test

Questions 1 through 25 = Unit I Pretest

Questions 26 through 50 = Unit II Pretest

Student Instructional Material

MEWS UNIT I

THE SOUNDS OF GENERAL AMERICAN ENGLISH*

	Symbol	Spelling	Sound	Symbol	Spelling	Sound
VOWELS		TENSE			LAX	
		<u>BEE</u>	[bīy]	[e]	<u>BET</u>	[bet]
		<u>FATE</u>	[fēyt]	[ɛ]	<u>RAT</u>	[rɛt]
		<u>BITE</u>	[bāyt]	[i]	<u>BIT</u>	[bit]
		<u>MOB</u>	[māb]			
		<u>JAW</u>	[jɔh]			
		<u>TOY</u>	[tōy]			
		<u>GO</u>	[gōw]			
		<u>NOON</u>	[nūwn]	[ʌ]	<u>ABOVE</u>	[əbʌv]
		<u>NOW</u>	[nāw]	[u]	<u>PUT</u>	[put]
		<u>FUSE</u>	[fyūwz]			
				[ə]	<u>ABOVE</u>	[əbʌv]
NON-VOWELS	[p]	<u>PEP</u>	[pep]	[h]	<u>HAT</u>	[hɛt]
	[b]	<u>BOB</u>	[bāb]	[tʃ]	<u>CHURCH</u>	[tʃɜɜ]
	[t]	<u>TOT</u>	[tāt]	[j]	<u>JUDGE</u>	[jʌdʒ]
	[d]	<u>DID</u>	[did]	[m]	<u>MOM</u>	[mām]
	[k]	<u>KICK</u>	[kik]	[n]	<u>NONE</u>	[nan]
	[g]	<u>GAG</u>	[gɛg]	[ŋ]	<u>SING</u>	[sɪŋ]
	[f]	<u>FIVE</u>	[fāyv]	[l]	<u>LULL</u>	[lʌl]
	[v]	<u>VIEW</u>	[vyūw]	[r]	<u>RARE</u>	[rɛr]
	[θ]	<u>THIN</u>	[θɪn]	[w]	<u>WELL</u>	[wel]
	[ð]	<u>THEN</u>	[ðen]	[hw]	<u>WHAT</u>	[hwɛt]
	[s]	<u>CEASE</u>	[siys]	[y]	<u>YELL</u>	[yel]
	[z]	<u>ZOOS</u>	[zūwz]			
	[ʃ]	<u>SHIP</u>	[ʃip]			
	[ʒ]	<u>ASIA</u>	[eyʒə]			

* As reflected in the output of the rules in Chapter 5 of The Sound Pattern of English by Noam Chomsky and Morris Halle (New York: Harper & Row, 1968).

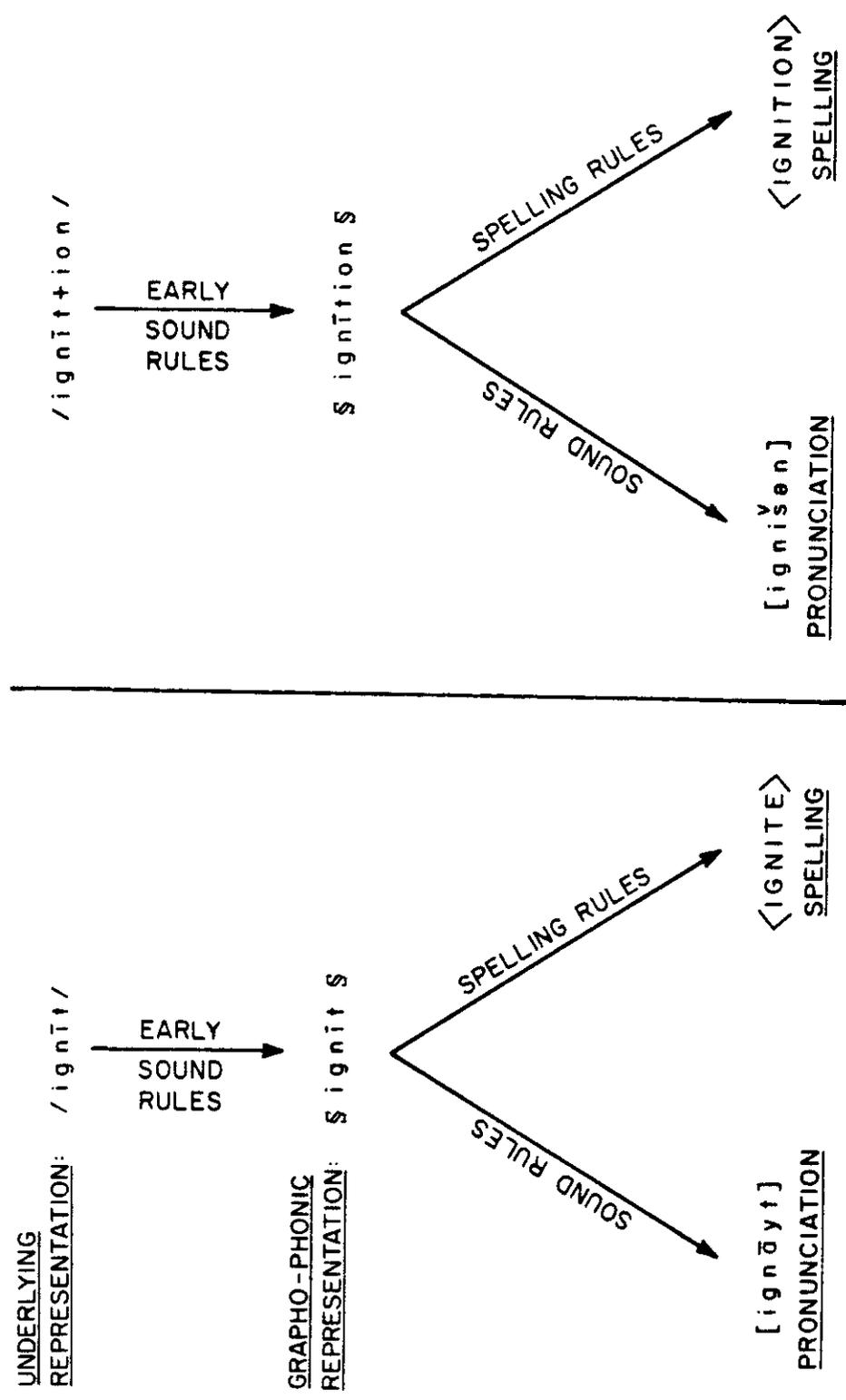
ALTERNATING ENGLISH FORMS

<u>Shorter Form</u>	<u>Longer Form</u>
FIN <u>I</u> TE	INFIN <u>I</u> TY
NAT <u>U</u> RE	NAT <u>U</u> RAL
FACE	FAC <u>I</u> AL
DIV <u>I</u> NINE	DIV <u>I</u> NITY
BEAST	BEST <u>I</u> AL
RES <u>I</u> DE	RES <u>I</u> DUAL
IM <u>P</u> OSE	IM <u>P</u> OSTER
PROV <u>O</u> KE	PROV <u>O</u> CATIVE
FLE <u>E</u>	FLE <u>D</u>
GRATE <u>F</u> UL	GRAT <u>I</u> TUDE
PRE <u>S</u> CRIBE	PRE <u>S</u> CRPTION
RE <u>M</u> IT	RE <u>M</u> ISSION
IMP <u>P</u> UNITY	P <u>N</u> ISH
ST <u>U</u> DIO	ST <u>U</u> DY
DU <u>K</u> E	DU <u>C</u> HESS
HO <u>U</u> SE	H <u>U</u> SBAND

A shorter form and related longer forms are called alternations because they follow a general pattern of sound change. Although the pronunciations of shorter and longer related forms differ, the base which they share is spelled alike.

ALTERNATIONS PERMIT NATIVE SPEAKERS OF ENGLISH TO KNOW
HOW TO SPELL.

ALTERNATIONS ALSO PERMIT NATIVE SPEAKERS OF ENGLISH TO
KNOW PRONUNCIATIONS.



Relationship between Alternating English Forms

Deriving from a common underlying representation, both of the related words <IGNITE> and <IGNITION> include the spelling <IGNIT>. The pronunciations differ because pronunciation rules apply after the main spelling rules.

COMING AND GOING FROM ENGLISH

SPELLING TO SOUND

Sound Rules		Underlying Representation	Spelling Rules		
Example	Stressed Pronunciation		Main Mapping	Other Rules	Example
[sāytən] trāy dāy dāy bāyt	[āy]	/ī/	I →	Y IE YE I...E	CITING TRY DIE DYE BITE
[pīl] mānkīy * kūkīy *	[i]	/i/	I →	EI IE	PILL MONKEY COOKIE
[nīs] mīyt bīy mīyt	[iy]	/ē/	E →	IE EA EE E...E	NIECE MEAT BEE METE
[bēl] dēd	[e]	/e/	E →	EA	BELL DEAD
[rēyn] brēyk mēyt	[ēy]	/ā/	A →	AI EA A...E	RAIN BREAK MATE
[pāl]	[æ]	/a/	A →		PAL
[tūt] tāwə	[aw]	/ū/	U →	OU OW	OUT TOWER
[blūw] sān lmyūwn kud	[ūw] ^ yūw u	/u/	U →	OU	BLUE SUN IMMUNE COULD
[dūw] būwt sūw lūwz	[ūw]	/ō/	O →	OO OE O...E	DO BOOT SHOE LOSE
[mānīy] gād kōwld kōhst	[ā] ^ ōw sh	/o/	O →		MONEY GOD COLD COST
[bōwt] sōwl hōw hōwp	[ow]	/s/	O →	OA OU OE O...E	BOAT SOUL HOE HOPE
[dāl] perələs **	[ā]	/ə/	O →	OU	DOLL PERILOUS

NOTE: Some vowel sounds are ignored for simplicity in graphic representation.

* The [i] tenses under rules not covered here.

** The [ā] reduces to [ə] in an unstressed syllable.

SOME TENSE ~ LAX ALTERNATIONS IN ENGLISH

Pronunciation			SPELLING		
Tense	Lax Stressed	Lax Unstressed	Tense	Lax Stressed	Lax Unstressed
[āy]	~ [i]	[ə]	F <u>IN</u> ITE ~	IN <u>FIN</u> ITY ~	IN <u>FIN</u> ITE
[īy]	~ [e]	[ə]	M <u>ET</u> ER ~	M <u>ET</u> RIC ~	S <u>PEE</u> D <u>OM</u> ET <u>ER</u>
[ēy]	~ [æ]	[ə]	N <u>A</u> TURE ~	N <u>A</u> TURAL ~	N <u>A</u> TIV <u>ITY</u>
[ūw]	~ [ʌ]	[ə]	PR <u>O</u> DUCE ~ (verb)	PR <u>O</u> D <u>U</u> CTION ~	PR <u>O</u> D <u>U</u> CTIV <u>ITY</u>
[ūw]	~ [ʌ]	[ə]	M <u>OO</u> N ~	M <u>OO</u> N <u>DAY</u>	
[ōw]	~ [ā]*	[ə]	P <u>O</u> SE ~	P <u>O</u> SITIVE ~	IM <u>P</u> OSITION

* Tenseness in this vowel is the result of a late sound rule. From a systematic point of view, [ā] spelled o is clearly a lax vowel. In fact, it is traditionally called "short o."

PRACTICE WITH ALTERNATIONS

- A. Circle the number for the probable spelling of a longer form which alternates with a shorter form. The instructor will pronounce the shorter form and then the correct longer form.

Shorter Form	Longer Form		
	1	2	3
1. PROFANE	PROWFANITY	PROFANITY	PROFANNITY
2. SUPREME	SUPRIMACY	SUPREMACY	SUPREAMACY
3. VULGAR	VULGARITY	VULGERITY	VULGORITY
4. EXTREME	EXTREMITY	EXTREEMITY	EXTREAMITY
5. CHRIST	CHRISCHUN	CHRISSTIAN	CHRISTIAN
6. ILLUSTRATE	ILLUSTRUTIVE	ILLUSTRATIVE	ILLESTRATIVE

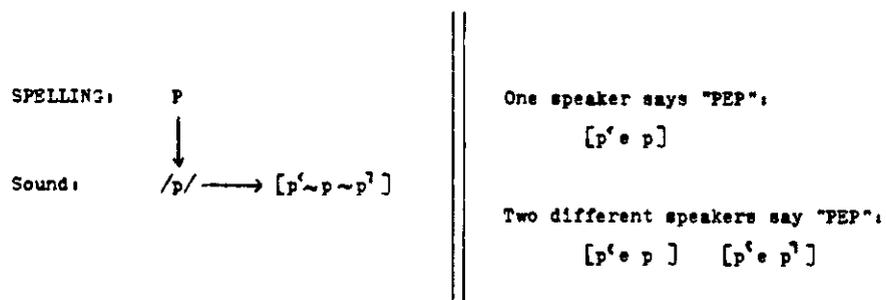
- B. Circle the number for the probable pronunciation of a shorter form which alternates with a longer form. The instructor will pronounce the longer form and three versions of a shorter form; only one of the versions will be correct. The correct short-form spelling is shown.

Longer Form	Spelling	Shorter Form		
		1	2	3
7. PHOTOGRAPHY	PHOTO	1	2	3
8. INSANITY	INSANE	1	2	3
9. LINEAR	LINE	1	2	3
10. INDIANA	INDIAN	1	2	3
11. ASIATIC	ASIA	1	2	3
12. IRONIC	IRONY	1	2	3
13. INTRODUCTION	INTRODUCE	1	2	3

MEWS UNIT II

WHAT IS "SPELLING WITH ONE SOUND"?

In this study, what do we mean when we say that a spelling has one sound?



We mean that a sound is distinct in meaning even though it may have varying pronunciations by different speakers, or even by the same speaker, depending on the surrounding sounds.

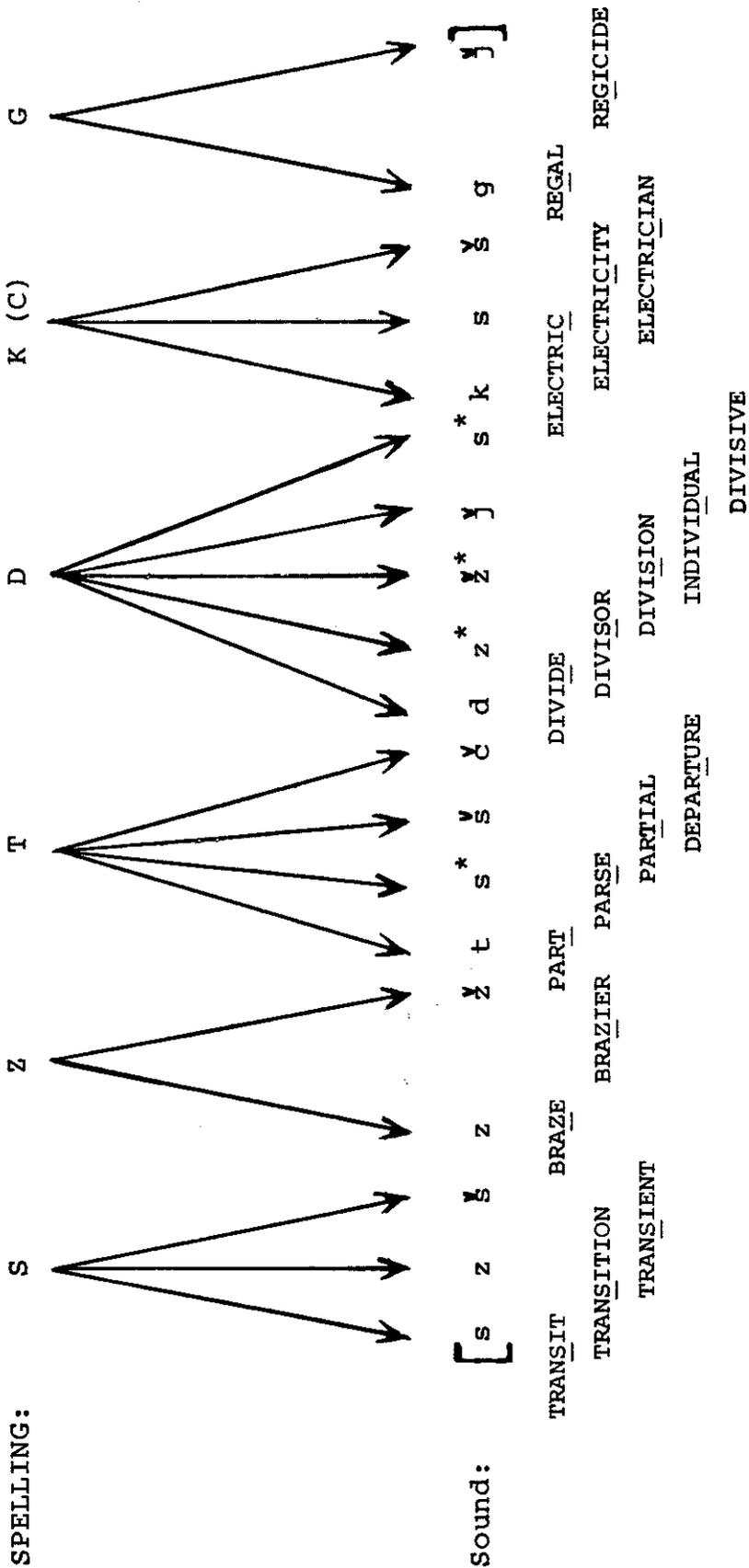
NON-VOWEL SPELLINGS WHICH HAVE ONE PRONUNCIATION

SPELLING:	P	B	F	V	J	GE	H	M	N	N ^K N ^G	L	R	Y	W
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Sound:	<u>PEP</u>	<u>BOB</u>	<u>FIFE</u>	<u>VERVE</u>	<u>JAM</u>	<u>GEM</u>	<u>HAT</u>	<u>MOM</u>	<u>NONE</u>	<u>SINK</u>	<u>LULL</u>	<u>RARE</u>	<u>YELL</u>	<u>WELL</u>

NON-VOWEL SPELLINGS WITH TWO LETTERS FOR A SOUND

SPELLING:	SH	CH	TH	WH
	↓	↓	∧	∧
Sounds:	[^v s]	[ç]	[θ]	[ð]
	SH <u>ISH</u> -KE <u>BAB</u>	CH <u>URCH</u>	TH <u>IN</u>	WH <u>EAT</u>
				WH <u>O</u>
				WH <u>OA</u>
				[w]

NON-VOWEL SPELLINGS WHICH HAVE ALTERNATING PRONUNCIATIONS



*Always respelled in the alternation to [s, z, ʒ].

