

DOCUMENT RESUME

ED 040 008

RE 002 476

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TITLE Occurrence of Graphonemes in the Vocabulary of Elementary School Children.  
INSTITUTION Northwest Regional Educational Lab., Portland, Oreg.  
PUB DATE Sep 69  
NOTE 35p.

EDRS PRICE EDRS Price MF-\$0.25 HC-\$1.85  
DESCRIPTORS \*Beginning Reading, \*Phonological Units, Reading Instruction, \*Reading Materials, \*Reading Research, \*Sight Vocabulary, Syllables, Word Lists, Word Recognition

ABSTRACT

This investigation was undertaken to identify the graphonemes inherent within the structure of those English words most likely making up the reading vocabulary of elementary school children. Such knowledge was deemed to be important in determining which words should be included in the content of reading materials designed for initial reading instruction. The hypotheses were that the graphoneme is a readily identifiable matrix within the structure of English words and that a frequency distribution of graphonemes occurring in the vocabulary of elementary school children would provide priorities for teaching purposes. This study dealt only with the decoding process. In identifying words, the 1962 edition of the Thorndike Barnhart Beginning Dictionary was examined and every tenth word marked. Seven generalizations were concluded from the data. The study also lent validity to the assumption that the graphoneme is a useful matrix to be recognized within a word and enforced the concept of movement away from monosyllabic toward the early introduction of multisyllabic vocabulary. References are included. (NH)

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OCCURRENCE OF GRAPHEMES IN THE VOCABULARY  
OF ELEMENTARY SCHOOL CHILDREN

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September, 1969

476

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OCCURRENCE OF GRAPHEMES IN THE VOCABULARY  
OF ELEMENTARY SCHOOL CHILDREN

INTRODUCTION

The usefulness of The Grapheme Concept<sup>1</sup> as the prime method of word attack taught to primary grade children has been proven. There is documented evidence that young children, taught to identify graphemes in monosyllabic words and then taught the encoding and decoding of multisyllabic words through grapheme analysis, rapidly become independent readers.<sup>2</sup> This becomes particularly true when early reading materials are constructed which contain vocabularies stable in their grapheme-phoneme correspondence. The investigator has prepared such reading materials as a part of a reading and language development program for the native youngsters in the State of Alaska.<sup>3</sup>

This study was undertaken in an effort to identify the graphemes inherent within the structure of those English words which would most likely constitute the reading vocabulary of elementary school children. It has become increasingly apparent that such knowledge could play an important role in determining which words should be included in the content of reading materials designed for initial reading instruction. The Chall<sup>4</sup> study clearly delineated the need for the early teaching of decoding procedures. This study attempts to identify the stable structures (graphemes), the teaching of which would logically speed up the process of independent decoding. Its findings have implications for all authors of readers, regardless of decoding methods to be employed.

GENERAL ASSUMPTIONS RELATED TO THE DECODING  
OF ENGLISH WORDS

1. Children can best learn to read when the reading vocabulary is stable in its grapheme-phoneme correspondence.
2. The English language is approximately 87%<sup>5</sup> stable in its grapheme-phoneme relationships, and it is this corpus of stable vocabulary which should constitute initial reading experiences.
3. Written language is, at best, only an approximation of speech.
4. Presently accepted syllabic divisions of words was arrived at in arbitrary fashion and varies from dictionary to dictionary depending upon the lexicographer employed.
  - a. The "rules" of syllabication serve little purpose in initial reading instruction.
  - b. The division of words into syllables frequently results in the formation of open syllables.
  - c. Syllabic divisions furnish poor clues to independent decoding without the presence of complicated systems of diacritical markings. The finite distinctions which characterize these markings and the fact that they vary from dictionary to dictionary renders them of little value to the young reader.
5. The closed syllable is the natural unit of the English language. The matrix here is a VC pattern, and it is this unit called a graphoneme which exemplifies the stability in English words.

## DESCRIPTION OF THE STUDY

### Problem:

Which graphonemes occur with sufficient frequency in the vocabulary of elementary school children to make their teaching appear necessary in enabling young children to independently decode English words?

### Hypotheses:

1. The graphoneme is a readily identifiable matrix within the structure of English words.
2. A frequency distribution of graphonemes occurring in the vocabulary of elementary school children would provide priorities for teaching purposes.

### Delimitations:

The source of vocabulary for this study was the Thorndike Barnhart Beginning Dictionary: Thorndike, E.L., Barnhart, Clarence L., Beginning Dictionary, Scott Foresman, Co., New York, 1962.<sup>6</sup> This reference was used since it is believed to be that dictionary most commonly used in elementary schools at the primary grade level. It has been the experience of the researcher that this book is usually used by pupils in the third grade, and that this volume provides pupils' first dictionary experience.

