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FOR AN
American Language,

OR
GERMANIC - ENGLISH,

Showing the Necessity of Systematic Spelling and of Making
our Words Pure, Self-developed and Self-
explaining according to

Greek, German and Irish Models,

WITH A
GRAMMAR, READER AND VOCABULARY

OF THE
Proposed American Language.

Appeal to Germans, Irishmen and Scandinavians as well
as the Americans in Behalf of an

EXPRESSIVE TONGUE.

MOTTO.—Except ye utter by the tongue words
easy to be understood, how shall it be
known what is spoken? for ye shall
speak unto the air. (I Corinthians,
Chap. 14, v. 9.)

THE PRESENT ENGLISH PROVEN TO BE A NATIONAL MISFORTUNE.

BY
ELIAS MOLEE, PH. B.

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1888.

Grapheme-Phoneme Correspondence in Beginning Reading of Disadvantaged Five-year-olds

Myrtle Scott

This study was designed to investigate the effect of grapheme-phoneme correspondence on word acquisition in beginning readers. Two groups of disadvantaged children were taught word acquisition skills, one group using a non-controlled grapheme-phoneme correspondence orthography, standard English, while the other group used a controlled grapheme-phoneme correspondence orthography, the Initial Teaching Alphabet. No differences were found between groups as a function of orthography used. Significant differences did appear as a function of level of word familiarity with familiar words being identified more easily than unfamiliar ones. Irregular words were identified significantly more easily than regular ones, which was contrary to the prediction, and was explained in terms of a model of stages of development of word recognition skills.

One of the basic assumptions upon which several approaches to beginning reading have been predicated is that children have difficulty which is attributable to the lack of correspondence between the spoken phoneme and the written grapheme in the traditional English orthography. In the case of the culturally disadvantaged whose language patterns and speech sounds are so different from those typically used in the classroom, this poor match between sound and symbol may be a key to the high incidence of reading failure among these groups. The high incidence of reading failure among the culturally disadvantaged often leads to early school drop-out, a crucial social problem.

Research and theory from five areas contribute to the background literature upon which the present study was based: (1) studies of basic perceptual processes underlying reading, (2) studies of grapheme-phoneme correspondence *per se*, (3) methods designed to control grapheme-phoneme correspondence, (4) the relationship of reading to chronological age, and (5) the process of reading as it occurs in culturally disadvantaged or different groups. Several excellent

151 Scott : *Grapheme-Phoneme Correspondence in Beginning Reading*

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reviews of the reading research literature are available elsewhere (Harris, 1963; Harris, 1965; Robinson, *et al.*, 1966; Chall, 1967).

In the area of basic perceptual processes underlying reading, perhaps the most notable work is that of Gibson (1962, 1964, 1966) who believes that children perceive neither individual letters nor whole words but, rather, groups or clusters of letters based on grapheme-phoneme correspondences. Gibson calls these clusters "higher order invariants." In one experiment Gibson (1962) generated two lists of words, one according to rules of pronounceability and the second of unpronounceable words. The results of this experiment demonstrated that a letter-group with a high spelling-to-sound correlation is produced more accurately than an equivalent letter-group with a low spelling-to-sound correlation. Gibson pointed out that this result could not be caused by a difference in the familiarity of the letters taken alone, or even in the vowel and consonant clusters taken alone, for the same clusters were used in both lists. She concluded that the higher accuracy of production of the high pronounceable list must be due to the existence of higher-order graphic units or letter combinations of English writing that function as relatively stable units in grapheme-phoneme correspondences. Anisfeld (1964) criticized Gibson on the basis that she did not control for summed bi-gram and tri-gram frequency and said that high pronounceability, or high grapheme-phoneme correspondence, alone could not account for a high accuracy of production. Gibson later showed, however, that summed bi-gram and tri-gram frequency *was* controlled in that each item had its match and that the same letters were used in the matched item as well as the same length. Bishop (1964) further demonstrated that transfer of word recognition skills is higher with a group trained using single letters than a group trained using whole words and considerably higher than a control group. The subjects in this experiment were asked afterward to explain how they tried to learn the transfer words. Most of the letter-trained group reported using knowledge of component correspondences but so did 12 of 20 of the word-trained group. Bishop concluded that, although it is possible to learn words without learning the component letter-sound correspondences, transfer to new words depends on use of them, whatever the method of original training.