Practice with Alternations

- A. Circle the number for the probable spelling of a longer form which alternates with a short form. The instructor will pronounce the short form and then the correct longer form.

Short Form	Longer Form		
	1	2	3
1. ARTIPICE	ARTIPICIAL	ARTIPISHIAL	ARTIPIISIAL
2. CONFIDENT	CONFIDENSHIAL	CONFIDENTIAL	CONFIDENTSHIAL
3. ABUSE	ABUZIVE	ABUCIVE	ABUSIVE
4. RIGOR	RIDGIDITY	RIGIDITY	RIJIDITY
5. ARDENT	ARDUOUS	ARJUOUS	ARDJUOUS
6. USE	UZERY	USHERY	USURY

- B. Circle the number for the probable pronunciation of a longer form which alternates with a shorter one. The instructor will give three pronunciations for the longer form, and you are to select the most likely one.

Shorter Form	SPELLING	Longer Form Pronunciation		
		1	2	3
7. PURGE	PURGATORY	1	2	3
8. CREDIBLE	CREDULOUS	1	2	3
9. COMPOSE	COMPOSURE	1	2	3
10. BENEFICE	BENEFICIAL	1	2	3
11. PARSE	PARTIAL	1	2	3
12. RUSSO	RUSSIAN	1	2	3
13. AUDACITY	AUDACIOUS	1	2	3
14. LONG	LONGITUDE	1	2	3

MASTERY OF THE ENGLISH WRITING SYSTEM

A Review of MEWS Units I and II

For Students of the English Language



Diana Mae Sims

1977

THE SOUNDS OF GENERAL AMERICAN ENGLISH*

	Symbol	Spelling	Sound	Symbol	Spelling	Sound	
<u>VOWELS</u>		<u>TENSE</u>			<u>LAX</u>		
		[i]	<u>BEE</u>	[bi]	[ɛ]	<u>BET</u>	[bet]
		[e]	<u>FATE</u>	[fet]	[æ]	<u>RAT</u>	[rat]
		[aɪ]	<u>BITE</u>	[bait]	[ɪ]	<u>BIT</u>	[bit]
		[ʌ]	<u>MOB</u>	[mab]			
		[ə]	<u>JAW</u>	[dʒə]			
		[əɪ]	<u>TOY</u>	[tɔɪ]			
		[o]	<u>GO</u>	[go]			
		[u]	<u>NOON</u>	[nun]	[ʌ]	<u>ABOVE</u>	[ə bʌv]
		[aʊ]	<u>NOW</u>	[naʊ]	[ʊ]	<u>PUT</u>	[pʊt]
		[ju]	<u>FUSE</u>	[fjuːz]	[ə]	<u>ABOVE</u>	[ə bʌv]
	<u>NON-VOWELS</u>	[p]	<u>PEP</u>	[pep]	[h]	<u>HAT</u>	[hæt]
[b]		<u>BOB</u>	[bab]	[tʃ]	<u>CHURCH</u>	[tʃɜrtʃ]	
[t]		<u>TOT</u>	[tat]	[dʒ]	<u>JUDGE</u>	[dʒʌdʒ]	
[d]		<u>DID</u>	[dɪd]	[m]	<u>MON</u>	[mɒn]	
[k]		<u>KICK</u>	[kɪk]	[n]	<u>NONE</u>	[nʌn]	
[g]		<u>GAG</u>	[gæg]	[ŋ]	<u>SING</u>	[sɪŋ]	
[f]		<u>PIPE</u>	[faɪp]	[l]	<u>LULL</u>	[lʌl]	
[v]		<u>VIEW</u>	[vjuː]	[r]	<u>RARE</u>	[raɪ]	
[θ]		<u>THIN</u>	[θɪn]	[w]	<u>WELL</u>	[wɛl]	
[ð]		<u>THEN</u>	[ðɛn]	[hw]	<u>WHAT</u>	[hwʌt]	
[s]		<u>CEASE</u>	[siːs]	[j]	<u>YELL</u>	[jɛl]	
[z]		<u>ZOOS</u>	[zuz]				
[ʃ]		<u>SHIP</u>	[ʃɪp]				
[ʒ]		<u>ASIA</u>	[eɪʒə]				

* Using a modified International Phonetic Association Alphabet to reflect the output of the rules in Chapter 5 of *The Sound Pattern of English* by Noam Chomsky and Morris Halle (New York: Harper & Row, 1968).

VOWEL SPELLINGS FOR ALTERNATING SOUNDS

For the tense~lax alternations of a vowel in related forms, sometimes the spelling changes from underlying representation to other predictable spellings. The following are the tense and lax spellings in English for an underlying vowel.

	TENSE	LAX	TENSE	LAX
<u>SPELLINGS:</u>	I Y IE* YE* I...E*	I ~ I | "I"	OU OW | | |	U ~ U | "U"
<u>Sounds:</u>	[aɪ]	~	[aʊ]	~ [ʊ ʌ ju v]
<u>SPELLINGS:</u>	E IE EA EE E...E*	E ~ EA | "E"	O OO O...E*	O ~ O | "O"
<u>Sounds:</u>	[i]	~	[e]	~ [ʌ ə ɔ]
<u>SPELLINGS:</u>	A AI EA A...E*	A ~ A | "A"	O OA OU OE* O...E*	O ~ O | "O"
<u>Sounds:</u>	[e]	~	[ə]	~ [o]

*Must be in final position.

ALTERNATING SOUNDS FOR VOWELS

4

VOWEL SPELLING
↓
Alternating Sounds

<p>SPELLING:</p> <p style="text-align: center;">I</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">FINITE INFINITY INFINITE</p> <p>Sounds: [aɪ ~ ɪ ~ ə]</p>	<p style="text-align: center;">U</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">BROWN BRUNET BRUNSWICK</p> <p>[aʊ ~ u ~ ʌ]</p>
<p>SPELLING:</p> <p style="text-align: center;">E</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">METER METRIC THERMOMETER</p> <p>Sounds: [i ~ e ~ ə]</p>	<p style="text-align: center;">O</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">POOR POVERTY PONY</p> <p>[u ~ a ~ o]</p>
<p>SPELLING:</p> <p style="text-align: center;">A</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">FLAME FLAMMABLE INFLAMMATION</p> <p>Sounds: [e ~ æ ~ ə]</p>	<p style="text-align: center;">O</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">PROVOKE PROVOCATIVE PROVOCATION</p> <p>[o ~ a ~ ə]</p>

Legend:

Tense

Lax

Stressed

Lax

Unstressed

Note: In English all lax unstressed vowels become schwa [ə].

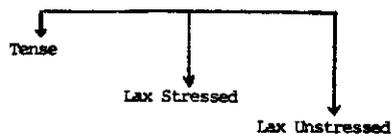
EXAMPLES OF
VOWEL ALTERNATING FORMS

I	U
FINITE ~ INF <u>I</u> NITY ~ INF <u>I</u> NITE	ROUT ~ R <u>U</u> TE ~ RUT
STR <u>I</u> KE ~ STR <u>I</u> CKEN	B <u>R</u> OWN ~ BR <u>U</u> NET ~ BRUNSWICK
DIV <u>I</u> NE ~ DIV <u>I</u> NITY	PRON <u>O</u> UNCE ~ PRON <u>U</u> NCIATION
WR <u>I</u> TE ~ WR <u>I</u> TEN	C <u>O</u> W ~ C <u>U</u> D
CHR <u>I</u> ST ~ CHR <u>I</u> STIAN	T <u>O</u> WER ~ T <u>U</u> RRET
L <u>I</u> NE ~ L <u>I</u> NEAR	P <u>O</u> WER ~ P <u>U</u> NITIVE
RES <u>I</u> DE ~ RES <u>I</u> DUAL ~ RES <u>I</u> DUE	D <u>O</u> WN ~ D <u>U</u> NE
E	O
EXT <u>E</u> ME ~ EXT <u>E</u> MITY	SCH <u>O</u> OL ~ SCH <u>O</u> LAR ~ SCH <u>O</u> LASTIC
ABB <u>E</u> VIATE ~ B <u>E</u> VITY	SH <u>O</u> E ~ SH <u>O</u> D
M <u>E</u> TER ~ M <u>E</u> TRIC ~ SPEEDOM <u>E</u> TER	F <u>O</u> OL ~ F <u>O</u> LLY
L <u>E</u> AVE ~ L <u>E</u> FT	SH <u>O</u> OT ~ SH <u>O</u> T
M <u>E</u> ET ~ M <u>E</u> T	L <u>O</u> SE ~ L <u>O</u> ST
B <u>R</u> EATH <u>E</u> ~ B <u>R</u> EATH	M <u>O</u> ON ~ M <u>O</u> NDAY
SUP <u>R</u> EME ~ SUP <u>R</u> EMACY	CH <u>O</u> OSE ~ CH <u>O</u> SE
B <u>E</u> AST ~ B <u>E</u> STIAL	
A	O
N <u>A</u> TURE ~ N <u>A</u> TURAL ~ N <u>A</u> TIVITY	PH <u>O</u> NE ~ PH <u>O</u> NIC ~ PH <u>O</u> NETIC
GR <u>A</u> T <u>E</u> FUL ~ GR <u>A</u> T <u>I</u> TUDE	C <u>O</u> NE ~ C <u>O</u> NIC
ACCL <u>A</u> IM ~ CL <u>A</u> MOR ACCL <u>A</u> MATION	PR <u>O</u> V <u>O</u> KE ~ PR <u>O</u> V <u>O</u> CATIVE
V <u>A</u> IN ~ V <u>A</u> NITY	CL <u>O</u> T <u>H</u> E ~ CL <u>O</u> T <u>H</u>
B <u>A</u> T <u>H</u> E ~ B <u>A</u> T <u>H</u>	G <u>O</u> ~ G <u>O</u> NE
P <u>A</u> L <u>E</u> ~ P <u>A</u> L <u>L</u> ID	H <u>A</u> RM <u>O</u> NIOUS ~ H <u>A</u> RM <u>O</u> NIC ~ H <u>A</u> RM <u>O</u> NY
VULG <u>A</u> T <u>E</u> ~ VULG <u>A</u> RITY ~ VULG <u>A</u> R	PH <u>O</u> T <u>O</u> ~ PH <u>O</u> T <u>O</u> GRAPHY
C <u>A</u> SE ~ C <u>A</u> SUALTY	IMP <u>O</u> SE ~ IMP <u>O</u> STER ~ IMP <u>O</u> SITION

Note:

English has two underlying O's. One O is said higher in the mouth than the other. Both underlying O's are represented in spelling by O or a combination of O with some other vowel letter. In speech, the higher O has the sound [u] in tense words, whereas the lower O is [o]. In alternations, the higher O can be [A], [a], [o], or [ɔ], whereas the lower O is always [a].

Legend:

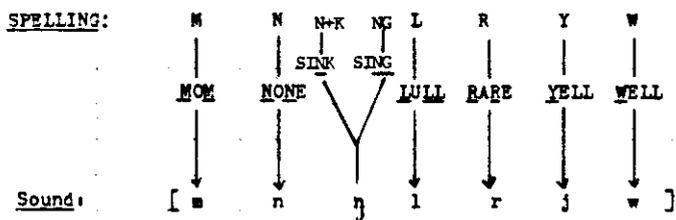
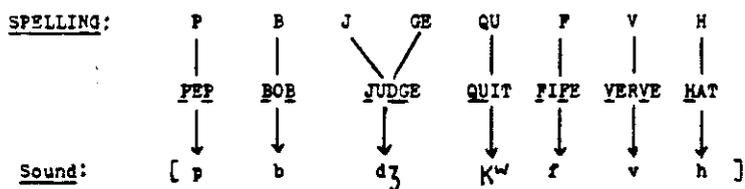


6

ENGLISH SPELLING: CONSONANTS WITH ONE SOUND

SPELLING One Sound

The following letters of the English writing system usually have the one sound shown:

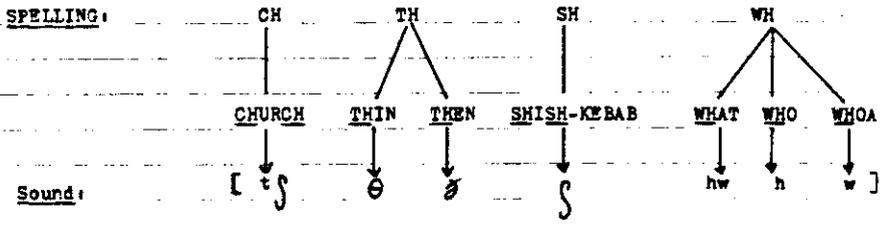


SPELLINGS WITH "H" FOR ONE SOUND

7



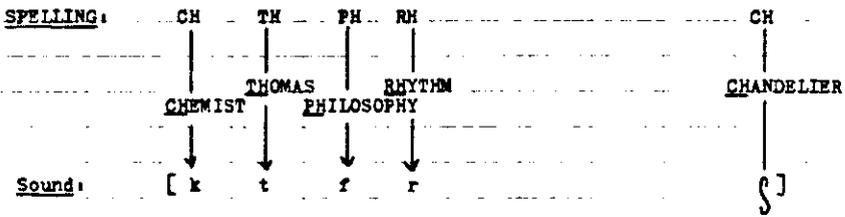
The following letters followed by "H" usually have the one sound shown:



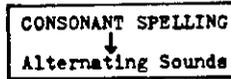
EXCEPTIONS: BORROWED WORDS

Greek

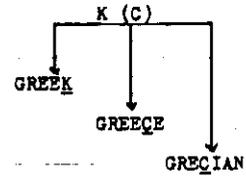
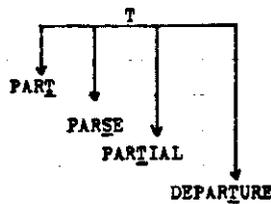
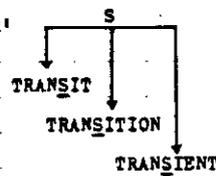
French



ALTERNATING SOUNDS FOR CONSONANTS

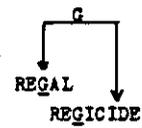
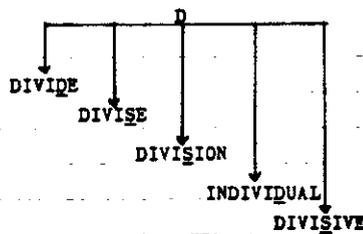


SPELLING:



Sounds: [s ~ z ~ ʃ] [t ~ s ~ ʃ ~ tʃ] [k ~ s ~ ʃ]

SPELLING:



Sounds: [z ~ ʒ] [d ~ z ~ ʒ ~ dʒ ~ s] [s dʒ]

Note: Some alternations are reflected in re-spellings.