### Basic Assumptions:

1. The teaching of graphonemes promotes pupils' ability to decode English words.
2. The graphoneme (i.e., the VC pattern) is a more readily identifiable unit than the standardly accepted notion of the syllable.
3. Graphoneme analysis of every tenth word in the Thorndike Barnhart Beginning Dictionary would yield data indicating those graphonemes most frequently occurring in the vocabulary of elementary school children.

4. Beginning reading materials designed to include the findings of this study could be instrumental in promoting early independence in decoding English words.

Definition of Terms:

Graphoneme: A graphoneme is a closed syllable, one that begins with a vowel and ends with a consonant, semi-vowel, or silent "e".

an	ay	ate
it	ow	ike
ar	ew	ume

Matrix: The smallest identifiable unit within the graphoneme which retains the characteristics of the entire graphoneme.

art - the matrix is ar

end - the matrix is en

Duplicity: In connection with the identification of graphonemes, the term "duplicity" refers to those times when one spelling pattern can produce more than one speech sound -

ow - /aw/\*<sup>7</sup> - (cow)

ow - /ow/ - (snow)

or when one speech sound can be represented by more than one spelling.

ight - /ay/ - (night)

ite - /ay/ - (kite)

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\*Linguistic notations of the vowel sounds according to "Modified Key to the Trager-Smith System of Phonemic Notation", Manual for Seven is Magic, Ginn & Company. Boston, Massachusetts, 1969, p. 344.

Closed Syllable: A syllable which begins with a vowel and ends with a consonant, semi-vowel, or silent "e".

Open Syllable: A syllable which begins with a consonant or semi-vowel and ends with a vowel; a single vowel sound as a syllable.

Variant Endings: The term as used here is synonymous with inflectional endings (forms) of words.

Negative Graphonemes: This term refers to those graphonemes identified which are not given the phonemic value one might expect. For example, at in a word like admiration is considered to be negative because of this inflected form of the root word "admire"; the ed in a word such as baked.

Further Limitations:

This study deals only with the decoding process, the ability of pupils to translate symbols into sounds. It ignores word choices based on content considerations.



## PROCEDURES

1. The 1962 edition of the Thorndike Barnhart Beginning Dictionary was examined and every tenth word marked.
2. The words thus identified were listed, yielding a total of 1,432 words. (The total number of words in this dictionary is 14,327.) This constitutes the sample, and can be found as Appendix 1.
3. Each word on the resultant list was analyzed according to graphonemes.
  - a. The VC pattern in each word was underlined.
  - b. A rank distribution was made from greatest to least frequency of occurrence as shown in Table I; the cut-off point was determined to be ten.
  - c. All existing graphonemes were grouped according to their beginning vowels (a, e, i, o, u, y) and the actual numbers of occurrences noted for each. (Appendix 2)
  - d. The phonemic value of the vowel sound was noted. (example: ear - Was it /iyr/ as in "hear"; /eyr/ as in "bear"; /ər/ as in "earth"; or /är/ as in "heart"?)
  - e. Graphonemes requiring the placement of a macron over the vowel sound were noted separately.\* (Appendix 3)
  - f. Open syllables were identified. (Table II)
  - g. Variant endings were noted as a separate item. (Table III)

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\*Part of the pedagogy of The Graphoneme Concept<sup>1</sup> takes into account the necessity of teaching the use of the macron.

TABLE I

RANK DISTRIBUTION OF GRAPHONEMES  
IDENTIFIED IN SAMPLE

<u>Times Occurred</u>	<u>Graphoneme</u>	<u>Phonemic Value of Vowel.*</u>	<u>Example</u>
160	er	/ér/	her <u>er</u>
78	in	/in/	win <u>in</u>
75	en	/en/	ten <u>en</u>
71	or	/ôr/	for <u>or</u>
51	an	/an/	can <u>an</u>
45	on	/on/	on <u>on</u>
39	un	/un/	run <u>un</u>
37	ate	/āt/	late <u>ate</u>
37	it	/it/	hit <u>it</u>
35	et	/et/	pet <u>et</u>
34	is	/iz/	his <u>is</u>
33	at	/at/	cat <u>at</u>
33	al	/al/	Al <u>al</u>
33	ic	/ik/	panic <u>ic</u>
32	ess	/es/	dress <u>ess</u>
30	ing	/ing/	sing <u>ing</u>
28	ent	/ent/	went <u>ent</u>
28	es	/es/	yes <u>es</u>
27	om	/om/	Tom <u>om</u>
24	ec	/ec/	record <u>ec</u>