Richardson (1966) found no significant differences between three

methods of teaching word recognition skills which involved continued concentrated emphasis on (1) letter similarities between words, (2) letter dissimilarities between words, and (3) a combination of similarities and dissimilarities. These findings elaborate those of Bishop somewhat and indicate that, although there is a differential learning rate between whole-word trained groups and letter-trained groups, there is none between specific letter-trained groups.

Concurrently with the work in the Gibson laboratory, research in psycholinguistics has been aimed at analyzing the nature of grapheme-phoneme correspondence. Based on previous work (Moore, 1951; Venezky, 1966, 1967) Hanna, *et al.*, (1966) analyzed 17,000 words for grapheme-phoneme correspondence using an algorithm or set of rules for translating the spoken English phoneme to the written grapheme. A list of words was generated which were classified according to their degree of regularity or irregularity based on the number of spelling errors which occurred in their production.

The Hanna, *et al.*, work and that of Gibson, *et al.*, have represented two of the major efforts to delineate the nature of some of the variables involved in the process of reading itself before attempting to specify teaching methodology. Others, however, have felt that research on methodology should proceed concurrently with that of basic processes. Of the great number of methodological studies attempting to control grapheme-phoneme correspondence in beginning reading probably the best known are those of Downing (1962, 1966, 1967a, 1967b). He advocates the use of the Initial Teaching Alphabet (ITA) as a means of controlling the sound-to-symbol match. Although Downing has presented some very enthusiastic arguments supporting ITA, his conclusions have been sharply criticized on some rather basic points, such as experimental design and data analysis. The best statement at the present time seems to be that the efficacy of ITA has still not yet been fully determined. Research using ITA, as well as other orthographies attempting to control grapheme-phoneme correspondence, has frequently shown rather serious deficits such as confounding of variables, use of inefficient designs, inappropriate statistical analysis, and other research problems so that these results are at best confusing and at worst worthless or contradictory.

Another problem in the methodology of teaching reading concerns the optimal age for beginning reading. Many standard reading pro-

grams are based on the premise that a child must have attained a mental age of six and one-half years before he can be successful at reading, but no adequate research findings support this premise. A growing body of literature in this area (Moore, in press; Williams, 1965; Durkin, 1961, 1963; Muehl, 1962; Hendrickson & Muehl, 1962) suggests that a child might more profitably begin his reading experiences as early as two years of age. Furthermore, age interacts with the basic perceptual processes underlying reading, so that age alone does not constitute an adequate predictor of reading success. Certainly the literature on cultural and perceptual deprivation confirm the deleterious effects of prolonged lack of stimulation and training in these areas.

Chall (1967) summarized the literature concerning reading programs for culturally deprived children and concluded that the evidence did argue for a different approach with these children. She espoused a code approach, which presents reading as a problem-solving situation in translating the spoken language into written form and emphasizes early independence in recognizing words, as opposed to a meaning approach which stresses content rather than process. These conclusions were supported by numerous studies cited in her excellent review.

In summary, a review of the literature seemed to suggest the following cogent points:

1. There is a clear-cut need to study the basic processes underlying reading as a pre-requisite to attempting conclusions about effective reading methodologies.
2. It becomes increasingly clear that training in the basic perceptual processes associated with reading should begin as soon as possible. Early training in these areas becomes crucial with the culturally disadvantaged.
3. The relationship of the spoken phoneme to the written grapheme is thought to play a significant role in these basic processes.
4. Because of their very different language and sound pattern backgrounds, the reading of culturally disadvantaged pupils is particularly affected by grapheme-phoneme correspondence.