EXAMPLES OF
CONSONANT ALTERNATING FORMS

S	T	K [C]
ABUSE (noun) = ABUSE (verb)	BENEVOLENT = BENEVOLENCE	MEDIC = MEDICINE
ADVICE = ADVISE	CONSEQUENT = CONSEQUENCE	CRITIC = CRITICIZE
CHOICE = CHOOSE	RESIDENT = RESIDENCE = RESIDENTIAL	INDUCT = INDUCE
CONSUME = RESUME	CONFIDENT = CONFIDENCE = CONFIDENTIAL	ELASTIC = ELASTICITY
FROST = FREEZE	EGYPT = EGYPTIAN	ELECTRIC = ELECTRICITY = ELECTRICIAN
TRANSIT = TRANSITION = TRANSIENT	EXPEDITE = EXPEDITIOUS	GREEK = GREECE = GREEKIAN
RUSSO = RUSSIAN	AUDIT = AUDITION	BENEFICE = BENEFICIAL
CONFESS* = CONFESSION	CAPTAIN = CAPTION = CAPTURE	VICE = VICIOUS
	PART = PARSE = PARTIAL = DEPARTURE	ARTIFICE = ARTIFICIAL
		AUDACITY = AUDACIOUS
		MUSIC = MUSICIAN
*English spellings do not end in only one S.		
Z	D	G
SEIZE = SEIZURE	INVADE = INVASION	LEGAL = LEGISLATE
BRAZE = BRAZIER	RESIDE = RESIDUAL	LONG = LONGITUDE
	ARDENT = ARDOUS	ANALOG = ANALOGY
	CREDIBLE = CREDULOUS	ALLEGATION = ALLEGE
	FRAUD = FRAUDULENT	RIGOR = RIGID
	COMPREHEND = COMPREHENSIVE	OBLIGATION = OBLIGE
	DECIDE = DECISIVE = DECISION	PURGATORY = PURGE
	INTRUDE = INTRUSIVE = INTRUSION	PUGNACIOUS = PUGILIST
	DIVIDE = DIVISE	REGAL = REGENT

NEWS UNIT I
PRETEST

A. BLACKEN THE NUMBERED BOX ON YOUR ANSWER SHEET FOR THE BEST OF THREE PRONUNCIATIONS TO REPRESENT EACH OF THE FOLLOWING NONSENSE WORDS FOR ENGLISH. FOR EXAMPLE:

HAMES 1 2 3

ON THE ANSWER SHEET YOU WOULD PUT A DARK PENCIL MARK THROUGH BOX NUMBER 2 FOR THE PRONUNCIATION YOU NOW HEAR FROM YOUR INSTRUCTOR. DO THE FOLLOWING NONSENSE WORDS IN THE SAME WAY:

SPELLING	PRONUNCIATIONS		
1. CEET	1	2	3
2. FRACE	1	2	3
3. FRASS	1	2	3
4. COAF	1	2	3
5. NOLE	1	2	3
6. NOLIC	1	2	3
7. CLIT	1	2	3
8. CLITE	1	2	3
9. REASE	1	2	3
10. RESS	1	2	3
11. WARB	1	2	3
12. COSS	1	2	3
13. TRAW	1	2	3
14. MUNNER	1	2	3
15. MUNE	1	2	3

-PAGE 1-

B. ON YOUR ANSWER SHEET MARK THROUGH THE BOX FOR NUMBER 1, 2, OR 3--WHICHEVER MATCHES THE PROBABLE SPELLING FOR A NONSENSE WORD FOR ENGLISH DICTATED BY YOUR INSTRUCTOR. FOR EXAMPLE:

FOR THE PRONUNCIATION YOU NOW HEAR: _____
 YOU WOULD MARK BOX NUMBER 1 ON YOUR ANSWER SHEET; THE PROBABLE SPELLING FOR THIS PRONUNCIATION IS NUMBER 1 FROM AMONG THE FOLLOWING CHOICES:

1 2 3

 NATE NATT NAT

NOW DO THE FOLLOWING NONSENSE WORDS IN THE SAME WAY:

	SPELLINGS		
16. SOOM	1	2	3
17. DRET	1	2	3
18. STRES	1	2	3
19. BIVE	1	2	3
20. TOAF	1	2	3
21. RELEME	1	2	3
22. CLOOP	1	2	3
23. CUTCH	1	2	3
24. CROT	1	2	3
25. LATH	1	2	3

-PAGE 2-

NEWS UNIT II
PRETEST

A. BLACKEN THE NUMBERED BOX ON YOUR ANSWER SHEET FOR THE BEST OF THREE PRONUNCIATIONS TO REPRESENT EACH OF THE FOLLOWING NONSENSE WORDS FOR ENGLISH. FOR EXAMPLE:

FESSION 1 2 3

ON THE ANSWER SHEET YOU WOULD PUT A DARK PENCIL MARK THROUGH BOX NUMBER 2 FOR THE PRONUNCIATION YOU NOW HEAR FROM YOUR INSTRUCTOR. DO THE FOLLOWING NONSENSE WORDS IN THE SAME WAY:

SPELLING	PRONUNCIATIONS		
1. LACITY	1	2	3
2. OPTURAL	1	2	3
3. GELLATION	1	2	3
4. TRANGE	1	2	3
5. TRIDENCE	1	2	3
6. DARTIAL	1	2	3
7. CLADITIOUS	1	2	3
8. NARTICIAN	1	2	3
9. LISSION	1	2	3
10. IMPEDURE	1	2	3
11. ACRICIZE	1	2	3
12. LATURE	1	2	3
13. ROTTION	1	2	3
14. ROTIVE	1	2	3
15. LASIALITY	1	2	3

-PAGE 1-

B. ON YOUR ANSWER SHEET MARK THROUGH THE BOX FOR NUMBER 1, 2, OR 3--WHICHEVER MATCHES THE PROBABLE SPELLING FOR A NONSENSE WORD FOR ENGLISH DICTATED BY YOUR INSTRUCTOR. FOR EXAMPLE:

FOR THE PRONUNCIATION YOU NOW HEAR: _____
YOU WOULD MARK BOX NUMBER 1 ON YOUR ANSWER SHEET; THE PROBABLE SPELLING FOR THIS PRONUNCIATION IS NUMBER 1 FROM AMONG THE FOLLOWING CHOICES:

1 2 3
BADURE BASHURE BAZURE

NOW DO THE FOLLOWING NONSENSE WORDS IN THE SAME WAY:

	SPELLINGS		
16.	1	2	3
17.	1	2	3
18.	1	2	3
19.	1	2	3
20.	1	2	3
21.	1	2	3
22.	1	2	3
23.	1	2	3
24.	1	2	3
25.	1	2	3

-PAGE 2-

MEWS
POST-TEST

A. BLACKEN THE NUMBERED BOX ON YOUR ANSWER SHEET FOR THE BEST OF THREE PRONUNCIATIONS TO REPRESENT EACH OF THE FOLLOWING NONSENSE WORDS FOR ENGLISH:

	PRONUNCIATIONS		
SPELLING	1	2	3
1. CEET	1	2	3
2. FRACE	1	2	3
3. FRASS	1	2	3
4. COAF	1	2	3
5. NOLE	1	2	3
6. NOLIC	1	2	3
7. CLIT	1	2	3
8. CLITE	1	2	3
9. REASE	1	2	3
10. RESS	1	2	3
11. WARB	1	2	3
12. COSS	1	2	3
13. TRAW	1	2	3
14. MUNNER	1	2	3
15. MUNE	1	2	3

-PAGE 1-

B. ON YOUR ANSWER SHEET MARK THROUGH THE BOX FOR NUMBER 1, 2, OR 3--WHICHEVER MATCHES THE PROBABLE SPELLING FOR A NONSENSE WORD FOR ENGLISH DICTATED BY YOUR INSTRUCTOR:

	SPELLINGS		
	1	2	3
16.	SOOM	SOM	SOAM
17.	DRET	DRITE	DREAT
18.	STRES	STRAS	STRACE
19.	BIVE	BIV	BAIV
20.	TOAF	TOFF	TOOF
21.	RELIME	RELEME	RELEM
22.	CLOOP	CLOPPE	CLOPE
23.	CUTCH	COCH	COOCH
24.	CROT	CROTE	CRAT
25.	LATH	LEETH	LETH

-PAGE 2-

C. BLACKEN THE NUMBERED BOX ON YOUR ANSWER SHEET FOR THE BEST OF THREE PRONUNCIATIONS TO REPRESENT EACH OF THE FOLLOWING NONSENSE WORDS FOR ENGLISH:

	PRONUNCIATIONS		
SPELLING	1	2	3
26. LACITY	1	2	3
27. OPTURAL	1	2	3
28. GELLATION	1	2	3
29. TRANGE	1	2	3
30. TRIDENCE	1	2	3
31. DARTIAL	1	2	3
32. CLADITIOUS	1	2	3
33. NARTICIAN	1	2	3
34. LISSION	1	2	3
35. IMPEDURE	1	2	3
36. ACRICIZE	1	2	3
37. LATURE	1	2	3
38. ROTTION	1	2	3
39. ROTTIVE	1	2	3
40. LASIALITY	1	2	3

-PAGE 3-

D. ON YOUR ANSWER SHEET MARK THROUGH THE BOX FOR NUMBER 1, 2, OR 3--WHICHEVER MATCHES THE PROBABLE SPELLING FOR A NONSENSE WORD FOR ENGLISH DICTATED BY YOUR INSTRUCTOR:

	SPELLINGS		
	1	2	3
41.	RICITY	RIKITY	RISHITY
42.	CROG	CROGE	CROGG
43.	LASHIAL	LASSIAL	LASIAL
44.	PLOSHURE	PLOTURE	PLOTTURE
45.	GROTTING	GROTING	GROOTING
46.	MOOSION	MUSION	MOUSION
47.	MESHURE	MEZURE	MEDURE
48.	LUDENTIAL	LUDENZIAL	LUDENSIAL
49.	LUDENSHY	LUDENCY	LUDENKY
50.	NITRITION	NITRICHION	NITRISION

-PAGE 4-

CHAPTER V

ANALYSIS OF DATA AND MATERIALS

Chapter IV of this dissertation reported procedures for carrying out the purposes of this research. The procedures included development of materials applying generative phonological principles to the teaching of MEWS in ESL, and the use of the materials in a pilot study. After the preliminary MEWS instruction was developed and used, all data from the pilot study were tabulated. Following these steps, statistical techniques were carried out by computer. This present chapter reports the statistical techniques and analyses. On the basis of these analyses, the preliminary MEWS materials were evaluated. A second section of Chapter V contains discussion of the evaluation.

Statistical Analysis of Pilot Study

Twenty different statistical tests on the data from the pilot project were obtained with the aid of research specialists and an electronic computer. At the NTSU Computer Systems Center, which ran all of the statistical analyses, a computer technician assisted in preparing the data for computer analysis and in overseeing statistical jobs as they were executed. In addition, counselors at the

Center for Research and Evaluation at NTSU provided guidance in a determination of which statistical techniques to order.

This section contains a report of the statistical analyses. Statistical formulas for the analyses are shown in Appendix I. In the formulas and in analyses discussed below, the following statistical symbols are used:

N	=	total frequencies or measures
X	=	a measure or a subject
\bar{X}	}	= mean of measures
M		
S	=	standard deviation
r_{xx}	=	Kuder-Richardson reliability coefficient
df	=	degrees of freedom
F	=	<u>F</u> -ratio
p	=	probability level
r	=	correlation
n.s.	=	not significant
k	=	total groups
>	=	greater than
<	=	less than
R.S.	=	raw score
Σ	=	summation
z	=	a standard score having a mean of zero and a standard deviation of one

The order of discussion in this section is roughly the chronological order of parts of the pilot study to which these topics relate:

Demographic Data
First Reading Test
MEWS Tests
Second Reading Test
Correlations

The statistical tests and results afforded a picture of the project from which to evaluate the pilot materials.

Demographic Data

By means of a double-column, numeric-frequency distribution technique, the study obtained percentage frequencies on demographic data about the fifty-three subjects in the pilot study. Classifications according to several variables provided the following information:

132B Section.--The four 132B participating classes differed somewhat in size. In the control group, Section I had 12 students (22.64 per cent of all subjects). In the experimental group, Section 2 had 13 students (24.53 per cent of all subjects), while Section 3 had 16 students (30.19 per cent), and Section 4 had 12 (22.64 per cent). These figures were useful in an analysis of whether top-scoring students proportionately represented the control and experimental groups (see below, under MEWS Tests).

Age.--The largest category according to age was twenty-three years. Of all the subjects, 15.09 per cent were in this age category. Although they ranged from nineteen to

fifty-three years, 92.47 per cent of the subjects were between nineteen and twenty-nine years old.

Sex.--Only 15.09 per cent of the subjects were women.

Language.--Arabic-speaking students constituted 39.62 per cent of all students in the study. Farsi speakers constituted 20.75 per cent of the subjects; Spanish, 15.09 per cent; and eight other L_1 's, the remaining 24.54 per cent. Despite the plurality of Arabic speakers in the study, none was in the control group. These figures were useful in analysis of whether speakers of certain L_1 's scored higher than others (see below among MEWS Tests).

Higher education.--Among the subjects, 52.83 per cent had a year of college, and 26.42 per cent had two years. The remaining 20.75 per cent had three or more years of higher education.

ESL training.--With respect to previous study of English, 41.51 per cent of the subjects had studied ESL for a year since leaving secondary school, and 35.85 per cent for two years. The remaining 22.64 per cent had three or more years of ESL training. This percentage of 22.64 roughly approximates the 20.75 percentage figure for students with three or more years of college. The findings warrant the conclusion that whatever their major, subjects who had

three or more years of higher education had taken ESL while in college.

These statistics about subjects in the pilot study present a composite picture of a subject who is twenty-three years old, a male from Saudi Arabia, a native speaker of Arabic with sophomore or junior college standing, and an ESL student throughout college years.

First Reading Test

For all subjects in the pilot study, the mean grade-level equivalents on parts of the Nelson-Denny Reading Test were low. The test results were those shown in Table IX. Since the total score combines vocabulary and weighted comprehension scores, it is the most indicative part of the test and is an index of overall reading ability (Brown, Nelson, and Denny:3). When compared with scores of native speakers, the total mean for subjects in the pilot study places them in the second percentile rank.

The chief purpose for administration of the Nelson-Denny, however, was to determine whether control and experimental groups were similar in their ability to read English morphemes. Using an analysis of variance statistical technique, a comparison between control and experimental groups on mean raw-score totals on this test showed no significant difference. The data on raw scores appear in Table X, and

on the analysis of variance in Table XI. A Fisher's t -test for the difference between means of two independent samples resulted in a t of 0.6861. This finding is not significant at a level equal to or greater than 0.05. It warrants the

TABLE IX
STUDENT MEAN GRADE LEVELS AND STANDARD DEVIATIONS
OF ERROR ON FIRST READING TEST

Section of Nelson-Denny Reading Test	N	\bar{X}	S	r_{xx}
Vocabulary	43	8.3093	1.8783	. .
Comprehension	44	7.6568	2.7296	. .
Total*	43	7.2628	2.6658	0.8915
Reading Rate	42	7.0881	3.1363	. .

*Computed by doubling comprehension raw score, adding vocabulary raw score, and converting the total to grade-level equivalent.

conclusion that control and experimental subjects did not differ significantly in the ability to read English morphemes.

Another statistical technique which was run on the Nelson-Denny test data bears mention. This was a Pearson Product Moment Correlation, on which all parts of the test correlated with each other. Using the mean grade-level equivalents shown in Table IX, the correlations of Table XII are all significant. These findings warrant the conclusion that vocabulary and comprehension scores are indicative of ESL reading ability. Both are significant, though not equally significant. The findings also warrant the conclusion

TABLE X
 MEAN-TOTAL RAW SCORES OF ESL STUDENTS
 ON FIRST READING TEST, BY GROUP

Group	N	Nelson-Denny Reading Test Total Raw Score	
		\bar{X}	S
Control	11	28.3636	12.7693
Experimental	32	32.1250	16.5173
Total	43	31.1628	15.5868

TABLE XI
 COMPARISON OF GROUPS ON
 FIRST READING TEST

Source of Variance	Sums of Squares	df	Variance Estimate	F	p
Groups	115.8150	1	115.8150	0.4707	
All Subjects	10088.0455	41	246.0499	. .	0.4965 (n.s.)
Total	10203.8605	42	. .	. .	. . . .

that English vocabulary appears to be one limiting factor for ESL learners in that students' vocabulary and comprehension scores are equally low. That is, students comprehend what they can read, but their limited proficiency with lexical items restricts their overall range of performance.

Item, test, and homogeneity analyses of the Nelson-Denny provided further dimensions of ESL student problems. A pattern of "difficult" and "easy" items is clear in data

of Table XIII, "Selected Item Responses by ESL Students on Vocabulary Portion of First Reading Test." Since the Nelson-Denny Reading Test has one hundred test items on vocabulary, a simplified presentation is displayed in the table. Only

TABLE XII
CORRELATION OF GRADE-LEVEL SCORES
BY ESL STUDENTS ON PARTS OF
FIRST READING TEST

<u>r</u>	Comprehension	Total	Reading Rate
Vocabulary	0.5750* df=42	0.8266* df=42	0.2829* df=40
Comprehension		0.8551* df=42	0.2715* df=41
Total			0.2618* df=41

*Indicates significance at a level ≥ 0.05 .

item means approaching 1.000 or approaching 0.000, and only test items having a negligible number of non-responses are shown. An item mean approaching 1.000 indicates a relatively easy item for persons taking the test. An item mean approaching 0.000 indicates a difficult question. The three lowest item means in Table XIII are those for test items consisting of a root or a root with a suffix. These items are <COPE, TAUT, BELLIGERENT>. On the other hand, the three highest item means in the table are for test items

TABLE XIII
 SELECTED ITEM RESPONSES BY ESL STUDENTS ON
 VOCABULARY PORTION OF FIRST READING TEST

Test Item: Synonym for--	\bar{x} *	S	No Response	Response Values by Frequency Distribution									
ILLEGIBLE	0.455	0.504	3	20 UNREADABLE**	8 ILLITERATE	7 IRREGULAR	4 SECRET	2 RESTRAINED	4 SECRET	7 IRREGULAR	9 CLING	7 CONTEND**	7 ASSIST
COPE	0.159	0.370	3	4 COMPARE	14 COPY	9 CLING	7 CONTEND**	7 ASSIST	7 CONTEND**	9 CLING	7 CONTEND**	7 ASSIST	7 ASSIST
TAUT	0.114	0.321	7	5 TENSE**	8 RIDICULED	10 AWKWARD	6 WISE	8 LANKY	6 WISE	10 AWKWARD	6 WISE	8 LANKY	8 LANKY
BELLIGERENT	0.205	0.408	3	16 PROUD	4 UNCOMFOR- TABLE	9 HOSTILE**	8 STRONG	4 HOSPITA- BLE	8 STRONG	9 HOSTILE**	8 STRONG	4 HOSPITA- BLE	4 HOSPITA- BLE
OBNOXIOUS	0.477	0.505	6	21 UNPLEASANT**	7 TRICKY	4 DANGEROUS	5 WILD	1 STUBBORN	5 WILD	4 DANGEROUS	5 WILD	1 STUBBORN	1 STUBBORN
CLOSELY CORRELATED	0.432	0.501	4	7 FITTED	19 RELATED**	3 PACKED	2 HELD	9 COMBINED	2 HELD	3 PACKED	2 HELD	9 COMBINED	9 COMBINED

*Highest \bar{x} on a vocabulary item was 0.477; lowest was 0.000.