<u>Times Occurred</u>	<u>Graphoneme</u>	<u>Phonemic Value of Vowel*</u>	<u>Example</u>
23	ab	/ab/	cab
22	ap	/ap/	cap
22	ed	/ed/	red
21	im	/im/	him
21	al	/əl/	final
20	ar	/är/	car
20	em	/em/	them
20	id	/id/	hid
20	ul	/ul/	ultimate
18	el	/el/	elevator
17	ac	/ak/	accent
17	as	/az/	has
16	am	/am/	am
16	ex	/eg/	exit
15	il	/il/	civil
15	if	/if/	if
15	ur	/ër/	fur
14	ay	/ā/	play
14	um	/um/	hum
14	us	/us/	bus
13	ad	/ad/	bad
13	ish	/ish/	wish
13	ol	/ol/	olive
12	är	/ar/	arid
12	op	/op/	hop

<u>Times Occurred</u>	<u>Graphoneme</u>	<u>Phonemic Value of Vowel*</u>	<u>Example</u>
11	ant	/ant/	pl <u>ant</u>
11	ep	/ep/	st <u>ep</u>
11	ig	/ig/	pi <u>g</u>
11	ill	/il/	wi <u>ll</u>
11	ow	/ō/	sn <u>ow</u>
11	ure	/ür/	su <u>re</u>
10	ag	/ag/	ja <u>g</u>
10	ef	/ef/	che <u>f</u>
10	ip	/ip/	li <u>p</u>
10	ōs	/ōz/	po <u>sing</u>

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An examination of the graphonemes thus identified leads to some interesting observations. For example: er occurs in only one monosyllabic English word (her), yet it occurred with the highest frequency of all graphonemes; affixes appear important in that they apparently account for much of the stability in grapheme-phoneme correspondence; one might have expected eck (which occurred only three times in the sample), or ick (six times) to be more common than ec (24 times) or ic (33 times), but such was not the case; only two examples of duplicity occurred in this high frequency count (al and ar), both exemplifying one grapheme producing two phonemes, while there were no instances of the reverse - one phoneme represented by two graphemes.

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\*Phonemic notations are as given in the Thorndike Barnhart Beginning Dictionary.

TABLE II  
OPEN SYLLABLES

y (ī) - 99	ōō - 3
le - 48	ēē - 3
ī - 12	le (lī) - 2
a (ə) - 12	y (ī) - 2
ō - 10	īe - 2
ā - 9	ly (lī) - 2
ī - 10	u (ōō) - 1
ū - 8	ēā - 1
ē - 5	ue (ōō) - 1
i (ē) - 5	

TABLE III  
VARIANT ENDINGS

tion - 37	ial - 3
ious - 8	ient - 3
sion - 9	ian - 1
ion - 3	ean - 1

TABLE IV

SUMMARY OF ANALYSIS OF SAMPLE

Number of Words in Sample	Number of Syllables in Sample	Number of Closed Syllables (graphonemes) in Sample	Number of Open Syllables in Sample
1,432	3,101	2,866	235

1. The words in this sample averaged 2.16 syllables, 2.0 of which were closed.
2. 92.4% of the total number of syllables is closed.
3. An examination of the open syllables (Table II) reveals that the majority of these occurred in two endings: "y" and "le".

## CONCLUSIONS

The following generalizations can be assumed to be valid based upon the data acquired. (A summary of this data can be found in Table IV.)

1. There exists within the structure of English words a corpus of graphonemes which occur with sufficient frequency to warrant their teaching. (See Table I)
2. Priorities can be established to further the utility and reliability of word choice in initial reading vocabulary.\* For example, the pronoun "her" should be taught early, since the graphoneme er occurred the greatest number of times in the 1,432 words analyzed.\*\*
3. Duplicity in graphonemes does not occur as often as one might suspect.
4. The short vowel phoneme occurs more often than any other.
5. On the basis of this sample, there can be identified more closed than open syllables.
6. Open syllables occur most often in lateral position in English words. (See Table II)
7. Exceptions to graphoneme analysis most frequently occur in variant endings. The root forms of these same words are usually quite stable.

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\*It must be kept in mind that the author is dealing only with the selection of useful vocabulary for the promotion of independence in decoding. There are other important criteria for the selection of initial reading vocabulary. For example, "organ" would be a word easily decodable, since, according to this study, or occurred 71 times and an occurred 51 times, while ith as found in the word "with" occurred only once. However, "with" is certainly a more useful English word than "organ" because of its frequency of use.

\*\*In the present edition (1969) of the Alaskan Readers, "her" is introduced in Level Five. However, in the revision of the Alaskan Readers, the introduction of this pronoun will be moved to an earlier level because of the results of this study.