Purpose

The purpose of this investigation was to study the effect of two different levels of grapheme-phoneme correspondence on word acquisition in beginning readers as related to the degree of regularity of the word. In order to assess the effect of grapheme-phoneme correspondence on beginning reading, groups of disadvantaged readers were taught by two methods: one using standard English orthography, where the grapheme-phoneme problem occurs, and one designed to create a better match between sound and symbol. Following instruction, word recognition was related to level of word regularity in such a way as to permit assessment of the effect of instruction where the degree of grapheme-phoneme correspondence was varied systematically. Children's ability to generalize word acquisition skills to unfamiliar words as a function of degree of grapheme-phoneme correspondence was also measured.

Hypotheses Tested

Hypothesis I. Mean number of words acquired by subjects taught using a controlled grapheme-phoneme correspondence orthography will be greater than that of subjects taught using a non-controlled grapheme-phoneme correspondence orthography.

Hypothesis II. A. Word acquisition will decrease as level of irregularity increases. B. For a controlled grapheme-phoneme correspondence orthography the decrease in word acquisition as level of irregularity increases will be less than for a non-controlled grapheme-phoneme correspondence orthography.

Hypothesis III. A. A controlled grapheme-phoneme correspondence orthography will result in a significantly greater acquisition of unfamiliar words than a non-controlled grapheme-phoneme correspondence orthography. B. The acquisition of unfamiliar words will be significantly greater at higher levels of irregularity for a controlled than a non-controlled grapheme-phoneme correspondence orthography.

Subjects

The subjects for this study were 20 children enrolled in a pre-school project for culturally disadvantaged children at Peabody College at the Demonstration and Research Center for Early Education

(DARCEE). Of these children (who had been in the project for approximately nine months) half were Negro and half white, half were male and half female. All of the children in the Center participated in the experiment. The average age of the subjects was 73.25 months with a range of 70 months to 80 months, while the mean IQ for the group was 106.05, with individual scores ranging from 78 to 134 as measured by a Stanford Binet, Form L-M, given in July 1968.

These subjects had been presented with an extensive reading-readiness program throughout their pre-school experiences but had not as yet been introduced to formal reading activities.

Two groups of 10 subjects each were constituted from the alphabetical list of pre-school children using the table of random numbers.

Experimental Materials

Textbooks. The three pre-primers of the standard basal reading series published by the Scott Foresman Company (Robinson, *et al.*, 1965a, 1965b, 1965c, 1965e, 1965f) were used as textbooks for the experiment. The texts were presented in the standard order, beginning with *Now We Read* and followed by *Fun With the Family* and *Fun Wherever We Are*. Both the regular standard edition, printed in traditional orthography (TO), and the experimental edition, printed in the Initial Teaching Alphabet (ITA), of each pre-primer were used. The books were exactly alike for both sets in typeface and size, illustrations, and pagination except for the actual orthography used.

Word Cards. A set of word cards was made by an artist for each orthography used containing one card for each new word presented in the textbooks. The cards containing the unfamiliar words to be used in the criterion test were also made by this same procedure.

Criterion Measure

Examiner. The examiner was a white female graduate student in psychology who was not associated with the study and who was deliberately kept uninformed concerning the study. She was unaware of the subjects' assignment to treatment groups.

Pre-test. In order to check on the equality of the two groups following random assignment, each subject in both groups was individually tested to determine the extent of his sight vocabulary relative to the

words to be used in the instructional phase of the experiment. Only one word was recognized by one child and that was the single-letter word, I.