**Indicates correct response.

consisting of a root with a prefix. These items are <ILLEGIBLE, OBNOXIOUS, CORRELATED>. Since these are only six out of one hundred vocabulary test items, the findings warrant no conclusion. Still, the fact that students scored higher on items consisting of prefixes might be explained by theorizing that students might be using knowledge of combining elements in English. Of course, recognition and guessing may also be possible explanations.

Subskills on the comprehension portion of the Nelson-Denny Reading Test also provide insight on ESL reading skills. Table XIV contains a representative selection of high and low item means from among ones having few non-responses. This section of the test contained thirty-six items, which students answered after reading a paragraph. In the test examiner's manual, the authors classify these items according to literalness and interpretation "to indicate a student's understanding of the main idea of a passage" (Brown, Nelson, and Denny, 1973:18-19). Using the classifications set by the test authors, Table XIV shows six test items on which means are higher for literal and detail questions than for interpretive or evaluative questions. These findings suggest further investigation in another area of research. The explanation may be that students may not have mastered English structures and forms in such a way as to go beyond recognition of English linguistic

TABLE XIV
 SELECTED ITEM RESPONSES BY ESL STUDENTS ON COMPREHENSION
 PORTION OF FIRST READING TEST

Test Item	\bar{X} *	S	No Response	Response Values by Frequency Distribution					Types			Evaluative	Analytical
				1	2	3	4	5	Literal	Interpretive	Detailed		
6	0.182	0.390	5	8**	6	12	3	10	..	✓	..	✓	..
7	0.182	0.390	2	16	10	8**	3	5	..	✓	..	..	✓
8	0.182	0.390	3	8*	11	4	6	12	..	✓	..	✓	..
9	0.773	0.424	2	1	3	34**	4	0	✓	..	✓	..	..
10	0.614	0.493	4	27**	5	1	3	4	✓	..	✓	..	..
15	0.318	0.471	12	4	4	14**	7	3	..	✓	..	..	✓

*Highest \bar{X} on a comprehension question was 0.773; lowest was 0.000.

**Indicates a correct response.

forms to higher levels of understanding, such as analysis and interpretation. Of course, some of the subjects in the research may not have been able to do so in reading their own L_1 .

MEWS Tests

On the MEWS tests developed in the study, a notable finding was a uniform disparity between scores of native speakers and ESL students. This finding has implications for teaching and testing ESL. It was, in fact, serendipitous. The research had focused on performance by experimental and control groups, and the administration of the tests to instructors was incidental. The scores of native speakers on MEWS tests appear in Table XV. The perfect or near-perfect scores shown in the table contrast markedly with the subjects' generally lower scores (see Appendix H). This finding warrants a conclusion that native speakers know nonsense words which second-language learners do not. Their knowledge is evidently not semantic knowledge, since nonsense words have no lexical meaning.

With respect to student scores on MEWS tests, Table XVI shows statistics for all subjects in the pilot study. These figures show little difference between performance by subjects on pretests and post-tests. The Kuder-Richardson estimate of test reliability, using Formula 20 for item-test analysis, shows a coefficient of 0.7 on the pretest for

vowels (Unit I), 0.5 on the pretest for consonants (Unit II), and 0.7 on the combined post-test. Since the MEWS tests measure several dimensions (see Table III) and are not

TABLE XV
MEWS SCORES BY NATIVE SPEAKERS

Teacher*	MEWS Pretest Score			MEWS Post-test Score		
	I	II	Total	I	II	Total
1	. .	24	. .	25	25	50
2	. .	25	. .	. .	. .	. .
3	25	24	49	25	24	49
4	25	24	49	24	24	48

*Three teachers are professors; one, a graduate assistant beginning a master's degree.

timed, Formula 20 underestimates their reliability.¹ These findings warrant the conclusion that the MEWS tests have a good level of consistency as measuring devices.

Analysis of covariance on MEWS test scores for both units showed no significant differences between control and experimental groups. Using total score on the Nelson-Denny and pretest scores on MEWS as covariates, a multiple regression approach to analysis of covariance was run with the

¹Another finding in the data of Table XVI is that pretests and post-tests of all subjects had a higher test mean on consonants (Unit II) than on vowels (Unit I). Though the difference is not significant using a Tukey's test, the consistency of a higher mean on both administrations of tests is notable. Also, all L₁'s except Spanish had higher means on tests of consonants than on vowels (see Table XXI). Chapter VI discusses these findings in a section on suggested curriculum changes.

TABLE XVI
MEWS STATISTICS FOR PILOT SUBJECTS

MEWS Test	Pretest			Post-test		
	\bar{X}	S	r_{xx}	\bar{X}	S	r_{xx}
Unit I	18.971	3.666	0.7051	18.714	3.473	0.6687
Unit II	19.400	2.570	0.4968	19.524	2.949	0.6200
Total	. . .	. . .	. . .	38.238	5.467	0.7528

sums of squares-mean squares method reported in Table XVII. The adjusted means for MEWS post-test scores were the ones shown in Table XVIII. Comparisons between means, using Tukey's test, produced the critical differences shown in Table XIX. With $k=2$ and $df=29$ and $df=28$ on Units I and II, respectively, neither statistic is significant at a level equal to or greater than 0.05.

TABLE XVII
COMPARISON OF EXPERIMENTAL AND CONTROL
GROUPS ON MEWS TESTS

Source of Variance	Regression Coefficients	Sums of Squares	df	Mean Squares	F	p
Unit I						
Total	(0.088610) 4.590345	295.4753	28	. . .	. .	. .
Within	(0.088799) 4.700289	294.4797	27	10.9067	. .	. .
Difference	. . . .	0.9956	1	0.9956	0.0913	0.7649*
Unit II						
Total	(0.024897) 0.887978	167.1469	27	. . .	. .	. .
Within	(0.025217) 0.895496	162.5568	26	6.2522	. .	. .
Difference	. . . .	4.5901	1	4.5901	0.7342	0.3994*

*Not significant at a level ≥ 0.05 .

TABLE XVIII

GROUP MEANS ON MEWS TESTS, ADJUSTED FOR
MEWS PRETEST AND FIRST READING TEST

Group	N	Unit I \bar{X}	N	Unit II \bar{X}
Control	9	18.3320	7	19.4448
Experimental	22	17.9096	23	18.5168

TABLE XIX

GROUP COMPARISONS BETWEEN MEANS ON MEWS
TESTS, USING TUKEY'S TEST

Tukey's Test:	
Group	Experimental
Unit I	
Control	0.4273 (n.s.)
Unit II	
Control	1.2117 (n.s.)
$p \leq 0.05$	

Analysis of covariance by native language showed that subjects whose L_1 's are Germanic had the highest adjusted mean on MEWS tests. With the Nelson-Denny Reading Test and MEWS pretests scores as covariates, a multiple regression approach to analysis of covariance was employed in this instance. Table XX compares L_1 groups on this statistical technique, and Table XXI shows adjusted means for MEWS post-test scores by L_1 group. The Germanic L_1 mean of 24.3285 on Unit II supports the suggestion that consonants are relatively easy for students whose L_1 is Germanic. Of

TABLE XX
COMPARISON OF L₁ GROUPS ON MEWS TESTS

Source of Variance	Regression Coefficients	Sums of Squares	df	Mean Squares	F	p
Unit I Total	(0.088610) 4.590345	295.4743	28	. . .	. .	. .
Within Difference	(0.047498) 5.106584	266.5562	21	12.6931	. .	. .
	. . . .	28.9192	7	4.1313	0.3255	0.9337*
Unit II Total	(0.024897) 0.887978	167.1469	27	. . .	. .	. .
Within Difference	(0.027896) 0.889968	138.0947	20	6.9047	. .	. .
	. . . .	29.0522	7	4.1503	0.6011	0.7479*

*Not significant at a level ≥ 0.05 .

TABLE XXI
L₁ MEANS ON MEWS TESTS, ADJUSTED FOR MEWS
PRETEST AND FIRST READING TEST

L ₁	N	Unit I \bar{X}	N	Unit II \bar{X}
Arabic	10	17.3606	12	18.1563
Farsi	5	18.2071	2	19.0019
Spanish	7	19.7898	7	19.4678
Chinese	2	18.2185	2	19.7288
Thai	1	16.8135	1	18.8496
Vietnamese	2	15.3893	2	17.8826
Germanic	1	18.4360	1	24.3285
Miscellaneous*	3	17.7878	3	17.1481

*One each of Japanese, Tagalog, and Yoruba, analyzed as a single group.

course, the finding may also be related to length of previous study rather than to language background.

Comparisons among means, using Tukey's Test, produced differences reported in Table XXII. A table of values was entered with $k=8$ and $df=29$ and $df=28$ on Units I and II, respectively, without any significant finding. Since the number of subjects in each L_1 group is small, this finding is not necessarily definitive.²

Another noteworthy finding in results of the MEWS tests concerns the frequency distribution of the highest-scoring subjects. Analysis of high performers on the MEWS tests according to L_1 was run to determine whether language stock is a factor in reading skill. Table XXIII shows data for all L_1 's represented. The table shows a frequency for actual high scorers from each L_1 group (the "observed" frequency) and a frequency for a uniform distribution of groups (the "expected" frequency), according to demographic data (see above under Language). A chi-square goodness-of-fit test was calculated from the data in Table XXIII, and the statistic was compared with the tabled value having three degrees of freedom. The calculated statistics of 3.5000, 2.6746, and 1.2126 were not significant on a one-tailed test

²A third analysis of covariance, this one by sex, using the same covariates, showed that females had higher adjusted means on MEWS tests for both units (18.9296 and 20.2365) than did males (17.8993 and 18.5663). Comparisons between means with Tukey's Test showed the differences not significant.

TABLE XXII

L₁ COMPARISONS AMONG MEANS ON MEWS
TESTS, USING TUKEY'S TEST

Tukey's Test*	L ₁ Group							Misc. **
	Farsi	Spanish	Chinese	Thai	Vietnamese	Germanic		
Unit I	-0.3048	-0.8749 -0.5700	-0.3090 -0.0041 0.5659	0.1971 0.5019 1.0719 0.5060	0.7100 1.0148 1.5849 1.0189 0.5129	-0.3873 -0.0825 0.4876 -0.0783 -0.5844 -1.0973	-0.1539 0.1510 0.7210 0.1551 -0.3509 -0.8638 0.2334	
Unit II	-0.3941	-0.6112 -0.2171	-0.7328 -0.3387 -0.1216	-0.3231 0.0710 0.2881 0.4097	0.1275 0.5216 0.7387 0.8603 0.4506	-2.8762 -2.4822 -2.2651 -2.1435 -2.5531 -3.0038	0.4698 0.8639 1.0810 1.2026 0.7929 0.3423 3.3460	

*All comparisons shown are not significant at $p \leq 0.05$.

**One each of Japanese, Tagalog, and Yoruba, considered as a group.

TABLE XXIII
ANALYSIS OF MEWS TESTS FOR L_1 AS A FACTOR
IN HIGH SCORING¹

L_1	Unit I Pretest		Unit II Pretest		Post-test	
	Expected Frequency	Observed Frequency	Expected Frequency	Observed Frequency	Expected Frequency	Observed Frequency
Arabic	6	6	5.9	4	5.9	5
Farsi	3	3	3.1	5	3.1	3
Spanish	2	1	2.3	2	2.3	3
Chinese	1	2	1.1	1	1.1	1
Thai	1	2	0.6	1	0.6	1
Vietnamese	1	0	0.6	0	0.6	0
Germanic	1	1	0.6	1	0.6	1
Miscellaneous	1	1	0.8	1	0.8	1
N	16	16	15.0	15	15.0	15

df=7

Chi-square: Unit I pretest = 3.5000 (n.s.)
Unit II pretest = 2.6746 (n.s.)
Post-test = 1.2126 (n.s.)

at a level ≥ 0.05 . These findings warrant a conclusion that L_1 groups contained high scorers proportional to their numbers of subjects in the study.

Similarly, a chi-square statistic was run on MEWS post-test scores according to control and experimental groups. The purpose was to determine whether the treatment subjects scored higher. If they did, the finding could be interpreted as the result of the MEWS instruction. Table XXIV shows data for both groups on the MEWS Post-test. The actual number of high scorers from each group is the "observed" frequency, and a uniform frequency distribution of groups according to demographic data is the "expected"

TABLE XXIV
ANALYSIS OF MEWS POST-TEST FOR CONTROL OR
EXPERIMENTAL GROUP AS A FACTOR IN HIGH SCORING

Group	Frequency	
	Expected	Observed
Control	3.4	2.0
Experimental	11.6	13.0
N	15.0	15.0

df=1 chi-square=1.1377 (n.s.)

frequency (see 132B Section above). A chi-square goodness-of-fit test was calculated from the data in Table XXIV by using a Yates continuity correction since there were only two categories. The statistic was compared with the tabled value having one degree of freedom and was found to be not significant at a level equal to or greater than 0.05. This finding warrants the conclusion that control and experimental groups did not have significantly different scores on the MEWS Post-test and that the MEWS instruction had no significant effect among high scorers.

A final mention of MEWS test analysis concerns the relative difficulty of nonsense words in the test items. Table XXV lists nonsense words and item means on pretests and post-tests. The item mean is an indication of the number of correct answers on a test item as a percentage of all answers. The means in Table XXV are worth note in a

TABLE XXV
ITEM MEANS ON MEWS TESTS

Item	Item Mean		Item	Item Mean	
	Unit I Pretest	Unit I Post-test		Unit II Pretest	Unit II Post-test
CEET	0.771	0.857	LACITY	0.950	0.976
FRACE	0.857	0.810	OPTURAL	0.900	0.929
FRASS	0.714	0.833	GELLATION	0.825	0.690
COAF	0.829	0.738	TRANGE	0.650	0.667
NOLE	0.514	0.500	TRIDENCE	0.975	0.952
NOLIC	0.514	0.548	DARTIAL	0.600	0.619
CLIT	0.886	0.881	CLADITIOUS	0.600	0.738
CLITE	0.800	0.786	NARTICIAN	0.625	0.595
REASE	0.857	0.857	LISSION	0.750	0.619
RESS	0.714	0.738	IMPEDURE	0.300	0.524
NARB	0.743	0.786	ACRICIZE	1.000*	0.929
COSS	0.600	0.571	LATURE	0.875	0.905
TRAW	0.743	0.595	ROTION	0.950	0.881
MUNNER	0.571	0.571	ROTIVE	1.000*	0.976
MUNE	0.886	0.786	LASIALITY	0.625	0.690
SOOM	0.971	1.000*	RICITY	0.975	0.952
DREAT	0.800	0.857	CROGE	0.975	0.905
STRACE	0.914	0.905	LASIAL	0.500	0.333
BIVE	0.857	0.857	PLOTURE	0.875	0.881
TOAF	0.657	0.738	GROTTING	0.350	0.405
RELEME	0.743	0.619	MUSION	0.750	0.905
CLOPE	0.743	0.762	MEDURE	0.800	0.833
CUTCH	0.914	0.976	LUDENTIAL	0.775	0.905
CROT	0.657	0.548	LUDENCY	1.000*	1.000*
LETH	0.714	0.595	NITRITION	0.775	0.714

*Indicates a test item answered correctly by all subjects.

simple comparison of pretest and post-test with respect to each nonsense word. For example, subjects handled <NOLE> similarly on both administrations, but they scored lower on <LETH> on the readministration of the test.