## SUMMARY

The data furnished by this study has implications for all who would write materials for initial reading instruction if their aim is to rapidly promote pupils' ability to independently decode English words. Any materials so constructed would appear to be instrumental in the acquisition of this reading skill.\*

Furthermore, the study lends validity to the assumption that the graphoneme is, indeed, a useful matrix to be recognized within a word. The ratio of open versus closed syllables is greater than ten to one in favor of the closed syllable. The infrequent occurrence of duplicity and of negative graphonemes implies a stability inherent in this procedure.

The study also enforces the concept of movement away from monosyllabic and toward the early introduction of multisyllabic vocabulary. If pupils can initially be taught monosyllabic words containing graphonemes of high frequency as identified within the structure of English words, they should be able to transfer this knowledge as an important tool in independently decoding multisyllabic vocabulary. This transference should occur with minimal difficulty.

While the intent of the study was not to enforce The Graphoneme Concept, the resultant data does verify previous findings. It would appear that if we were to:

1. use an initial reading vocabulary employing those graphonemes most frequently found in English words,
2. teach pupils to identify graphonemes in English words,
3. teach the decoding of some words through the use of the macron,
4. teach pupils a small corpus of high frequency open syllables at the ends of English words,
5. teach pupils the effect of certain variant endings of English words,

we could, coupled with a program of phonics instruction aimed at teaching consonant grapheme-phoneme correspondences, greatly advance pupils' early reading achievement.

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\*The researcher is well aware that decoding (the translation of symbol into sound) is only one of the important criteria to be considered when selecting vocabularies. This criterion appears to be over-emphasized in this study only because this is the area under scrutiny.



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**APPENDIX**

## APPENDIX 1

### WORD SAMPLE

abbot	answer	ballad
abject	antenna	ban
abominable	antidote	banjo
absent	anxious	Baptist
abstract	apart	bard
accelerator	apology	bark
accident	appeal	barrel
accomplish	appliance	basement
accurate	apprehend	bass
acknowledge	approximate	bathroom
acquit	Arabia	battlefield
actress	arc	bazaar
adaptation	arctic	bean
adhesive	arid	beautiful
admiral	arm	becoming
adopt	armpit	bedtime
advance	array	bees wax
adverse	art	befriend
aerial	artistic	begun
affection	ashamed	behold
afloat	asparagus	bell
afterward	assassinate	belt
aggregate	assignment	benevolent
ago	assume	beset
ahead	astonishing	bestow
aircraft	at	betroth
airway	atom	beware
album	attain	bicuspid
alien	attire	bill
alley	audacious	biography
ally	August	bishop
aloof	authorize	black
alter	available	blade
alum	aversion	blaze
amber	avowal	blessing
America	awful	blister
among	axis	blockhouse
an		blossom
and	backbone	blubber
angler	bacteria	bluing
animate	bail	board
announce	balance	bob

boil  
bombardment  
boo  
born  
bottom  
bound  
bow  
box  
brace  
bramble  
brawn  
breast  
breeze  
bride  
brigand  
bring  
broaden  
bronchial  
broth  
browse  
brutal  
buckwheat  
bugbear  
bulge  
bullfinch  
bun  
buoy  
burlap  
burst  
bust  
butter  
buy  
bystander

cactus  
calculate  
call  
came  
Canada  
candor  
cannonade  
cantankerous  
cape  
capsize  
car  
cardboard  
careless  
carnival

carrot  
cascade  
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Christ  
chronicler  
churl  
cinnamon  
circumference  
citizenry  
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clamor  
clarion  
classroom  
cleanness  
cleave  
clerk  
clime  
cloak  
closeness  
cloudless  
cluck  
coachman  
coat  
cobweb  
cocoa

coffer  
cold  
collector  
colonization  
colossal  
comedian  
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crab  
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fiddler  
fiendish  
fiftieth  
file  
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finch  
fir  
fireman  
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fishhook  
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flake  
flashlight  
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glorious  
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goat  
goddess  
goldfish  
goodly  
gopher  
gossip  
grab  
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grandchild  
grange  
grapple  
gratification  
gravity  
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immortal  
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imperative  
impetuous  
importation  
impression

imprudent  
inaccessible  
inauguration  
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inconsistent  
incredibly  
indelible  
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indignant  
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ingratitude  
iniquity  
injury  
inmost  
innovate  
insane  
insert  
insistence  
install  
instinctive  
insufficient  
intake  
intend  
intercede  
interference  
intermingle  
interpreter  
interstate  
intimate  
intrepid  
inundate  
invent  
investigator  
invoke  
ire  
irresolute  
isle  
Italian  
ivory  
  
jade  
January

jay  
jellyfish  
Jesus  
jeweler  
job  
joke  
journalist  
jubilant  
jugular  
juncture  
just  
  
keenness  
kept  
keynote  
kiln  
kindergarten  
gingly  
kith  
kneel  
knighthood  
knotty  
  