Criterion test. On the two days immediately following the termination of the instructional phase of the experimental procedure, a criterion test consisting of 40 words was individually administered to each subject. Half of these words were familiar words randomly selected from those introduced during the experimental period. Ten of these represented no error or high grapheme-phoneme correspondence words while 10 were categorized as one-error words according to the Hanna (1966) data. The other half of the criterion list was made up of unfamiliar words matched to the familiar words on the basis of frequency of occurrence in the English language and level of regularity. Frequency was based on two factors: (1) occurrence in the pre-primers of at least one other basal reading series, and (2) Lorge-Thorndike norms (1963). Level of regularity was again taken as the error listing according to Hanna. In both familiar and unfamiliar sets of words the child was first asked to identify each of the words. He was then given an opportunity to simply recognize the correct word in a small group of word cards. Each word the child correctly identified or correctly recognized was then recorded by the examiner on a record form. Only the identification data are presented in the analysis section. The recognition data were not dissimilar from those obtained on identification and are not presented.

Experimental Procedure

Adaptation period. In order to establish rapport between the experimenter and the subjects in a large group situation and to elicit attention to the instructional procedure and materials, two adaptation sessions were held.

Instructional procedures. The experimental procedure consisted of one lesson each day for 16 days for each group. On days 1 through 8 and days 10 through 14, the format of the session took the following form:

Part A. Word Acquisition-Phase. During the initial period of each lesson a number of individual words were presented to the group using a modification of the Mills Learning Methods Test, Combined Method (1964). Two modifications were made in this combined method: (1) the kinesthetic procedures were deleted and only the

combined auditory and visual techniques were used and (2) only word cards were used, not pictures. All the words were presented each day which would be introduced as new words in the portion of the text to be read that day during Part B, Practice Phase. Each word was presented for approximately one and one-half minutes.

Part B. Practice Phase. During the second period of the reading lesson for the day the group read from the three pre-primers which were presented successively. The "guiding interpretation" portion of the teacher's manual for each text was used in a programmatic fashion to present the material to the subjects. The groups were counter-balanced as to time of presentation of lesson each day in order to control for practice effects, fatigue, and error on the part of the experimenter. The order of the groups was randomly assigned.

Days 9 and 15 were used as review days for all new words learned in the preceding section. On day 16 each group was given a total review of all the words which had been presented during the experimental period.

Results

The criterion test raw scores were analyzed in a Winer (1962) Three-Factor Experiment with Repeated Measures (Case I) design as illustrated in Figure 1. The A dimension represented the experimental treatment groups with one group being taught using a non-controlled grapheme-phoneme correspondence orthography (standard English), and the other group taught using a controlled grapheme-phoneme correspondence orthography (ITA). This dimension yielded a between-subjects comparison. The B dimension, degree of word regularity, and the C dimension, level of word familiarity, were the two factors in which repetitions of subjects were used and these were within subjects comparisons as were all the interactions with these factors. The results of this analysis are shown in Table I.

The predicted differences between groups based on the orthography used in instruction were not obtained. Interactions between orthography used and the other two factors—degree of regularity of word and level of familiarity of word—also failed to reach acceptable levels of significance.

A significant difference was found in subjects' ability to identify words based on their degree of regularity as demonstrated by the

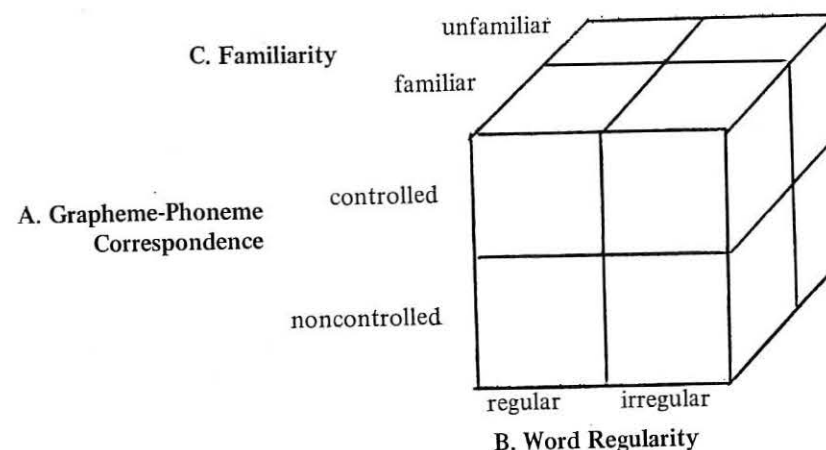


Figure 1. Experimental design.

