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ABSTRACT

This paper reports the consistency of phonic generalization employing two kinds of frequency determined from a corpus of the 18,000 most frequently occurring words in the English language. Twenty-two commonly taught phonic generalizations were analyzed using a computer. It was concluded that consistency alone is not a sufficient criterion on which to judge the utility of a rule. The authors found that when the rule was a simple one-to-one correspondence (e.g., "ch" is always pronounced, as in "chair"), then direct rule learning was most effective. However, when the rule was more complex (simulation of the final "e" rule), then direct rule learning was not as effective as a more inductive approach. This suggests that teaching rules directly is only advantageous over the other approaches when the rule is a simple one-to-one correspondence. (RB)

Reconsideration of Phonic Generalizations

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Several authors (Clymer, 1963; Fry, 1964; Oaks, 1952; Emans, 1966; Burmeister, 1966) have studied the consistency of various phonics rules in English that might be useful in teaching children to read. In general, it has been assumed that if a rule is highly consistent, then it will be a useful one to teach. Consistency in the past has been determined by computing the percentage of times a rule is found to occur in a relatively small corpus of words used by beginning readers.

In addition to consistency, rule complexity may be an important variable that has been ignored by reading researchers. If one were to translate English into another language by writing it, then very complex rules might be useful -- since the translator would have enough time to apply the rules. However, reading is a very rapid process, even for beginners; so that the time taken to apply any but the simplest rules would make their utility suspect. Even the relatively simple "soft c - hard c" rule requires considerable processing time. In its simplest form, it is "c followed by e or i sounds like s, otherwise c is pronounced k". While it is impossible to determine the amount of time it takes for this processing, it is likely to be longer than even the beginning reader can afford.

This paper reports the consistency of phonic generalizations employing two kinds of frequency determined from a corpus of the 18,000 most frequently occurring words in the English language. These results are related to the results of a simulated reading study on rule complexity which has been previously reported (Caldwell, Peckham, & Nix, 1973a).

As part of a larger study (Caldwell, Peckham, & Nix, 1972), a corpus of the most frequently occurring 18,000 words in the English language (Kucera & Francis, 1967) was analyzed to determine the frequency of occurrence of the bigrams, trigrams, tetragrams, pentagrams, hexagrams, and heptagrams (hereafter referred to as ngrams). All ngrams and the words in which they occur were part of the output. The frequency of the words in running text was also included. Thus, for any ngram, two kinds of frequency are available: 1) the number of words in which the ngram appears out of the 18,000, and 2) the frequency of the ngram in approximately a million words of running text. In addition, the various pronunciations of each ngram and their two types of frequencies are available by human inspection of the output (for a more complete description, see Caldwell, Peckham, & Nix, 1973b).

1 Presented at the annual meeting of the American Psychological Association; Chicago, August 1975.

Procedures

Twenty-two commonly taught phonic generalizations were analyzed using the computer output described above. For example, to determine the utility of the rule concerning pronunciation of hard c, soft c, all the words in the corpus that contain the bigram ce or ci were examined to determine the utility of the rule concerning pronunciation and the frequency of those words in running text were calculated and converted to percentages.

Results and Conclusions

Table 1 gives the results of this analusis in addition to results of similar analyses employing more limited corpii. In general, the consistencies of the rules parallel fairly closely those studies using a much more limited corpus. The greatest discrepencies are with the third and fourth vowel generalizations (see Table 1). The third generalization (a following w) is much more consistent than previous counts indicate when the frequency in running text is considered. (In terms of number or words, it is less consistent than in previous studies). The word was, which has a very high frequency, largly accounts for this. The fourth vowel generalization (final e rule) is considerable less consistent than past studies have indicated - less than 40% in running text. Vowel generalization five (ar followed by final e) would be 100% consistent if are, the single exception (frequency 4393), were taught separately.

Vowel generalization six (two vowel rule) is correct less than 30% of the time in running text. Its value is negligable since rule application is actually detrimental. However, some of the sub-elements of the rule may well be very consistent in their pronunciations. For example, au is pronounced as in sauce in 83% of the total frequencies. The generalization would be a useful one to teach as such, especially since 15 of the remaining 17% of the cases are forms of laugh or beauty. If these exceptions were taught as sight words, one would have accounted for 98% of the frequency of occurrence by teaching three mappings of the bigram au. In addition, many sub-elements become useful simply by revising the rule (the first letter is short/silent and the second is long).

As suggested earlier, consistency alone is not a sufficient criterion on which to judge the utility of a rule. If the rule is sufficiently complex, there are no exceptions. At the simplest level, the rule might merely list all of the exceptions. Caldwell, Peckham, and Nix (1973a) found evidence to support the contention that teaching complex rules is not useful in the decoding task. In a simulated reading task, the authors found that when the rule was a simple one-to-one correspondence (ie. ch is always pronounced as in chair), then direct rule learning was most effective. However, when the rule was more complex (simulation of the final e rule), then direct rule learning was not as effective as a more inductive approach. This suggests that teaching rules directly is only advantageous over the other approaches when the rule is a simple one-to-one correspondence.

Table 2 is a classification of the twenty-two generalizations according to the variables of consistency and complexity. Consistency is defined as 80% or better in running text and complexity is dicotomized as one-to-one correspondence-simple; all others-complex. It is proposed that only those generalizations in the upper left quadrant are useful. However, as indicated earlier, by examining frequencies of sub-elements of some of the rules, new rules, less complex and more consistent in nature, are likely to be found. In this way, some of these rules in other quadrants can be moved to the upper left quadrant.