Another finding from the data in Table XXV concerns items which students handled easily or not easily. For purposes of interpreting Table XXV, Table XXVI shows "difficult" and "easy" words. In the fourth column of Table XXVI are test items answered correctly by ninety per cent or more of the subjects. In the last column of Table XXVI are test items answered correctly by less than fifty-seven per cent of the subjects. Only words which had negligible percentage differences on both test administrations are listed. The data in Table XXVI warrant a conclusion that students in the study apparently had difficulty with <NOLE, NOLIC, MUNNER, IMPEDURE, LASIAL>, but not with <SOOM, STRACE, CUTCH, LACITY, OPTURAL, TRIDENCE, ACRICIZE, ROTIVE, CROGE, LUDENCY>. According to Table XXV, the item means for the question on <GROTTING> were 0.350 and 0.405. Apparently, <GROTTING> was the hardest item on the test. <SOOM, ACRICIZE, ROTIVE, LUDENCY>, which were answered correctly by all students on at least one test administration, were evidently the easiest items. Data in the table also warrant a further conclusion that <LUDENCY> evidently has morphological and phonological forms and structure which have been mastered

TABLE XXVI
 MEWS TEST ITEMS HAVING HIGH
 OR LOW ITEM MEANS

Test for--		Item	Item Mean	
Vowels	Consonants		High (≥ 0.90)	Low (≤ 0.57)
✓	• •	SOOM	✓	• •
✓	• •	STRACE	✓	• •
✓	• •	CUTCH	✓	• •
• •	✓	LACITY	✓	• •
• •	✓	OPTURAL	✓	• •
• •	✓	TRIDENCE	✓	• •
• •	✓	ACRICIZE	✓	• •
• •	✓	ROTIVE	✓	• •
• •	✓	RICITY	✓	• •
• •	✓	CROGE	✓	• •
• •	✓	LUDENCY	✓	• •
✓	• •	NOLE	• •	✓
✓	• •	NOLIC	• •	✓
✓	• •	MUNNER	• •	✓
• •	✓	IMPEDURE	• •	✓
• •	✓	LASIAL	• •	✓
• •	✓	GROTTING	• •	✓

by these subjects. All of them answered <LUDENCY> correctly on the pretest and post-test.

The data in Tables XXV and XXVI could be useful in revisions of MEWS tests and curricula. Table XXVI shows three test items on vowels and eight test items on consonants among "easy" items, i.e., ones having item means equal to or greater than 0.90. It also shows three test items on vowels and three on consonants among "hard" items, i.e., ones having items means equal to or less than 0.57. Since

the "easy" list contained more consonant items than vowel items, the finding may suggest that instruction in consonants should be given less emphasis in a revision of the MEWS program. Of course, a study of a much larger sample of words among more subjects would be necessary in order to make a generalization.

Second Reading Test

The analysis of data from a second reading test justified adding this measure to the pilot study. Table XXVII recapitulates reading-test scores of the ten subjects who took both reading tests. Raw scores and grade-level equivalents are listed for the Nelson-Denny Reading Test and for the English Reading Test for Students of English as a Foreign Language. As the table reflects, the mean raw scores on both reading tests were equivalent to below sixth-grade level or that of "average intermediate students (third or fourth year in courses meeting three hours a week)," according to the test authors (King and Campbell, 1956:8). These findings warrant the conclusions that results on the second reading test cross-validated those on the Nelson-Denny Reading Test³ and that the tests evidently tap similar knowledge.

³Conversely, a correlation of reading scores on both tests failed to show significance. Neither a t-test for related samples or a Pearson r had values which were significant when tabled.

TABLE XXVII
 READING TEST SCORES OF SUBJECTS
 TAKING BOTH READING TESTS

Student	First Reading Test		Second Reading Test	
	Total Raw Score	Grade-Level Equivalent	Total Raw Score	Grade-Level Equivalent
1	21.0	<6.0	58.0	7.6
2	20.0	<6.0	44.0	<6.0
3	11.0	<6.0	44.0	<6.0
4	23.0	<6.0	64.0	8.8
5	24.0	<6.0	30.0	<6.0
6	18.0	<6.0	36.0	<6.0
7	44.0	9.5	52.0	6.4
8	29.0	6.8	68.0	9.6
9	18.0	<6.0	38.0	<6.0
10	32.0	7.3	62.0	8.4
\bar{X}	24.0 =	<6.0	49.6 =	<6.0

In addition to a distribution analysis of the second reading test, an item, test, and homogeneity analysis was also run. Table XXVIII shows item means for the fifty questions on this test. According to the data, only three questions were answered correctly by everyone:

<u>Item</u>	<u>Question</u>	<u>Answer</u>
1.	A person may be justly proud when he--	does something well.
3.	We have our clothes washed so that they won't be--	dirty.
5.	When it's very windy, the water in the lake is--	rough.

TABLE XXVIII
ITEM MEANS ON SECOND READING TEST

Test Portion			
Vocabulary		Comprehension	
Item	Item Mean	Item	Item Mean
1	1.000*	19	0.0 **
2	0.050	20	0.050
3	1.000*	21	0.150
4	0.0 **	22	0.850
5	1.000*	23	0.050
6	0.550	24	0.800
7	0.700	25	0.0 **
8	0.250	26	0.300
9	0.0 **	27	0.450
10	0.450	28	0.500
11	0.100	29	0.250
12	0.0 **	30	0.200
13	0.650	31	0.150
14	0.0 **	32	0.100
15	0.200	33	0.100
16	0.050	34	0.0 **
17	0.550	35	0.100
18	0.250	36	0.550
		37	0.100
		38	0.150
		39	0.500
		40	0.050
		41	0.0 **
		42	0.0 **
		43	0.050
		44	0.450
		45	0.050
		46	0.200
		47	0.050
		48	0.400
		49	0.150
		50	0.050

*Indicates item answered correctly by all subjects.

**Indicates item answered correctly by no one.

Nine questions were answered correctly by no one. Four of these questions are as follows:

<u>Item</u>	<u>Question</u>	<u>Answer</u>
9.	Which of these would be a natural answer to the question, "How many years have you been here?"	almost five years now.
12.	If you are <u>going to</u> swim, it means--	you intend to do it.
14.	Healing devices are generally administered by--	doctors.
19.	Books are received--	daily.

Item 19 concerned a paragraph which subjects read before they answered the question. It calls for an inferential answer. The low scores on item 19 parallel the students' low scores on inferential questions in the first reading test. These findings suggest investigation into whether students who do not know the basic English structures and expressions tested in these items have received sufficiently effective exposure to English. On the other hand, their reading skill in L_1 may also show low inferential ability.

Correlations

Data from the second reading test, along with other measures in the study, also provided a large correlational matrix with several significant coefficients. A simple correlation technique was run with twenty-five variables, and a Pearson correlation coefficient was obtained for each

variable in relation to all the others. Table XXIX indicates the coefficients for all possible combinations of twenty-five variables and the degrees of freedom for each coefficient. On a one-tailed test, all of the coefficients marked with an asterisk (*) were found to be significant at the 0.05 level according to a table of critical values.⁴

With respect to the correlations, interpretation of one sort of demographic comparison seems important. This comparison consists of several significant relationships between L_1 and parts of the Nelson-Denny Reading Test. These are recapitulated in Table XXX. While these significant correlations do not reveal which L_1 students do well or poorly, they warrant a conclusion that reading performance in English as a second language is somehow related to native language.

A finding in the correlations of Table XXIX is the high internal consistency of MEWS tests and the Nelson-Denny Reading Test. This finding is clear in the significant correlations of MEWS tests with each other and of portions of the Nelson-Denny Reading Test with each other.⁵

⁴The one-tailed test was appropriate since the study was chiefly interested in variables positively related to linguistic proficiency.

⁵In addition, recall from Tables IX and XVI the high reliability coefficients under Kuder-Richardson Formula 20 for the Nelson-Denny Reading Test (0.8915) and for the MEWS tests (varying from 0.4968 to 0.7528).

TABLE XXIX
CORRELATION OF ALL DATA IN PILOT STUDY

r	Age	Sex	L ₁	Native Country	Higher Education	Post-Secondary ESL	Group (Control or Experimental)	Vocabulary		First Reading Test Comprehension	
								Raw Score	Grade Level	Raw Score	Grade Level
132B Section	0.0141 (52)	-0.2073 (52)	-0.3184 (52)	-0.2711 (52)	-0.1013 (52)	0.0758 (52)	0.7694* (52)	0.0391 (42)	0.0410 (42)	-0.1578 (43)	-0.1649 (43)
Age		0.0685 (52)	-0.1413 (52)	-0.1054 (52)	0.2556* (52)	0.0809 (52)	-0.1132 (52)	-0.0235 (42)	-0.0309 (42)	-0.1791 (43)	-0.1653 (43)
Sex			0.2906* (52)	0.2858 (52)	0.1863 (52)	-0.0564 (52)	-0.1497 (52)	0.2556* (42)	0.2693* (42)	0.2376 (43)	0.2695* (43)
L ₁				0.9101 (52)	-0.0003 (52)	-0.2411 (52)	-0.2313 (52)	0.2780* (42)	0.2509 (42)	0.3895* (43)	0.3672* (43)
Native Country					0.1003 (52)	-0.992 (52)	-0.2256 (52)	0.4234* (42)	0.4063* (42)	0.4399* (43)	0.4163* (43)
Higher Education						0.4706* (52)	-0.1889 (52)	0.2207 (42)	0.2024 (42)	0.0259 (43)	0.0448 (43)
Post Secondary ESL							-0.1738 (52)	-0.0910 (42)	-0.1017 (42)	-0.2217 (43)	-0.2183 (43)
Group (Control or Experimental)								0.1428 (42)	0.1609 (42)	0.0323 (43)	0.0316 (43)
First Reading Test									0.9894* (42)	0.5956* (42)	0.5922* (42)
Vocabulary Raw Score										0.5788* (42)	0.5750* (42)
Vocabulary Grade Level											0.9826* (43)
Comprehension Raw Score											
Comprehension Grade Level											
Total Raw Score											
Total Grade Level											
Reading Rate Raw Score											
Reading Rate Grade Level											
Second Reading Test											
Unit I Pre-test											
Unit II Pre-test											
Total Pre-test											
Unit I Post-test											
Unit II Post-test											
Total Post-test											
Semester Grade											

^aNo women received the second reading test.

^bData available only for men.

^cProbably a spurious statistic. Subjects computed their own reading rate, one control subject entered on unrealistically high score.

TABLE XXIX--Continued

First Reading Test		Reading Rate		Second Reading Test ^a	MEMS Tests						Semester Grade ^b	Essay ^b
Total		Grade Level			Pretest			Post-test				
Raw Score	Grade Level	Raw Score	Grade Level		Unit I	Unit II	Total	Unit I	Unit II	Total		
-0.0463 (42)	-0.0288 (42)	0.1135 (41)	-0.0463 (41)	-0.1014 (10)	0.1354 (34)	0.0918 (39)	-0.1153 (47)	0.2048 (41)	-0.0365 (41)	0.1104 (41)	0.1858 (11)	0.0681 (11)
-0.1298 (42)	-0.1709 (42)	-0.1143 (41)	-0.0760 (41)	-0.0813 (10)	-0.3091 (34)	-0.3621 (39)	-0.1926 (47)	-0.1389 (41)	-0.0843 (41)	-0.1337 (41)	0.1665 (11)	0.0995 (11)
0.2611 (42)	0.2071 (42)	0.0549 (41)	0.0565 (41)	0.0 (10)	-0.0554 (34)	0.1192 (39)	0.1277 (47)	-0.0850 (41)	0.0901 (42)	-0.0054 (41)	0.0 (11)	0.0 (11)
0.3697 (42)	0.3171* (42)	0.2366 (41)	0.1595 (41)	0.0 (10)	0.1456 (34)	-0.0588 (39)	0.3464* (47)	-0.1725 (41)	-0.0130 (41)	-0.1266 (41)	0.0 (11)	0.0 (11)
0.4682* (42)	0.4223* (42)	0.2203 (41)	0.1304 (41)	0.0 (10)	0.1386 (34)	-0.1116 (39)	0.2437* (47)	-0.1345 (41)	-0.0423 (41)	-0.1083 (41)	0.0 (11)	0.0 (11)
0.1179 (42)	-0.0001 (42)	-0.1435 (41)	0.1378 (41)	-0.3412 (10)	-0.0682 (34)	-0.1815 (39)	-0.1393 (47)	0.0596 (41)	0.0195 (41)	0.0484 (42)	0.1189 (11)	0.1890 (11)
-0.1787 (42)	-0.2781 (42)	-0.3603 (41)	-0.3469 (41)	-0.6205 (10)	0.1410 (34)	-0.0273 (39)	-0.3111 (47)	0.1377 (41)	-0.1112 (41)	0.0275 (41)	-0.0186 (11)	0.0632 (11)
0.1065 (42)	0.1010 (42)	0.3764 ^c (41)	0.2667 ^c (42)	0.0 (10)	0.1944 (34)	0.1793 (39)	0.0153 (47)	0.2345 (41)	0.0513 (41)	0.1766 (41)	0.0 (11)	0.0 (11)
0.8330 (42)	0.8221* (42)	0.3218* (40)	0.2720* (40)	0.0569 (9)	-0.1223 (32)	0.0097 (32)	-0.0328 (40)	0.1536 (36)	0.1447 (36)	0.1693 (36)	0.1811 (11)	-0.0966 (11)
0.8170 (42)	0.8266* (42)	0.3255* (40)	0.2829* (40)	0.0299 (9)	-0.1292 (32)	0.0463 (32)	-0.0267 (40)	0.1929 (36)	0.1604 (36)	0.2012 (37)	0.2081 (11)	-0.0720 (11)
0.9336 (42)	0.8519* (42)	0.2871* (41)	0.2282 (41)	0.4142 (9)	0.2857 (32)	0.1300 (33)	0.0471 (41)	0.2078 (37)	0.2534 (37)	0.2661* (37)	0.3548 (11)	0.2443 (11)
0.9197 (42)	0.8551* (42)	0.3095* (41)	0.2715* (41)	0.3284 (9)	0.2219 (32)	0.0878 (33)	0.0031 (41)	0.1617 (37)	0.2316 (37)	0.2278 (37)	0.3939 (11)	0.2256 (11)
	0.9391* (42)	0.3341* (40)	0.2620* (40)	0.4356 (9)	0.1539 (32)	0.1437 (32)	-0.0145 (40)	0.1852 (36)	0.2464 (36)	0.2425 (36)	0.2934 (11)	0.1341 (11)
		0.3189* (40)	0.2618* (40)	0.3427 (10)	0.1317 (32)	0.1434 (33)	0.0195 (40)	0.2005 (36)	0.2641 (36)	0.2612 (36)	0.2172 (11)	0.0390 (11)
			0.9248* (41)	-0.0765 (8)	-0.0408 (30)	0.0885 (33)	0.0788 (39)	-0.0528 (35)	-0.0309 (35)	-0.0493 (35)	0.0854 (10)	-0.0160 (10)
				-0.2034 (8)	-0.1717 (30)	-0.0164 (33)	0.1093 (39)	-0.0932 (35)	-0.0853 (35)	-0.1034 (35)	-0.1493 (10)	-0.2006 (10)
					0.6730* (6)	0.2463 (26)	0.2405 (26)	0.5830* (9)	0.2841 (9)	0.5232* (9)	0.4322 (9)	0.3996 (9)
						0.5391* (26)	0.2980* (34)	0.6675* (29)	0.5401* (20)	0.6829* (29)	0.2348 (7)	0.2672 (7)
							0.2837* (39)	0.5233* (32)	0.6249* (32)	0.6520* (32)	0.3317 (9)	0.5180 (9)
								0.1875 (39)	0.2877* (39)	0.2743* (39)	0.0277 (11)	-0.0378 (11)
									0.4460* (41)	0.8758* (41)	0.5301* (10)	0.5861* (10)
										0.8227* (41)	0.3239 (10)	0.2123 (10)
											0.5067* (10)	0.4812 (10)
												0.9271* (11)

Legend

* Indicates significance at a level ≥ 0.05 on a one-tailed test.

() Indicates degrees of freedom.

TABLE XXX
SIGNIFICANT CORRELATIONS BETWEEN NATIVE LANGUAGE
AND FIRST READING TEST SECTIONS

L ₁ Correlated with Nelson-Denny Section	df	r	p*
Vocabulary raw score	42	0.2780	≤ 0.05
Vocabulary grade level	42	0.2509	≤ 0.05
Comprehension raw score	43	0.3895	≤ 0.01
Comprehension grade level	43	0.3672	≤ 0.01
Total raw score	42	0.3697	≤ 0.01
Total grade level	42	0.3171	≤ 0.025

*On a one-tailed test.

Of course, the findings do not reveal precisely what knowledge is being tested. MEWS tests, however, seem to tap related forms of knowledge, and the several parts of the Nelson-Denny also seem to tap related knowledge.

The correlations between sex and performances on parts of the Nelson-Denny Reading Test are also worth mention. As Table XXIX shows, sex of the subjects in the pilot study correlates significantly with the following portions of the first reading test: vocabulary raw score, vocabulary grade level, comprehension grade level, and total raw score. Moreover, the Pearson coefficients are approximately the same in each case: 0.2556, 0.2693, 0.2695, and 0.2611, respectively. All are significant at a level equal to or greater than 0.05. These findings warrant the conclusion that sex may be related to reading proficiency in English.