TABLE I. *Results of Analysis of Variance of Winer Case F Design*

Source of Variation	df	x ²	s ²	F	F.95
Between Ss	19	18.74			
Orthography (A)	1	.61	.61	.60	4.41
SwG	18	18.13	1.01		
Within Ss	60	29.25			
Regularity (B)	1	1.01	1.01	5.32*	4.41
AB	1	.32	.32	1.68	4.41
BxSwG	18	3.42	.19		
Familiarity (C)	1	9.11	9.11	14.24*	4.41
AC	1	.02	.02	.03	4.41
CxSwG	18	11.62	.64		
BC	1	.12	.12	.60	4.41
ABC	1	.10	.10	.50	4.41
BCxSwG	18	3.53	.20		
Total	79	47.99			

* Significant at the .05 level.

significant B main effect, but it was in the opposite direction from that predicted. Inspection of the raw data indicated that the subjects were able to identify more irregular words than regular ones. The hypothesized interaction between degree of word regularity and orthography used in instruction moved toward significance but the prediction was not confirmed.

Analysis of the C dimension showed that the subjects were able to identify significantly more familiar words than unfamiliar ones. The predicted interaction between orthography used and level of words familiarity was not confirmed.

The second order interaction which had been predicted also failed to be confirmed. No reliable interrelationships were obtained between or among the three variables.

Discussion

The general concern of this study was the effect of grapheme-phoneme correspondence on beginning reading as measured by word acquisition. One of the major questions being asked was whether or not orthography used in instruction has a significant effect on a child's ability to identify words. No differences were found between groups instructed in standard English orthography, where the grapheme-phoneme problem occurs, and in ITA, where some attempt is made to create a better match between sound and symbol. On the basis of these data it can only be concluded that the degree of match between sound and symbol does not affect a child's acquisition of word identification skills.

Several plausible explanations could be proposed for this finding of no differences between experimental treatment groups on several dimensions. One obvious interpretation of this finding may be that there are no differences in word acquisition as a function of orthography used in instruction. This would suggest that grapheme-phoneme correspondence does not have the significant effect which it is thought to have upon the learning of words. Two other findings occurred which seem to lend support to this interpretation.

The data showing a difference in subjects' ability to identify words based on their degree of irregularity are a very interesting, if somewhat surprising, finding. Not only did children recognize more irregular words than regular ones but this effect was the same across

both groups. These data indicate that type of orthography used in instruction did not have a differential effect on degree of regularity of words recognized. If orthography is of major import, a differential group effect should have been obtained. No such effect having been obtained, further support accrues to the argument that the correspondence between grapheme and phoneme may not be as crucial in beginning reading as generally presumed. These data may also initially seem to stand somewhat in contradiction to Chall's notion that the child's first task is to break the alphabetic code. If such is the case, regular words would presumably be learned before more irregular ones. It may be, however (as will be argued later) that the subjects were measured during what is actually a prior stage in the development of beginning reading skills.

Secondly, although there was a significant difference in word recognition as a function of level of familiarity—confirming the seemingly self-evident fact that children who are just beginning their reading experiences are able to correctly identify more familiar words than unfamiliar ones—there was no interaction between type of orthography used in instruction and level of familiarity. Furthermore, there was no interaction between degree of regularity and level of familiarity in the presence of significant main effects of both these dimensions. This indicates that these main effects are the same across both groups and suggests, again, no differences as a function of type of orthography used.

When these findings are taken together, the evidence becomes more convincing that there are no differences in word recognition as a function of type of orthography used in instruction. This lack of difference occurs not only between the groups themselves but also between groups in interaction with other variables, even when these variables themselves are significant. These findings might be interpreted as indicating that there was an equal amount of generalization in the two groups. There were other factors, however, which may militate against such an interpretation.