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TABLE 1

CONSISTENCY OF PHONIC GENERALIZATIONS

Consonant Generalization	STUDY	CW[1]	TW[2]	%	FCW[3]	FTW[4]	%
1. C followed by e or i sounds like s	Clymer	66	69	96			
	Bailey	260	284	88			
	Emans	79	88	90			
	Turner	1065	1152	92	27,541	29,100	94
2. C followed by o or a sounds like k	Turner	1783	1784	99	42,412	42,419	99
3. Ch is usually pronounced as in kitchen, not as in machine	Clymer	99	104	95			
	Bailey	196	225	87			
	Emans	35	52	67			
	Turner	431	601	71	19,361	16,004	82
4. When c and h are next to each other, they make only one sound	Clymer	103	103	100			
	Bailey	225	225	100			
	Emans	53	53	100			
	Turner	596	598	99	19,164	19,171	99
5. When a word ends in ck, it has the same last sound as in look	Clymer	46	46	100			
	Bailey	80	80	100			
	Emans	9	9	100			
	Turner	83	83	100	3,011	2,011	100
6. The letters c and g before y are soft	Turner	74	74	100	998	998	100
7. The letter g often has a sound similar to that of j in jump when it preceeds the letters i or e	Clymer	49	77	64			
	Bailey	168	216	78			
	Emans	60	75	80			
	Turner	601	734	81	12,133	16,622	72
8. G before n is silent	Turner	40	96	41	1,083	1,989	54
9. When ght is seen in a word, gh is silent	Clymer	30	30	100			
	Bailey	40	40	100			
	Emans	3	3	100			
	Turner	133	135	98	5,418	5,463	99

Table 1, page 2.

	STUDY	CW	TW	%	FCW	FTW	%
10. When a word begins with <u>kn</u>, the <u>k</u> is silent	Clymer	10	10	100			
	Bailey	17	17	100			
	Emans	3	3	100			
	Turner	28	28	100	1,925	1,925	100
11. When a word begins with <u>wr</u>, the <u>w</u> is silent	Clymer	8	8	100			
	Bailey	17	17	100			
	Emans	4	4	100			
	Turner	32	32	100	1,038	1,038	100
12. In <u>ph</u>, one hears the sound of <u>f</u>	Turner	188	194	96	2,209	2,423	91
Vowel Generalization							
1. When <u>y</u> is the final letter in a word, it usually has a vowel sound	Clymer	169	201	84			
	Bailey	462	518	89			
	Emans	265	270	98			
	Turner	1,505	1,620	92	49,613	60,302	82
2. When the letter <u>i</u> is followed by the letters <u>gh</u>, the <u>i</u> usually stands for its long sound and the <u>gh</u> is silent	Clymer	22	31	71			
	Bailey	25	35	71			
	Emans	3	3	100			
	Turner	109	139	78	4,551	5,230	87
3. When <u>a</u> follows <u>w</u> in a word, it usually has the sound of <u>a</u> as in <u>was</u>	Clymer	5	47	32			
	Bailey	17	78	22			
	Emans	5	18	28			
	Turner	29	246	11	112,481	17,721	63
4. Final <u>e</u> makes the preceeding vowel long	Clymer	80	288	63			
	Bailey	330	578	57			
	Emans	37	59	63			
	Turner	941	2,212	42	40,886	102,292	39
5. When <u>a</u> is followed by <u>r</u> and final <u>e</u>, we expect to hear the sound heard in <u>care</u>	Clymer	9	10	90			
	Bailey	23	24	96			
	Emans	2	2	100			
	Turner	26	27	96	843	5,238	16

Table 1, page 3.

	STUDY	CW	TW	%	FCW	FTW	&
6. When two vowels are together, the first is long and the second is silent	Clymer	309	686	45			
	Bailey	586	1,732	34			
	Emans	87	480	18			
	Turner	1,728	6,508	26	54,204	185,215	29
7. In ay, the y is silent and the a is long	Clymer	36	46	78			
	Bailey	44	50	88			
	Emans	6	6	100			
	Burmeister	21	21	100			
	Turner	238	241	98	15,147	15,387	98
8. Words that have ee, have a long e sound	Clymer	85	87	98			
	Bailey	148	171	87			
	Emans	24	24	100			
	Burmeister	31	35	89			
	Turner	285	325	87	11,245	14,222	79
9. The two letters ow make the long o sound* or the ou sound as in out (* first half not used)	Emans	18	18	100			
	Burmeister	31	31	100			
	Turner*	151	277	54	6,466	12,445	51
10. In ie, the i is silent and the e is long	Clymer	8	47	17			
	Bailey	27	88	31			
	Emans	5	22	23			
	Burmeister	8	31	26			
	Turner	292	553	52	5,615	11,119	50

1 number of words consistent with the rule
2 total number of words containing the elements of the rule
3 frequency in running text of the words consistent with the rule
4 total frequency in running text of words containing the elements of the rule

TABLE 2

CONSISTENCY COMPLEXITY CLASSIFICATION OF PHONIC GENERALIZATIONS

	CONSISTENT		INCONSISTENT	
	CONSONANT	VOWEL	CONSONANT	VOWEL
SIMPLE	3* 5 6 8 9 10 11 12	1* 2 7	2	3 8 9*** 10
COMPLEX	1 7		4	4 5 6