Another finding in the correlation matrix of Table XXIX is that the MEWS tests, and only the MEWS tests, correlated significantly with all other performance measures. In addition, the MEWS tests also correlated significantly with the subjects' native language at a level ≥ 0.05 . Table XXXI recapitulates the various significant findings with respect to MEWS tests and other variables.⁶ No other measure in the pilot study showed this extent of relatedness to other criteria. The finding warrants the conclusion that tests of English nonsense words provide one measure of areas of ESL proficiency.

In connection with testing for proficiency, the data supports a final note on test validity. The Nelson-Denny Reading Test appears to test not only reading but also other knowledge or skill. Supporting this conclusion are relationships between the Nelson-Denny and years of higher education, and between the MEWS tests and higher education. All parts of the Nelson-Denny correlated significantly with years of college. The correlations on these variables showed significant Pearson r 's of 0.4234, 0.4063, 0.4399, 0.4163, 0.4682, and 0.4223 at a level ≥ 0.05 . By contrast MEWS tests had negative or low positive correlation coefficients with respect to higher education (r 's of -0.0682,

⁶Only the MEWS tests on consonants (Unit II) failed to show significant correlations with other criteria in the study. Paradoxically, subjects had higher adjusted means on Unit II tests than on other MEWS tests (see Table XXI).

TABLE XXXI

SIGNIFICANT CORRELATIONS BETWEEN MEWS TESTS AND OTHER LANGUAGE MEASURES IN PILOT STUDY

MEWS Test	r_1	First Reading Test: Comprehension R.S.	Second Reading Test	Semester Grade	Essay
Unit I Pretest	0.3464 (47) [≥ 0.01]	0.2857 (32) [≥ 0.05]	0.6730 (6) [≥ 0.05]	. . . .	. . . .
Total Pretest	. . . .	. . . .	. . . .	. . . .	. . . .
Unit I Post-test	. . . .	. . . .	0.5830 (9) [≥ 0.05]	0.5301 (10) [≥ 0.05]	. . . . 0.5861 (10) [≥ 0.025]
Total Post-test	. . . .	0.2681 (37) [≥ 0.05]	0.5232 (9) [≥ 0.05]	0.5067 (10) [≥ 0.05]	. . . .

Legend

() degrees of freedom
[] level of significance on
a one-tailed test

-0.1815, -0.1393, 0.0596, 0.0195, and 0.0484, with none significant at a level ≥ 0.05). The first two to three years of college typically broaden a student's general education. Perhaps significant correlations of Nelson-Denny performance with college experience can be viewed as evidence of general knowledge as well as of mastery of the English writing system.

Evaluation of Preliminary MEWS Materials

Based on the foregoing analyses of data from the pilot project, an evaluation of the preliminary MEWS materials was undertaken. For the evaluation, the following items were relevant:

Effectiveness of MEWS Instruction

On MEWS pretests and post-test, subjects' scores were not significantly different (see Tables XVI, XIX, and XXIV and accompanying discussions). The preliminary MEWS instruction evidently had no effect. However, this part of the research was simply a pilot project with a short time allotted for the treatment, i.e., the use of MEWS materials. A pilot study is a short-range exploratory study carried out to test the feasibility of methods and to see what sorts of problems might be encountered. The conclusion is warranted, therefore, that the finding of no significance should be tentative rather than definitive.

Emphasis in Curriculum

Students consistently scored higher on Unit II (consonants) than on Unit I (vowels). This finding warrants the conclusion that instructional materials need to stress English vowels (see also Tables XVI and XXI and discussions). The division of the preliminary MEWS program into half vowel study and half consonant study is not appropriate in light of this conclusion.

Test Discrimination

Another finding about the MEWS tests is that many items on the MEWS Unit II pretest and post-test were answered correctly by all or a large percentage of subjects (see Tables XXV and XXVI and discussions). This finding warrants the conclusion that the tests do not discriminate as well as they might be expected to do among ESL students of the kind included in this research, with respect to their knowledge of English consonants.

Test Reliability

MEWS tests have reasonably high coefficients on tests for internal consistency (see Tables XVI and XXIX and discussions). This finding warrants the conclusion that MEWS tests are reliable.

Test Validity

MEWS tests significantly correlated with all other ESL and performance measures in the pilot study (see Table XXIX and discussion). This finding warrants the conclusion that MEWS tests are apparently valid as measures of proficiency in the morphological and phonological forms and structures of English. The MEWS tests do not measure reading comprehension, since test items have no lexical content.

Materials Validity

The instructional materials in the preliminary MEWS program concerned phonological and morphological derivation and alternation in English and the ways in which they are reflected in English spelling. Nonsense words making up the MEWS tests among the preliminary materials exhibit phonological and morphological alternation. Thus, the curriculum materials and tests cover similar content areas.

Materials Format

Emphasis in the MEWS materials was on theoretical foundations. These included the concepts of underlying forms, phonological principles of derivation and alternation, phonological rules, and relation of English orthography to phonological representations. One reason for this approach was that little class time was available for practice exercises since the experimental project was only

a pilot study. In what time was available, the objective in the research was to lay the conceptual groundwork essential to this approach. The concept of abstract levels of representation, though, proved to be a matter of which subjects seemed already aware. In addition, since student scores were not improved on post-test over pretests, evidently the philosophical content of the instructional materials was unnecessary or ineffective.

In connection with the purposes of this research, analyses of MEWS materials and data of the pilot project have been reported in this chapter. Chapter VI of this dissertation continues the discussion of salient findings reported in Chapter V and their implications for MEWS and ESL.

CHAPTER VI

CONCLUSION

To accompany the analyses in Chapter V, this final chapter of the dissertation reports conclusions from the research. It includes a summary of the problem, purposes, and procedures reported in detail in previous chapters. A second section contains discussion of revisions of preliminary MEWS materials based upon the evaluation reported in Chapter V. An accompanying Appendix J gives examples of the revised MEWS instruction. The chapter also reports recommendations and suggestions about testing in ESL, extending MEWS to ESD classes, and evaluating ESL materials. A final section of Chapter VI reports on implications of the research with respect to the appropriateness of generative phonological principles for teaching MEWS in ESL, the psychological reality of phonological forms represented by orthography in English, and the use of the MEWS approach among second-dialect speakers in reading acquisition.

Summary

A survey of the literature showed that materials for teaching English as a second language reflect little impact of generative phonological theory. Within a generative

framework, the nature and relatedness of English phonology and orthography were examined. Instruction and tests covering generative phonological and orthographic rules were developed and pilot-tested with fifty-three ESL college students. Subjects showed, among other characteristics, a sixth-grade mean reading level. They had more difficulty with English vowels than with consonants. In addition, they had scores on nonsense-word tests, developed in the research, which correlated significantly with seven other criteria. These criteria included measures of ability to use English.

The research identified, by means of the nonsense-word instruments, a uniform disparity between native-speaker and second-language learner ability. Since the tests involved no syntactic units, and since nonsense words have no semantic content, perfect scores by native speakers on the tests indicated knowledge of English morphology and phonology. Low scores by second-language learners of English indicated a lack of this kind of knowledge.

Conclusions: Contributions of the Research

By exploiting the necessity of knowledge about English phonology and morphology for skill in reading, the research sought a new approach to teaching MEWS in ESL. Instructional material and tests were developed. These were based on generative phonological principles of

derivation and alternation, and on the orthographic systems of English. These principles and systems were further investigated on an exploratory basis in a pilot project using the newly-developed materials. The experience of the pilot study provided information about formulation of such a program for ESL and about procedures for sound research in possible future investigations.

As pointed out in Chapter I, the use of the newly-developed materials to teach MEWS in ESL was specified as a pilot study. Accordingly, the same effects of the treatment among experimental subjects could not reasonably be expected in the pilot project as could be expected in a full use of the instruction over a longer period of time within a sound experimental design. Instruction in the writing system of English using phonological principles of underlying forms, derivation, alternation, and ordered rules involves content which requires numerous lessons and practice exercises. In the pilot study, the aim was to try out selected portions of the MEWS program so as to observe the practical effects of lesson techniques and, especially, the difficulties which might be encountered. These effects and difficulties were clarified in the course of the pilot study, and this aim of the research was therefore fulfilled even though the treatment group showed no significant gains in MEWS. A succeeding section of this chapter on the MEWS

Program gives details about the data which the pilot study provided.

In addition to the factor of a short time for the treatment, two other factors may account for the failure of the treatment to provide significant results among the experimental subjects. These were the following:

1. Little time was spent in actual instruction on the content areas of the MEWS program. This situation was the case, even though the pilot study extended over a four-week period, because the class time allotted for the pilot project by teachers of the experimental classes was taken up largely by the reading tests and MEWS tests. In fact, a total of only two hours of study and review and one hour of practice exercises was devoted to actual instruction among the experimental subjects.
2. As Appendix F shows, there was a high rate of absenteeism among subjects in the pilot study during the treatment period of April 11 to May 6, 1977. Of the three classes making up the experimental group, Sections 2 and 3 of 132B had especially high rates of absenteeism throughout this time. The

remaining class, Section 4, had lower absenteeism. Of course, students who missed any of the two hours of study and review and one hour of practice exercises did not receive all of the treatment. Moreover, students who were absent may not have received the MEWS handouts which were distributed as out-of-class study assignments.

In the light of the probable reasons for treatment results, the findings may be seen as tentative, not definitive. Indeed, a long-range study of the MEWS instruction in a sound experimental design is a desideratum. Other findings from the data of the pilot study support a view that the application of generative principles should be further investigated in separate research for effectiveness in teaching MEWS. These additional findings are discussed below under recommendations, suggestions, and implications.

MEWS Program

With respect to MEWS classroom material developed in the research, analysis and evaluation provided guidelines for revision of the program. These revisions were undertaken in order to make the materials appropriate for use by ESL students. The pilot project was a contribution of the research because it provided the data for the analyses.

Based upon the statistical analyses and the writer's experience in the pilot study, needed changes in techniques and instruction became apparent. These are listed below.

Changes in Techniques.--Conclusions about needed revisions in the original MEWS program cover five points:

1. Teachers should allow about two weeks for the study of a discrete grapheme or cluster of graphemes.
2. Each lesson should be used by at least one try-out class for feedback before revision of a lesson into final form.
3. Teachers should not hesitate to use phonetic transcription in presenting instruction.
4. An audio-cassette tape recording should be used for administering MEWS tests. One speaker should record instructions exactly like those on printed test forms. When students listen to the taped instructions, they can become accustomed to the speaker's voice, matched to a stretch of text, before they answer the test items.
5. The taped instructions for MEWS tests should include sounds from the farthest ranges on the vowel grid of American English, i.e., [īy, ūw, āh]. This sort of presentation allows students to become accustomed to features in the speech of the test administrator. Also, it should obviate any possible effects of dialectal variation.

Changes in Instruction.--Along with revised techniques for administering the MEWS program, needed revisions in instructional material were evident in these three areas:

1. The format of presentation of instructional materials should include briefly-worded rules, numerous examples, and frequent exercises which take up one spelling at a time, with its pronunciations.
2. Emphasis in the materials should be on vowels.
3. Instructional materials should contain as little discursive prose as possible. In ESL such a format is inefficient. The reason is that memory and recall are required to deal with the discursive language of a lesson before higher levels of understanding can deal with its content. Charts and other kinds of illustration, not dependent entirely on English-specific linguistic forms, offer information in a more direct way. In revised MEWS material, the aim should be to minimize the use of English as medium of instruction, and to restrict its use as much as possible to the content of a lesson.

New MEWS Instruction

Incorporating a number of the changes in methods and instruction enumerated above, revised MEWS materials were drawn up. Appendix J, "Selected Revisions of MEWS Instruction," contains examples of a lesson on combinations of <H> with other consonants and a lesson on <T>. The lesson on <H> aims to help students pronounce written occurrences of <H> preceded by other consonants. The lesson on <T> aims to help readers understand the relatedness of short and longer forms with underlying /t/. Each lesson has instruction and an exercise. These materials, benefitting from experiences

of the research, should be potentially more effective for ESL learners than were the preliminary ones.

Recommendations and Suggestions

Several concluding remarks about the initial problem need mention on the basis of this report. These consist of the recommendations and suggestions which follow below. They concern testing in ESL, improving upon ESL materials for teaching the English writing system, and extending the MEWS program to second-dialect learners of English.

On the Utility of Standardized Tests in ESL

This research showed that two standardized tests may be of questionable value for determining ESL proficiency. The tests are the Nelson-Denny Reading Test (Brown, Nelson, and Denny, 1973) and the English Reading Test for Students of English as a Foreign Language (King and Campbell, 1956). Two findings in the research warranted such a recommendation. One was that scores on the two tests failed to correlate with each other. Another was that they failed to correlate with an essay and semester grade in an ESL-related course. Of course, the aims of these reading tests are different, and they are normed for different groups (see Chapter IV, Nelson-Denny Reading Test and Second Reading Test). Granted that the expectation of grades in the ESL course may also have been an influence, whether these

instruments test exclusively for proficiency with linguistic structures and forms is still questionable. They may also test for comprehension skill and general knowledge.

On the Use of MEWS Tests in ESL

MEWS tests, in contrast with the two standardized reading tests administered in the pilot study, probably are valid measures of proficiency in the morphological and phonological forms and structures of English. Justification for this conclusion is the significant correlation of MEWS tests with other criteria, including measures of success in ESL.

A further conclusion about the MEWS tests involves the way native speakers respond with a high degree of accuracy to all test items. ESL students do not. Their contrasting behavior supports the conclusion that MEWS tests, unlike the two reading tests, concern linguistic competence in English. The reading tests apparently concern reading skill, cultural knowledge, and other factors.

The data of the study also verified statistical validity and reliability of the MEWS instruments as tests. Because of this finding and the findings mentioned above in this section, research in an additional area is recommended. This area is that of the possible use of MEWS tests for measuring proficiency in ESL.

On the Further Development of MEWS Tests

As mentioned above, native speakers generally do not miss test items on nonsense words such as those in the MEWS tests. This finding warrants recommendation of new research in this additional area of investigation because of its relevance to ESL. If this faculty of native speakers is the case, then ESL scores on MEWS tests can be interpreted according to their divergence from perfect scores of native speakers. At the heart of this conjecture is the equation of nonsense words with the fundamental forms and structures of a language, both phonological and morphological. Under such concept, the MEWS tests, if perfected for validity and reliability, are potentially susceptible to norming in such a way that concrete determinations of ESL proficiency may be available.

On the Use of MEWS Instruction for ESD

In developmental English classes for English as a second dialect (ESD), students exhibit some of the same problems that ESL students do. Lessons and exercises in the MEWS program might possibly be worth trying in these classes. This kind of approach to reading acquisition is not now available. Ironically, the numbers of ESD students increase despite nationwide efforts to alleviate functional illiteracy. For them, as well as for ESL students, the MEWS program may have promise.

On the State of the Art in ESL

Evaluations of teacher materials and instructional materials based on criteria which were established in the research ranged from low to high (see Chapter II). A few texts for student use met most of the criteria for favorable, or high, evaluation. Dixon, 1953, 1971, and Robertson, 1964, 1972, are examples. A logical question for investigation in an additional area is whether ESL students have similar judgments on ESL materials. Their evaluations, subjectively arrived at, could supplement information from an expanded objective evaluation similar to the one carried out in this research. Such investigation would serve two purposes. Educators and teachers would have information on student preferences before selecting classroom materials, and curriculum writers would have guidelines for developing new ESL materials.

Implications

On the Appropriateness of the MEWS Program for ESL

Students of English as a second language typically accept the concept of abstract underlying forms, foundation of the MEWS approach, as if they were already aware of this level of representation. Instruction in this concept and in the polysystematic nature of English spelling proved not

to be difficult. In this pedagogical sense, the approach to MEWS using generative principles is appropriate.

On English Spelling and Psychological Reality

English orthography reflects an underlying phonological level which is psychologically real though abstract (see above). Consequently, for people who want to go beyond mere functional literacy, the spelling of English represents the reality which is essential for the acquisition and use of English. For ESL and ESD students, the implications of this statement are far-reaching. Under this reasoning, knowledge and understanding of English orthography are important for proficiency in the forms and structures of the language. Moreover, learning to read English is helpful, as well, in learning to pronounce it. Since these concepts are in opposition to the audiolingual rationale which has been in favor, acceptance of them would likely influence many pedagogical changes.

On the Use of MEWS in Reading Programs for Native Speakers

Quite possibly, the purpose of this research to develop materials for second-language students of MEWS has a wider application than ESL. As mentioned earlier, the MEWS program may have implications for reading acquisition by native students. Logically, if reading English as a second language requires mastery of the English orthographic system and phonological patterns, then students of

English as a second dialect need mastery of these skills as well. While it is true that native speakers likely have internalized the phonology of English, such students need help in mastering its spelling system. Thus, the possible advantages of applying principles of generative phonology to teaching English seem unlimited.