A second interpretation which must be considered in the finding of no differences between groups as a function of the orthography used in instruction is that the ITA does not represent an actual one-to-one match between sound and symbol. These criticisms have been pointed out elsewhere (Griffin, 1967). While ITA does regularize the spelling

of all irregular words in an attempt to control the correspondence between the spoken phoneme and the written grapheme, the correlation between the two in this orthography is not perfect. From this standpoint, then, the standard ITA as it was used in this study could not be said to represent complete control of the grapheme-phoneme correspondence variable. Further research using some completely controlled orthography would be necessary in order to fully explore this possibility.

Methodological considerations must also be examined in attempting to interpret the finding of no differences between experimental groups. It became apparent as the study progressed that two factors were operating which had not been anticipated. One of these concerned the program itself. As has been previously mentioned, it is believed that the level of difficulty of the program was above that which could be handled successfully by many of the children. The number of new words on some days and the number of pages covered per day in the texts seemed to be beyond the scope of assimilating or accommodating ability of some children in both groups. Although an adequate ceiling was sought for the program in order to help promote reliability and validity of measurement, it is felt that an adequate floor was not developed. In addition, the total treatment time may have further minimized any differences which might have appeared as a function of difference in groups.

A second methodological factor which may have had an effect upon the experimental results is instructional variability. Although every effort was made to make the experimental procedure exactly the same across both groups, it is recognized that some differences did occur. The quantification of these differences is, at the present state of psychological knowledge and measurement, impossible. It is, therefore, not known to what extent level of difficulty of the program and instructional variability affected the results.

In view of instructional variability, inadequate program floor and lack of complete control of the grapheme-phoneme correspondence variable, the study hypotheses may not have received an adequate test. Further research is needed in order to establish whether the finding of no differences is a reliable one.

The data showing a difference in subjects' ability to identify words based on their degree of irregularity were very interesting and deserve

a closer look as they may shed some light on interpretation of the present findings as well as a possible model underlying beginning reading. Gibson (1962) suggests that children learn words not as words or as groups of single letters but in intermediate units or clusters of letters. This implies, as a first step, perceptual discrimination in terms of distinctiveness of cues. Gibson goes on to propose that the child learns to associate the written grapheme with the spoken phoneme according to some higher-order invariant rules. It may be that the subjects in the present study at the time of the criterion testing had reached the stage of perceiving differences in the words in terms of distinct cues but had not as yet begun to associate symbol with sound. If a model of developmental stages of word recognition skills is appropriate and if the subjects were measured during this stage, the current results would obtain.

It is also interesting to note in scanning the raw data, that many of the children who showed higher irregular-word identification scores than regular consistently identified correctly the word *to*. Although it was not in the criterion test, the word *two* was also in the list of words which the subjects learned. Of course, in ITA both words are written the same way so that the ITA subjects had additional practice in this word and the data may represent an artifact of the word list.

In summary, no differences were found in beginning reading as measured by the acquisition of word identification skills as a function of orthography used in instruction. On the basis of these data it can only be concluded that the degree of match between sound and symbol does not significantly affect a child's beginning reading skill. A consistent lack of differential effect between groups across all other dimensions also lends support to this interpretation.

Assuming the validity of the findings, the results were explained in terms of stages of development of word recognition skills. It was proposed that a stage of discrimination on the basis of distinctiveness of cues occurs prior to the actual association of the written grapheme to the spoken phoneme. If this model is appropriate the fact that differences were obtained in the acquisition of regular and irregular words would lend some support to the notion that the subjects may have been measured during this initial perceptual learning stage rather than at the later association stage.

Lack of complete control of the grapheme-phoneme correspon-

dence variable and methodological considerations such as instructional variability and level of program difficulty may have militated against an adequate test of the hypotheses, however. The possibility that some of the current results may have been obtained as a function of an artifact of the word list used was also pointed out and discussed. Further research is needed in order to elaborate the nature of the effect of grapheme-phoneme correspondence upon beginning reading.

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