lack  
ladybug  
lameness  
landlady  
lantern  
larder  
lash  
late  
latter  
laundry  
lawmaking  
layer  
leaf  
leant  
lease  
lecture  
left  
legion  
lemonade  
lent  
let  
liberal  
lichen  
life  
lifetime  
lighthouse  
likelincod

limb  
limpid  
links  
liquid  
literate  
livelong  
lizard  
loath  
location  
locust  
logic  
long  
loom  
lopsided  
lost  
lovable  
lowly  
lucky  
luminous  
lurid  
lye

machinist  
made  
magistrate  
magnitude  
mailman  
maintain  
maker  
mallard  
man  
manful  
manicure  
manor  
manuscript  
march  
mark  
maroon  
marshy  
masculine  
massage  
mat  
mathematician  
maul  
mayhap  
meager  
meanness  
mechanically  
mediate  
medium

mellow  
memorize  
mental  
mercury  
merrily  
message  
meter  
mettle  
microscope  
middy  
midway  
migration  
milk  
milliner  
mind  
minion  
mint  
mire  
mischievous  
mishap  
miss  
mist  
misty  
mixer  
mode  
Mohammedan  
molding  
momentary  
monk  
monstrous  
moonbeam  
moral  
morose  
mosque  
motherly  
motorcycle  
mound  
mourn  
move  
mown  
muddle  
mule  
mum  
murderer  
mushroom  
muskrat  
mute  
my

namesake  
nasal  
natural  
nausea  
nearby  
necessity  
needlework  
neigh  
nest  
neutron  
New Jersey  
New World  
nickname  
nightmare  
ninth  
nocturnal  
nominee  
noontide  
northeast  
northwest  
notch  
notorious  
now  
nuisance  
nurse  
nymph

obedience  
obligation  
obscure  
obstacle  
occasional  
ocelot  
odds  
offender  
offset  
oil  
olden  
omelet  
oneself  
onward  
operate  
opposite  
oral  
orbit  
ordinarily  
organize  
originate  
ostentatious  
ourselves



outcast  
outermost  
outlaw  
outpost  
outskirts  
outwit  
overcame  
overflow  
overheat  
overlord  
overseas  
overstep  
overweight  
oxbow

pad  
pagoda  
pair  
palfrey  
palpitate  
panda  
pantry  
parable  
paralyze  
pardon  
parka  
parsnip  
particle  
partridge  
passion  
pasteurize  
pate  
patient  
patter  
paving  
peaceful  
pearly  
peculiar  
peek  
pelican  
pence  
penitence  
pension  
peppermint  
perch  
perforate  
periodic  
permission  
persecute

personal  
pertain  
pester  
petroleum  
pharmacist  
Philippine  
phonetic  
physically  
pick  
picture  
pig  
pike  
pillar  
pincushion  
pinto  
pistol  
pitfall  
placid  
planet  
plastic  
player  
plea  
plentiful  
ploughman  
plumber  
plutonium  
pocket  
point  
polar  
polio  
poll  
pompon  
poodle  
poppy  
pore  
port  
portico  
possessive  
postage stamp  
postpone  
potion  
pour  
practicable  
praiseworthy  
precaution  
precipitous  
prediction  
prehistoric  
preparatory

presentable  
press  
presumptuous  
prevailing  
priceless  
primary  
primrose  
prior  
privateer  
probable  
proclaim  
production  
profile  
progressive  
prominence  
pronoun  
propensity  
proposal  
prospective  
protein  
provender  
provocation  
pry  
publish  
puffy  
pulverize  
punctual  
punt  
pure  
purport  
push  
pyramid

Quaker  
quarry  
quaver  
quick  
quilt  
quoit

racial  
radical  
rag  
raiment  
rake  
ranch  
rap  
rarely  
rather

rave  
raw material  
read  
reality  
rear  
rebellious  
recede  
recipe  
recline  
reconcile  
recover  
recur  
redouble  
reek  
referee  
reflector  
refresh  
refuse  
regime  
regularly  
reiterate  
relatively  
reliable  
relish  
remedy  
remorse  
renewal  
repair  
repel  
report  
reproachful  
repulsive  
requite  
reserve  
resigned  
resonant  
respectively  
rest  
restriction  
retaliate  
retract  
revelation  
reverie  
revolution  
rhododendron  
riches  
ride  
rig  
rightly

ring  
ripe  
rival  
roam  
robust  
rod  
role  
romantic  
roost  
rosette  
rouge  
rouse  
row  
rubbish  
ruff  
rumble  
rung  
russet  
  