APPENDIX A

ESL MATERIALS EXAMINED IN THE STATE OF THE ART

Source		Item No.	Format*						
Author	Date		Teacher Material				Student Material		
			Theory		Methods		Text	Tape	Media
		Book	Article	Book	Article				
Allen and Campbell	1965, 1972	1	✓		✓				
Ayer	1975	2							
Boggs and Dixon	1956, 1971	3					✓		
Bowen	1975	4					✓		
Burt and Kiparsky	1972	5			✓		✓		
Chastain	1971, 1976	6	✓		✓				
Chomsky, C.	1970	7		✓					
Clarey and Dixon	1947, 1963	8					✓		
Croft	1972	9			✓				
Diller	1971	10	✓		✓				
DiPietro	1971, 1976	11			✓				
Dixon	1948, 1971	12					✓		
Dixon	1949, 1971	13					✓		
Dixon	1950a, 1971	14					✓		
Dixon	1950b, 1971	15					✓		
Dixon	1951, 1971	16					✓		
Dixon	1953, 1971	17					✓		
Dixson	1955, 1972	18					✓		
Dixson	1956-59	19					✓		
Dixson	1957a, 1972	20					✓		
Dixson	1957b	21					✓		
Dixson	1960a	22					✓		
Dixson	1960b, 1975	23	✓		✓				
Dixson	1962, 1971	24					✓		
Dixson	1963	25					✓		
Dorry	1966	26						✓	
Doty and Ross	1960, 1973	27					✓		
Duong	1975	28			✓				
Erazmus and Campos	1970, 1977	29					✓		
Finocchiaro	1974	30	✓		✓				
Friend	1971	31					✓		
Fries	1967	32		✓			✓		
Grate	1974	33					✓		
Hale and Budar	1970	34				✓			
Hall, E.	1965	35					✓		
Hall, E.	1967	36					✓		
Hall, E.	1969-73	37					✓		
Hall, E.	1972	38					✓		
Hall, E.	1974	39					✓		
Hall, E.	1976	40					✓		
Hall, R.	1966	41		✓					
Harris	1969	42			✓				
Hines	1973	43					✓		
Hirschhorn	1970	44					✓		
Jones and Spolsky	1975	45			✓		✓		
Jocos	1967	46			✓		✓		
Lado	1964	47	✓		✓		✓		
Lado	1970-73	48					✓		✓
Lorenz	1976	49					✓		
Mazurkiewicz	1976	50					✓		
National	1975-76	51					✓		
Nilsen and Nilsen	1973	52			✓		✓		
Norris	1970	53					✓		
Oller and Richards	1973	54	✓		✓		✓		
Palmer and Spolsky	1975	55	✓		✓		✓		
Paulston and Bruder	1975	56	✓		✓		✓		
Paulston and Bruder	1976	57	✓		✓		✓		
Richards and Gibson	1973	58			✓		✓		
Richards, R.	1972	59			✓		✓		
Robertson	1964, 1972	60					✓		
Rutherford	1968, 1975	61					✓		
Saville-Troike	1976	62	✓		✓				
Schane	1970	63		✓					
Sheeler	1976	64					✓		
Spenser	1976	65					✓		✓
Stieglitz	1970	66					✓		
Wardhaugh	1974	67	✓				✓		
White, C. and Martin	1976	68					✓		
Whitford and Dixon	1973	69					✓		
Wilkins	1972	70	✓		✓				
Total		70	12	4	23	2	35	9	2

*Some sources pertain to more than one category.

APPENDIX B
EVALUATION OF ESL TEACHER MATERIALS

Source		Criteria for Judgment*										Total (1) - (9)	"Yes" (9) - (1)				
Author	Date	Format		Impact of SPE	Expectations										Total Score	Per Cent	
		Book	Article		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)				
Allen and Campbell	1965, 1972		x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	100.0
Burt and Kiparsky	1972		x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	100.0
Chastain	1971, 1976		x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	4	44.4
Chomsky, C.	1970	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	8	88.8
Croft	1972	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	7	77.7
Diller	1971	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	6	66.6
DiPietro	1971, 1976	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	8	88.8
Dixon	1960b, 1975	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1	11.1
Duong	1975	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	7	77.7
Finocchiaro	1974	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	6	66.6
Fries	1967	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	6	66.6
Hale and Budar	1970	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	7	77.7
Hall, R.	1966	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	4	44.4
Harris	1969	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3	33.3
Jones and Spolsky	1975	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	7	77.7
Joos	1967	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	8	88.8
Lado	1964	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	5	55.5
Mazurkiewicz	1976	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	4	44.4
National	1975-76	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	6	66.6
Nilsen and Nilsen	1973	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	5	55.5
Norris	1970	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	100.0
Oller and Richards	1973	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	8	88.8
Palmer and Spolsky	1975	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	8	88.8
Paulston and Eruder	1975	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	4	44.4
Paulston and Bruder	1976	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	6	66.6
Richards, R.	1972	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	7	77.7
Saville-troike	1976	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	7	77.7
Schane	1970	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	100.0
Wardhaugh	1974	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	100.0
Wilkins	1972	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	5	55.5
Total		24	6	16	10	28	19	27	18	29	27	20	14				
Per cent of total				53.3	33.3	93.3	63.3	90.0	60.0	96.6	90.0	66.6	46.6				

Legend
✓ = Yes
x = No
.. = Inapplicable

*A Festschrift receives (✓) if at least one article fulfills a criterion.

APPENDIX D
TABLES OF SPECIFICATIONS
I. PHONOLOGY

Amount of Emphasis in Evaluation of Student Progress

Unit of Inst.	CONTENT	OBJECTIVES I. To achieve knowledge of:		OBJECTIVES II. To achieve knowledge and skill in:			Total Per Cent
		A. Facts and Concepts	B. Principles	A. Interpretation of Visuals	B. Problem Solving	C. Use of Information in Situations	
		20%	20%	20%	20%	20%	
Planned Emphasis in the Total Instruction	I. VOWEL RULES						
	A. Diphthongization	2	2	2	2	2	16.67
	B. Vowel Shift	2	2	2	2	2	16.66
	C. Rounding Adjustment	2	2	2	2	2	16.67
	D. Backness Adjustment	2	2	2	2	2	16.66
	E. Schwa Insertion	2	2	2	2	2	16.67
	F. Vowel Reduction	2	2	2	2	2	16.67
	Total	20%	20%	20%	20%	20%	100.00
	II. CONSONANT RULES						
	A. Velar Softening	2	2	2	2	2	25.00
B. Spirantization	2	2	2	2	2	25.00	
C. Identical Consonant Elision	2	2	2	2	2	25.00	
D. Palatalization	2	2	2	2	2	25.00	
Total	20%	20%	20%	20%	20%	100.00	

Adapted from Nunnally (1972:134-35).
Cells contain number of test items as a minimum.

II. ORTHOGRAPHY

Amount of Emphasis in Evaluation of Student Progress

Unit of Inst.	CONTENT	OBJECTIVES I. To achieve knowledge of:		OBJECTIVES II. To achieve knowledge and skill in:			Total Per Cent
		A. Facts and Concepts	B. Principles	A. Interpretation of Visuals	B. Problem Solving	C. Use of Information in Situations	
		20%	20%	20%	20%	20%	
Planned Emphasis in the Total Instruction	I. VOWEL RULES						
	A. Main Vowel Mapping	2	2	2	2	2	25.00
	B. Vowel Biliteralization	2	2	2	2	2	25.00
	C. Silent <E>: Tense Vowels	2	2	2	2	2	25.00
	D. Syllabic Resonants	2	2	2	2	2	25.00
	Total	20%	20%	20%	20%	20%	100.00
	II. CONSONANT RULES						
	A. <GE> from <YS>	2	2	2	2	2	25.00
	B. Main Consonant Mapping	2	2	2	2	2	25.00
	C. <H> Biliteralization	2	2	2	2	2	25.00
D. Spirantization	2	2	2	2	2	25.00	
Total	20%	20%	20%	20%	20%	100.00	

Adapted from Nunnally (1972:134-35).

Cells contain number of test items as a minimum.

APPENDIX E

DEMOGRAPHIC DATA ON SUBJECTS IN PILOT STUDY

Student Number	132B Sec.	Age	Sex	L1	Native Country	Post-Secondary Education	
						Univ.	ESL
1	1	23	F	Spanish	Paraguay	6-1/2	1
2	1	23	M	Farsi	Iran	2-1/2	3
3	1	22	M	Tagalog	Phillipines	2	2
4	1	53	M	Spanish	Peru	5	1-1/2
5	1	20	M	Farsi	Iran	1	1-1/2
6	1	25	M	Yoruba	Nigeria	1	1
7	1	19	F	Farsi	Iran	2-1/2	3
8	1	23	M	Farsi	Iran	2-1/2	4-1/2
9	1	24	M	Vietnamese	South Vietnam	3	3
10	1	20	M	Spanish	Bolivia	1	1-1/2
11	1	22	M	Farsi	Iran	2	3
12	2	21	M	Arabic	Saudi Arabia	2	2
13	2	26	M	Farsi	Iran	1	1
14	2	25	M	Arabic	Saudi Arabia	5	3
15	2	25	M	Arabic	Lebanon	1-1/2	1-1/2
16	2	24	M	Spanish	Venezuela	1	1-1/2
17	2	21	M	Chinese	Hongkong	1	1
18	2	21	F	Farsi	Iran	2	2
19	2	28	M	Arabic	Saudi Arabia	1	2
20	2	29	F	Thai	Thailand	5	4
21	2	23	M	Arabic	Saudi Arabia	1	1-1/2
22	2	23	M	Spanish	Venezuela	1	1
23	2	26	M	Spanish	Chile	4	1
24	2	22	F	Chinese	Hongkong	3	1
25	2	21	M	Vietnamese	South Vietnam	1	1-1/2
26	3	23	M	Arabic	Saudi Arabia	1	2
27	3	26	M	Arabic	Saudi Arabia	1	2
28	3	25	M	Arabic	Saudi Arabia	1	2
29	3	31	F	German	Germany	1	1
30	3	23	M	Chinese	Hongkong	1	1
31	3	25	M	Arabic	Saudi Arabia	1	2
32	3	21	M	Arabic	Saudi Arabia	1	2
33	3	24	M	Farsi	Iran	3	3
34	3	23	F	Spanish	Cuba	1	1
35	3	20	M	Thai	Thailand	1	1
36	3	28	M	Arabic	Saudi Arabia	1	2
37	3	21	M	Farsi	Iran	3	3
38	3	21	M	Japanese	Japan	2	2+
39	3	24	M	Chinese	Hongkong	1	1
40	3	20	F	Swedish	Sweden	1	1
41	3	28	M	Arabic	Saudi Arabia	1	1-1/2
42	4	26	M	Arabic	Saudi Arabia	2-1/2	2-1/2
43	4	28	M	Arabic	Saudi Arabia	2	2
44	4	28	M	Arabic	Saudi Arabia	2-1/2	2-1/2
45	4	26	M	Portuguese	India	5	5
46	4	28	M	Arabic	Saudi Arabia	2-1/2	2-1/2
47	4	28	M	Arabic	Saudi Arabia	1-1/2	2
48	4	25	M	Arabic	Saudi Arabia	1	2
49	4	25	M	Farsi	Iran	4	4
50	4	32	M	Arabic	Saudi Arabia	2-1/2	2-1/2
51	4	26	M	Farsi	Iran	2	2-1/2
52	4	26	M	Arabic	Saudi Arabia	2-1/2	2-1/2
53	4	22	M	Arabic	Saudi Arabia	1	1-1/2
121	1	41	F	Farsi	Iran	1	3

Note: Student number 18 dropped English 132B prior to the MEWS Unit I Pretest.

Legend

abs Absent
 ✓ Present
 . . Unmarked

APPENDIX F

ATTENDANCE REGISTER FOR SUBJECTS
 IN PILOT STUDY

Stu. No.	132H Sec.	April										May	
		11	13	15	18	20	22	25	27	29	2	6	
1	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	1	✓	abs	abs	✓	abs	✓	✓	✓	abs	abs	✓	✓
3	1	✓	✓	✓	✓	✓	abs	✓	✓	abs	abs	✓	✓
4	1	✓	abs	✓	abs	✓	✓	✓	✓	abs	✓	✓	✓
5	1	✓	✓	✓	✓	✓	abs	✓	✓	✓	✓	✓	✓
6	1	✓	✓	✓	✓	✓	abs	✓	✓	✓	✓	✓	✓
7	1	✓	abs	✓	✓	abs	abs	abs	abs	✓	abs	✓	✓
8	1	✓	✓	✓	✓	✓	abs	✓	✓	✓	✓	abs	✓
9	1	✓	✓	✓	✓	abs	abs	✓	✓	✓	abs	✓	✓
10	1	✓	✓	✓	✓	abs	abs	✓	✓	✓	abs	✓	✓
11	1	✓	✓	✓	abs	abs	abs	abs	abs	abs	abs	✓	✓
12	2	✓	abs	✓	abs	✓							
13	2	✓	✓	✓	abs	abs	✓	✓	✓	✓	✓	✓	✓
14	2	✓	abs	✓	abs	abs	abs	abs	✓	✓	abs	abs	✓
15	2	✓	abs	abs	✓	✓	✓	abs	✓	✓	abs	abs	✓
16	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
17	2	✓	✓	✓	abs	✓	abs	✓	✓	✓	✓	✓	✓
18	2	✓	abs	abs	✓	✓	✓	✓	✓	✓	✓	✓	✓
19	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	abs	abs	✓
21	2	✓	abs	✓	abs	abs	abs	abs	✓	abs	abs	abs	✓
22	2	✓	✓	✓	✓	abs	✓	abs	abs	abs	abs	abs	✓
23	2	✓	abs	✓	✓	abs	✓	abs	abs	abs	abs	abs	✓
24	2	✓	✓	abs	✓	✓	abs	✓	✓	abs	abs	abs	✓
25	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
26	3	✓	✓	✓	abs	✓	✓	✓	✓	✓	✓	✓	✓
27	3	✓	abs	✓	✓	✓	✓	abs	✓	✓	✓	✓	✓
28	3	✓	abs	abs	✓	abs	abs	✓	✓	abs	✓	✓	✓
29	3	✓	✓	✓	✓	✓	✓	✓	✓	abs	✓	✓	✓
30	3	✓	abs	✓	✓	✓	✓	✓	✓	abs	✓	✓	✓
31	3	✓	✓	abs	✓	abs	✓	✓	✓	abs	abs	abs	✓
32	3	✓	abs	✓	✓	abs	✓	✓	✓	abs	abs	abs	✓
33	3	✓	abs	abs	✓	abs	✓	abs	✓	abs	abs	abs	✓
34	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
35	3	✓	✓	✓	abs	✓	abs	✓	✓	✓	✓	✓	✓
36	3	✓	abs	abs	✓	abs	abs	abs	✓	✓	abs	abs	✓
37	3	✓	✓	✓	✓	✓	abs	abs	✓	✓	abs	abs	✓
38	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
39	3	✓	✓	✓	✓	abs	✓	✓	✓	✓	abs	abs	✓
40	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
41	3	✓	✓	abs	✓	abs	✓	abs	✓	abs	abs	abs	✓
42	4	✓	✓	✓	✓	abs	✓	✓	✓	✓	✓	✓	✓
43	4	✓	✓	✓	✓	✓	✓	✓	✓	abs	✓	✓	✓
44	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
45	4	✓	abs	✓	✓	abs	✓	✓	abs	✓	✓	✓	✓
46	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
47	4	✓	✓	✓	✓	abs	✓	✓	✓	✓	✓	✓	✓
48	4	✓	abs	✓	✓	abs	✓	✓	✓	abs	abs	abs	✓
49	4	✓	✓	✓	✓	abs	✓	✓	✓	✓	abs	abs	✓
50	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
51	4	✓	✓	✓	✓	abs	✓	✓	✓	✓	✓	✓	✓
52	4	✓	✓	✓	abs	abs	✓	✓	abs	abs	abs	✓	✓
53	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
121	1	✓	abs	✓	✓	✓	✓	✓	abs	✓	✓	✓	✓

APPENDIX G
TEACHERS' DAILY LOGS DURING PILOT STUDY

APRIL				
Monday (11)	Tuesday	Wednesday (13)	Thursday	Friday (15)
Meet all sections and explain the pilot study.		Describe Nelson-Denny Reading Test. Sec. 1, 2: Check grammar test. Sec. 3: Work on idioms. Sec. 4: Conduct poll of international students.		Administer Nelson-Denny Reading Test. Sec. 1, 2: Study vocabulary.
(18) Sec. 1, 2: Discuss short story; check reading comprehension quiz; work on idioms. Sec. 3: Discuss verbs taking infinitives and complements. Sec. 4: Discuss words on Nelson-Denny Test.		(20) Administer MEWS Unit I Pretest. Sec. 1, 2: Discuss problems in agreement. Sec. 3: Discuss punctuation, usage, and subordination. Sec. 4: Discuss revision of themes.		(22) Return Reading Test and discuss; distribute Unit I handouts. Sec. 1, 2: Check vocabulary and organization exercises. Sec. 3: Review dialect words and sounds. Sec. 4: Revise themes.
(25) Discuss Unit I handouts and practice exercises.		(27) Administer MEWS Unit II Pretest. Sec. 1, 2: Study problems in agreement. Sec. 3: Discuss verb tenses. Sec. 4: Work on student themes.		(29) Distribute and discuss MEWS Unit II handouts. Sec. 1, 2: Study vocabulary, organization, and comprehension of two essays.
MAY Discuss Unit II handouts. Sec. 1, 2: Work on verb tenses. Sec. 3: Study paragraphing. Sec. 4: Go over student themes.		(4) Do practice exercises on Unit II; administer Units I and II Post-test.		(6) Return and discuss MEWS tests. Sec. 1, 2, 3, 4: Discuss final examination.
NOTE: Individual section activities appear only when they supplement MEWS.				