sacrifice  
sag  
sailor  
salesman  
salty  
sanctity  
sane  
sap  
satellite  
saucepan  
savior  
sawmill  
scaffold  
scan  
scare  
scent  
schooling  
scientist  
score  
scourge  
scraper  
scribe  
scrutinize  
scurry  
seagoing  
seaman  
seaside  
secluded  
secrete  
sediment

seemingly  
seldom  
selfish  
semaphore  
sensation  
sentiment  
sequel  
serial  
server  
setting  
seventy  
sex  
shady  
sham  
shanty  
shatter  
sheathe  
sheer  
shelter  
shied  
shiny  
shirk  
shod  
shop  
shorten  
should  
shower  
shrill  
shrunk  
shy  
sideline  
sieve  
significance  
silk  
silverware  
simultaneous  
singer  
sip  
site  
sixtieth  
skid  
skinny  
skylight  
slake  
slave  
sleepless  
slicker  
slingshot  
sloop

slow  
slunk  
smallpox  
smit  
smoky  
snack  
snaredrum  
snipe  
snowdrift  
snuggle  
soccer  
sodden  
soil  
sole  
soloist  
someone  
songbird  
sorcerer  
sort  
sour  
southerly  
sovereignty  
spaghetti  
spanking  
spasm  
special  
speck  
sped  
spellbound  
Sphinx  
spin  
spirit  
splendor  
spoken  
spore  
sprain  
springboard  
spun  
squad  
squash  
squirm  
stag  
stake  
stamen  
standpoint  
stare  
starvation  
station  
stave

steak  
steed  
stepfather  
stew  
stile  
stink  
stop  
storm  
straggle  
strand  
strategy  
street  
stricken  
stringy  
stroke  
strut  
studio  
stunk  
sturgeon  
sublime  
subsequent  
substitution  
succeed  
such  
suffering  
suggest  
sulk  
summer  
sunburnt  
sung  
sup  
supermarket  
supple  
supposing  
surf  
surpass  
surveyor  
suspicion  
swamp  
sweat  
sweetish  
swiftness  
switch  
swum  
symmetrical  
syrup

tact  
taint  
tall  
tangible  
tape  
tarantula  
tartan  
tattle  
taxi  
teamwork  
teepee  
television  
temperature  
tenacious  
tenderness  
tension  
terminus  
territory  
tetanus  
thankless  
thee  
theology  
therein  
thermostat  
thickly  
think  
thistle  
those  
thrasher  
threshold  
throng  
thumb  
thus  
ticket  
tie  
tiller  
timothy  
tinware  
tired  
toast  
toil  
toll  
ton  
took  
topic  
torment  
tot  
toughen  
towel

trace	unprepared	watercourse
trademark	unremitting	waterway
trail	unsatisfactory	way
trance	unsettle	weakling
transgress	unspeakable	weariness
transom	untie	web
trappings	untrue	weed
tread	unwholesome	weft
treaty	unwound	wellborn
trencher	upkeep	wept
tribe	uproar	westwards
tricolor	upturn	whatever
trinket	us	when
trivial	usher	wherein
tropical	utter	whetstone
trousers		whimsical
true	vagabond	whisk
trustful	valise	whiten
tub	vane	wholesale
tuition	varied	why
tuneful	vastness	widen
Turk	vehement	wigwag
turpentine	vendor	will
tweed	ventilation	win
twill	verdant	windmill
two	verse	wing
typify	vestige	wintergreen
	vial	wise
unaccented	vicinity	wither
unavoidable	vigil	wives
unbolt	villain	wolverine
uncertain	vineyard	wonderful
unconstitutional	violet	woodcraft
underclothes	virtue	woodwind
underline	visionary	wording
undertaker	vivacious	workmanlike
undisputed	vociferous	worry
unduly	voluble	worthy
unequal	vouch	wrangle
unfamiliar	vying	wreck
unfortunate		wretched
unguent	wager	write
unheeded	waiter	wrought
unify	wall	
United States	wander	
unkindly	warden	
unlimited	warmth	
unmindful	wary	
unobserved	wasteful	

yard  
yearling  
Yellowstone  
yielding  
you  
youth

Zeus  
zone

APPENDIX 2\*

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "a"