APPENDIX H

SCORES AND GRADES OF SUBJECTS IN PILOT STUDY

Student No.	Sec. No.	MEMS Pre-Test		MEMS Post-Test		Nelson-Denny Vocab. Comp.	Reading Test Total Grade	EFL Rch. Test Score Grade	EPI198 Course	EPI198 Grade	Group
		Unit I	Unit II	Unit I	Unit II						
1	1	14	20	18	21	20	56	11.6			Control
2	1	23	34	22	24	36	33	7.5			Control
3	1	19	17	19	19	5	38	17			Control
4	1	15	30	15	21	8	17	<6.0			Control
5	1	18	19	20	20	1	18	<6.0			Control
6	1	17	34	12	12	12	28	6.6			Control
7	1	17	17	20	18	8	4	<6.0			Control
8	1	22	43	15	18	32	40	8.8			Control
9	1	20	15	16	21	7	14	<6.0			Control
10	1	20	20	19	22	10	24	34			Control
11	1	20		19	22	14	20	34			Control
12	2	19		19	22	4	10	<6.0			Exper.
13	2	23	21	22	20	7	12	<6.0			Exper.
14	2	22	18	22	20	7	12	<6.0			Exper.
15	2	14	21	19	19	19	38	57			Exper.
16	2	17	17	18	27	10	34	44			Exper.
17	2	22	34	18	27	5	16	21			Exper.
19	2	21	41	20	21	12	34	46	4	4	Exper.
20	2	21		21		2	10	<6.0			Exper.
22	2	20	44	21	21	20	30	50			Exper.
23	2	20	24	22	18	20	32	52			Exper.
24	2	17	34	11	20	19	16	35			Exper.
25	2	12	17	16	14	6	14	20			Exper.
26	3	12	30	11	17	3	8	11	2	1	Exper.
27	3	22	22	20	20	20	40	40	2	1	Exper.
28	3	22	23	20	20	26	42	68	4	4	Exper.
30	3	20	19	23	24	10	28	38			Exper.
31	3	22	44	25	23	2	6	8	4	4	Exper.
32	3	18		21	19	2	6	<6.0			Exper.
33	3	18	22	21	22	24	22	46			Exper.
34	3	22	44	20	22	7	32	39			Exper.
35	3	22	22	20	22	24	22	46			Exper.
36	3	23		21	19	18	34	52	3	1	Exper.
37	3	22	44	21	19	8	12	20			Exper.
38	3	22	22	20	22	8	12	<6.0			Exper.
39	3	16	30	13	17	15	40	55			Exper.
40	3	25	23	8	28	8	28	36			Exper.
41	3	21	40	22	21	8	12	20	78	11.6	Exper.
42	4	21	19	22	22	8	12	<6.0			Exper.
43	4	20	40	24	19	7	16	23	64	8.8	Exper.
44	4	19	20	4	20	4	20	24	30	<6.0	Exper.
45	4	19	44	20	19	27	24	51			Exper.
46	4	21	44	22	20	18	10	<6.0			Exper.
47	4	16	37	20	18	16	28	44	36	<6.0	Exper.
48	4	16	40	18	21	9	20	29	52	6.4	Exper.
49	4	22	40	21	18	4	10	14	68	9.6	Exper.
50	4	10	23	12	12	12	6	18	38	<6.0	Exper.
51	4	14	24	14	12	6	16	32	62	8.4	Exper.
52	4	20	13	20	13	4	8	12			Exper.
53	4	17	19	16	18	4	8	12			Control
121	1	15	36	15	16	2	16	18			Control

APPENDIX I

FORMULAS FOR STATISTICAL ANALYSES USED

Mean

$$\bar{X} = \frac{\sum X}{N}$$

Standard Deviation

$$S = \sqrt{\frac{\sum (X - \bar{X})^2}{N - 1}}$$

Kuder-Richardson Formula 20

$$r_{xx} = \left(\frac{n}{n-1} \right) \left(\frac{\sigma^2 - \sum p q}{\sigma^2} \right)$$

where n = number of test items
 σ^2 = variance of test scores
 p = proportion of subjects
 answering a test item
 correctly
 q = 1 - p

Analysis of Variance

$$SS_t = SS_w + SS_b$$

where $SS = \sum X^2 - \frac{(\sum X)^2}{N}$

SS_t = total sum of squares
 for k samples
 SS_w = sum of squares within
 groups
 SS_b = sum of squares between
 groups

$$F = \frac{MS_b}{MS_w}$$

where MS_b = mean square between
 MS_w = mean square within

Fisher's t-test of Independent Samples

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

Pearson Product Moment

$$r = \frac{\sum z_x z_y}{N}$$

Analysis of Covariance

$$\text{Cov} = \frac{SP}{N} = \frac{\sum x y}{N}$$

$$SP_t = SP_b + SP_w$$

$$F = \frac{MS'_b}{MS'_w}$$

where $SP = \sum x y$
 x = deviation of X variable from mean
 y = deviation of paired variable from mean

MS'_b = adjusted mean square between

MS'_w = adjusted mean square within

Multiple Regression

$$\tilde{Y} = a + bX$$

where \tilde{Y} = predicted criterion variable score for subject having score X on predictor variable

$$b = r \frac{S_y}{S_x}$$

$$a = \bar{Y} - b \bar{X}$$

Tukey's HSD Test

$$q = \frac{M_1 - M_2}{\sqrt{\frac{MS_w}{n}}}$$

where n = number in each sample
 MS_w = mean square within

Chi-Square Goodness-of-Fit Test

$$X^2 = \sum \frac{(O - E)^2}{E}$$

where O = observed frequency
 E = expected frequency

Chi-Square, with Continuity Correction

$$X^2 = \sum \frac{\left(|O - E| - \frac{1}{2}\right)^2}{E}$$

APPENDIX J

SELECTED REVISIONS OF MEWS INSTRUCTION

SAYING "_H" IN ENGLISH

→ = "is pronounced as"

- CH →
1. [∅] in YACHT, DRACHM
 2. [k] in the clusters CHL, CHN, AND CHR; and borrowed Greek words*
 3. [s̥] in borrowed French words*
 4. [ç] in remaining words

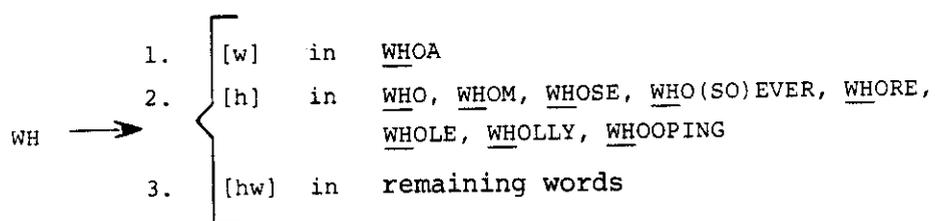
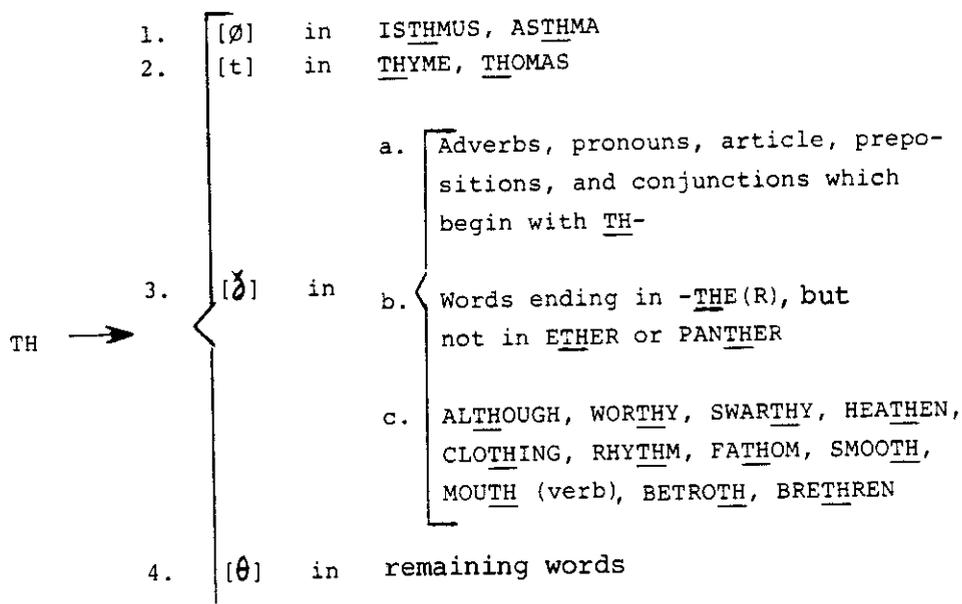
*See attached list.

- GH →
1. [f] in COUGH, DRAUGHT, ENOUGH, LAUGH(TER), ROUGH, TOUGH, TROUGH
 2. [g] in AGHAST, BURGH(ER), DINGHY, SORGHUM, SPAGHETTI, and all words beginning with GH-
 3. [∅] in remaining words

PH → [f] in all words

RH → [r] in all words

SH → [s̥] in all words



BORROWED WORDS

Greek CH = [k]		French CH = [ʃ]
ACHE	INCHOATE	BROCHURE
ALCHEMY	LEPRECHAUN	CACHE
ANARCHY	MASOCHISM	CHAGRIN
ANCHOR	MATRIARCH	CHAISE
ARCHAEOLOGY	MECHANIC	CHALET
ARCHAIC	MECHANICAL	CHALLIS
ARCHANGEL	MECHANISM	CHAMBRAY
ARCHETYPE	MELANCHOLY	CHAMOIS
ARCHIPELAGO	MONARCHY	CHAMPAGNE
ARCHITECT	OCHER	CHANDELLIER
ARCHITECTURE	OLIGARCHY	CHANTY
ARCHIVE	ORCHESTRA	CHAPERON
BRONCHITIS	ORCHID	CHARADE
CATECHISM	PAROCHIAL	CHARLATAN
CHAMELEON	PATRIARCH	CHASSIS
CHAOS	PENTATEUCH	CHATEAU
CHAOTIC	PSYCHIATRIST	CHAUFFEUR
CHARACTER	PSYCHIATRY	CHAUVINISM
CHARACTERISTIC	PSYCHOLOGIST	CHEF
CHARACTERIZE	PSYCHOLOGY	CHEMISE
CHASM	PSYCHE	CHENILLE
CHEMICAL	PSYCHIC	CHEROOT
CHEMIST	PSYCHO	CHEVALIER
CHEMISTRY	PSYCHOSIS	CHEVRON
CHIMERA	PSYCHOPATH	CHIC
CHIROPRACTOR	PSYCHOSOMATIC	CHICANERY
CHOIR	SACCHARIN	CHIFFON
CHOLERA	SCHEDULE	CHIFFONIER
CHOLERIC	SCHEMA	CHIVALROUS
CHORAL	SCHEME	CHIVALRY
CHORD	SCHEMATIC	CHUTE
CHOREOGRAPHY	SCHIZOPHRENIA	CLICHE
CHORISTER	SCHOLAR	CROCHET
CHORUS	SCHOLASTIC	ECHELON
DICHOTOMY	SCHOLASTICISM	FUCHSIA
ECHO	SCHOOL	GAUCHE
EPOCH	SCHOONER	MACHINE
EUCHARIST	SEPULCHER	MACHINERY
EUNUCH	STOMACH	MUSTACHE
HIERARCHY	SYNECDOCHE	NONCHALANCE, NONCHALANT
HARPSICORD	TACHISTOSCOPE	PARACHUTE
HYPOCHONDRIAC	TACHOMETER	PISTACHIO
ICHTHYOLOGY	TRACHEA	RICOCHET
		SACHET
		STANCHION

Sources: Hanna et al., 1966:811-12,1028;
Hill and Ure, 1962:24-25; Venezky, 1970:67.

EXERCISE IN PRONOUNCING "_H"

The spellings of the following words have a consonant plus "H". By checking the pronunciation rules for "_H", decide how to say each word:

	<u>SPELLING</u>	<u>Sound for "_H"</u>
1.	<u>PHANTOM</u>	
2.	<u>DRAUGHT</u>	
3.	<u>CHOIR</u>	
4.	<u>MARSH</u>	
5.	<u>THIEF</u>	
6.	<u>WHATEVER</u>	
7.	<u>MACHINE</u>	
8.	<u>ARCHITECT</u>	
9.	<u>RHINOCEROS</u>	
10.	<u>ANARCHY</u>	
11.	<u>WHOLE</u>	
12.	<u>THENCEFORTH</u>	
13.	<u>SPHERE</u>	
14.	<u>LATHER</u>	
15.	<u>SHRIMP</u>	
16.	<u>BREATHE</u>	
17.	<u>GHETTO</u>	
18.	<u>CHEF</u>	
19.	<u>NOUGHT</u>	
20.	<u>CIRRHOSIS</u>	

ALTERNATIONS OF T

T is a letter whose underlying sound has alternating pronunciations in English. Underlying T sounds like [t], as in the short form PART. Alternating T has three other possible sounds in longer forms related to PART:

T = [s] in PARSE (a respelling)
T = [ʃ] in PARTIAL
T = [tʃ] in DEPARTURE

Why does T have these other predictable sounds in related words? From the further examples which follow, we can list below them the reason for each sound change of T to [s], [ʃ], or [tʃ]:

Underlying and Alternating Sounds for T

Short Form	Alternating Forms		
	<u>T</u> = [t]	<u>T</u> = [s]	<u>T</u> = [ʃ]	T = [tʃ]
<u>FACT</u> <u>STATE</u> <u>BENEFIT</u> <u>DEMOCRAT</u> <u>ADMIT</u> <u>NATIVE</u> <u>ACT</u> <u>MEDIATE</u> <u>CONTRACT</u> <u>SUBMIT</u>	. . . . . <u>STASIS</u> <u>BENEFICE</u> <u>DEMOCRACY</u> <u>ADMISSIBLE</u> <u>NASCENT</u> <u>IMMEDIACY</u> <u>SUBMISSIVE</u>	<u>FACTION</u> <u>STATION</u> <u>BENEFICIAL*</u> <u>ADMISSION*</u> <u>NATION</u> <u>ACTION</u> <u>MEDIATION</u> <u>CONTRACTION</u> <u>SUBMISSION*</u>	<u>FACTUAL</u> <u>STATUE</u> <u>NATURE</u> <u>ACTUAL</u> <u>CONTRACTUAL</u>
	<u>T</u> changes from [t] to [s] because the long form has an <u>E</u> , <u>I</u> , or <u>Y</u> following <u>T</u> . Here <u>T</u> is always respelled as <u>S</u> , <u>C</u> , <u>SC</u> , or <u>SS</u> .	<u>T</u> changes from [t] to [ʃ] because the long form has <u>-IA</u> or <u>-IO</u> following <u>T</u> . Here a few words also change spelling from <u>T</u> to <u>C</u> or <u>SS</u> .	<u>T</u> changes from [t] to [tʃ] because the long form has a <u>U</u> following <u>T</u> .

*The alternation results in a respelling.

Practice with Alternations of T

- I. In the table of words below, the twelve "Short Forms" are correctly spelled. On the same line with each short form are three possible spellings for a related longer form. In the set of three choices, ONLY ONE SPELLING FOR A LONGER FORM IS CORRECT. On each line, circle the spelling of a longer form which you think correctly alternates with a short form. In selecting your answer, consider two rules:
- A. The sound for T often changes in long forms, but the spelling for T usually does not. The chief exception occurs when T is respelled S in long forms having the sound [s], as in DEMOCRAT ~ DEMOCRACY.
- B. The spelling of the longer forms includes the spelling of the short form. Usually a few more letters are added at the beginning or end of the short form to make longer forms, as in FACT ~ FACTOR.

Short Form	Longer Form		
	1	2	3
1. COMPLETE	COMPLEETION	COMPLESHUN	COMPLETION
2. CONFIDENT	CONFIDESHIAL	CONFIDENTIAL	CONFIDENTSHIAL
3. PRESENT (noun)	PRESENCE	PRESUNTS	PRESUNCE
4. COMPLICATE	COMPLICASHUN	COMPLICAITION	COMPLICATION
5. IMPORTANT	IMPORTUNS	IMPORTANCE	IMPORTUNCE
6. FORMATIVE	FORMATION	FORMASHUN	FORMMATION
7. QUEST	QUESCHUN	QUESSTION	QUESTION
8. STATE	STATCHUE	STATUE	STACHUE
9. VULGAR	VULGARITY	VULGERITY	VULGORITY
10. EXTREME	EXTREMITY	EXTREEMITY	EXTREAMITY
11. CHRIST	CHRISTCHUN	CHRISSTIAN	CHRISTIAN
12. ILLUSTRATE	ILLUSTRASHUN	ILLUSTRATION	ILLUSTRATION

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