an-51	ack-5	**ac-2	aise-1
ate-37	āk-5	ac (as)-2	aith-1
at-33	ath-5	āb-2	āl-1
al-33	aw-5	aim-2	all (ul)-1
ab-23	ash-4	ait-2	alf-1
ap-22	ass-4	aze-2	āz-1
**at-21	ast-4	al (all)-2	alt-1
al (ul)-21	āv-4	ang-2	amp-1
ar-20	arm-4	ape-2	amp (omp)-1
ac-17	ard (erd)-4	aph-2	an (ahn)-1
as-17	ar (er)-4	ās-2	ange-1
am-16	age-4	ac (ace)-1	aord (ord)-1
ay-14	ame-4	aar-1	āp-1
ād-13	ark-3	ach (atch)-1	ār-1
ar-12	ank-3	ach (ush)-1	arch-1
ant-11	ave-3	ad (od)-1	**as-1
ag-10	ād-3	az-1	asm-1
and-8	āc-3	ayh (ā)-1	aste-1
ance-8	ah (uh)-3	auze-1	at (uh)-1
are-8	ale-3	auth-1	at (ut)-1
ail-8	ax-3	aunt-1	ate (ut)-1
ade-8	ām-3	aus-1	ath (ahth)-1
ake-7	art-3	aund-1	auc (aus)-1
act-7	ane-3	awn-1	aud-1
āt-7	arc-2	aul-1	
all-7	aug-2	aer-1	
ain-6	ar (or)-2	aft-1	
all (al)-6	ag (ug)-2	āg-1	
ard-6	ag (aj)-2	ahl (ul)-1	
av-6	af-2	ain (un)-1	
air-5	ace-2	aint-1	

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\*On occasion, phonetic spelling follows the graphoneme to illustrate differences in the phonemes produced.

\*\*Negative graphonemes.

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "e"

er-160	er (air)-4	eeze-2	eight (āt)-1
en-75	eam-3	eg (ej)-2	**eign-1
et-35	eb-3	eh (ā)-2	eign (ain)-1
ess-32	eck-3	ēl-2	eight-1
es-28	ēd-3	ēn-2	eigh (ā)-1
ent-28	ede-3	ēs-2	eith (ēth)-1
ec-24	ēy-3	esh-2	el (ul)-1
ed-22	eet-3	ēt-2	**el-1
em-20	eft-3	eac-1	elt-1
el-18	ert-3	eace-1	elm-1
ex-16	ead (ed)-2	eaf-1	empt-1
ep-11	ead-2	eal (el)-1	**ēn-1
ef-10	eag-2	eal-1	ense-1
ence-9	ear (air)-2	eant (ent)-1	eon (yun)-1
ew-9	er (ār)-2	earl (erl)-1	eone-1
est-9	eth-2	ear (ar)-1	ēp-1
ell-8	ear (er)-2	ease-1	**ep-1
ev-8	eas-2	east (est)-1	epth-1
ear-6	east-2	eat (ate)-1	erb-1
eed-6	eek-2	eat (et)-1	ere-1
end-6	erm-2	eathe-1	ere (air)-1
ēq-6	ern-2	eak (āk)-1	erch-1
ēr-6	erse-2	eak-1	erve-1
**es-6	ēc-2	eaut (ūt)-1	ete-1
ean-4	ec (es)-2	eave-1	ette (et)-1
eat-4	ect-2	**eb-1	eur (ur)-1
eep-4	**ed-2	ēb-1	eus (ōōs)-1
eer-4	ein-2	ebt-1	eut (ōōt)-1
eg-4	elf-2	ec (is)-1	eum (ium)-1
ept-4	erk-2	ech (ek)-1	**ew-1
	een-2	edge-1	**ey-1
		edth-1	ey-1
		eel-1	ey (ay)-1
		eem-1	ey (āy)-1
		ēg (ej)-1	eye (ī)-1
		**eg-1	
		ēg-1	

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "i"

in-78	**ic-3	ith-1	inx (inks)-1
it-37	īc-3	īz-1	iol-1
is-34	ice-3	ian (ien)-1	ion (on)-1
ic-33	ict-3	iar (yər)-1	ion (un)-1
ing-30	ike-3	ic (is)-1	ior (yər)-1
im-21	īm-3	idge-1	ipse-1
id-20	īn-3	ied-1	ipt-1
il-15	ise-3	ied (ēd)-1	iq (u)-1
if-14	ite (it)-3	iend (end)-1	īr-1
ish-13	ive-3	iend (ē)-1	ird-1
ig-11	ibe-2	iene (ēn)-1	irge-1
ill-11	īd-2	ief-1	irst-1
ip-10	ield-2	iev (ē)-1	irt-1
ight-9	ign-2	iev (iv)-1	irk-1
ive (iv)-9	ile-2	ieve (iv)-1	irm-1
ist-8	ilk-2	ife-1	ise (ēs)-1
ize-7	inch-2	if-1	ism-1
ib-6	īnd-2	īg-1	iss-1
ick-6	ind-2	igh (ī)-1	īst-1
ide-6	ink-2	ige (ij)-1	itch-1
iv-6	int-2	īgn-1	
ine (in)-5	ipe-2	**īl-1	
ine-5	ir (ear)-2	**il-1	
ir-5	**is-2	il (ul)-1	
ire-5	īs-2	ild-1	
iv-5	**it-2	iln-1	
ial (iul)-4	ix-2	ilt-1	
ime-4	iz-2	**imb-1	
ite-4	īt-1	iem (eme)-1	



OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "o"

or-71	ōb-4	om (um)-2	onk-1
on-45	ōd-4	ōn-2	ood (ōō)-1
om-27	ook-4	ond-2	oof-1
ol-13	oom-4	ōp-2	oop-1
op-12	oon-4	ord-2	oost (ōō)-1
ōw-11	ose-4	ork-2	oot-1
ōs-10	oss-4	ote-2	ope-1
old-9	oun-4	ōth-2	oph-1
ost-8	ox-4	ou (ōō)-2	opt-1
ot-8	oard-3	oub (ub)-2	**or-1
ōv-8	oat-3	our (er)-2	orde-1
ow-8	off-3	our (or)-2	ork (erk)-1
ob-7	ōg-3	ouse-2	orn-1
od-7	oid-3	own-2	orse-1
ound-7	ōk-3	oad (aud)-1	ōst-1
ous (us)-7	oke-3	oak-1	**ōt-1
ōc-6	ōm-3	oal-1	otch-1
or (er)-6	on (un)-3	oam-1	ouch-1
out-6	ool-3	oar-1	oud-1
ov-6	ore (or)-3	oast-1	ought-1
ock-5	orm-3	oath-1	ould-1
oil-5	ōt-3	oc (os)-1	ough (ōw)-1
ōl-5	oth-3	ode-1	ough (uf)-1
ole-5	oach-2	oes (uz)-1	ounce-1
one-5	ōc (ōs)-2	ōf-1	ourge-1
ong-5	oc-2	ōh-1	ourn-1
ood-5	og-2	oll-1	ourt (ort)-1
ort-5	oit-2	ōll-1	outh (uth)-1
os-5	oint-2	olt-1	outh (ōoth)-1
ous-5	ol (ul)-2	ome (um)-1	ove-1
		omb-1	ove (uv)-1
		one (un)-1	ove (ōō)-1
		one (wh)-1	owl-1
		ong (ung)-1	owse-1
			ōwn-1

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "u"

un-39	url-2	ump-1
ul-20	urn-2	unce-1
ur-15	usk-2	und-1
um-14	**ut-2	unt-1
us-14	uard (ard)-1	**uoy-1
ure-11	**ūc-1	up (oo)-1
ut-9	ūc-1	ur (er)-1
ub-8	uce-1	urf-1
up-7	uch-1	urk (erk)-1
ug-5	uck (oo)-1	urse-1
ūl-5	ūd-1	urst-1
ust-5	udge-1	ūs-1
ude-4	uent (went)-1	**us-1
unk-4	uff-1	uy (ī)-1
use-4	uilt-1	
ute-4	uis (ew)-1	
uck-3	uis (oo)-1	
uf-3	uit-1	
ull-3	uke-1	
ung-3	ul (oo)-1	
ūr-3	ule-1	
ush-3	ulf-1	
ūt-3	ulge-1	
ual-2	ulk-1	
ūb-2	ult-1	
uc-2	ūm-1	
ud-2	um (uh)-1	
ud (oo)-2	umb-1	
ūn-2	ume-1	

OCCURRENCE OF GRAPHONEMES

BEGINNING WITH "y"

ym-2  
yc-1  
ye (*i*)-1  
yg (*i*)-1  
yn-1  
ypt-1  
yr-1  
ys-1  
yth (eth)-1  
yze-1

APPENDIX 3

GRAPHONEMES REQUIRING THE USE OF THE MACRON

āt-7	ēq-6	īv-5	ōw-11	ūl-5	ȳn-1
āk-5	ēd-3	īc-3	ōs-10	ūr-3	
āv-4	ēy-3	īm-3	ōv-8	ūt-3	
ād-3	ēc-2	īn-3	ōus (us)-7	ūb-2	
āc-3	ēl-2	īd-2	ōil-5	ūn-2	
ām-3	ēs-2	īnd-2	ōb-4	ūc-1	
āb-2	ēt-2	īs-2	ōd-4	**ūc-1	
ās-2	ēb-1	īt-2	ōg-3	ūd-1	
āg-1	ēg (ej)-1	īz-1	ōk-3	ūm-1	
āl-1	ēg-1	īg-1	ōm-3	ūs-1	
āz-1	ēp-1	īgn-1	ōt-3		
āp-1		**īl-1	ōc (ōs)-2		
ār-1		īr-1	ōn-2		
		īst-1	ōp-2		
			ōth-2		
			ōf-1		
			ōh-1		
			ōll-1		
			ōst-1		
			**ōt-1		
			ōwn-1		

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\*\*Negative graphonemes.