Phonics-based Analyses of the Elementary English Words in the 2022 Revised National Curriculum

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ABSTRACT

This study examined the 800 elementary English words in the 2022 revised national curriculum to provide a comprehensive vocabulary profile that supports phonics education for young learners. Its focus was on analyzing the distributions of sound and letter patterns in first-syllable onsets and final-syllable rhymes, which are central components of phonics instruction. The implications of these sound-letter variations for teaching onsets and rhymes at the elementary level were also discussed. Analysis of the onsets revealed 33 and 30 sound-letter pairs for single-consonant (/k/-'c') and consonant-cluster onsets (/st/-'st'), respectively. For rhymes, 32, 177, and 93 sound-letter pairings were identified for those without a coda (/i/-'y'), with a single-consonant coda (/ər/-'er'), and with a consonant-cluster coda (/ænd/-'and'), respectively. Both onsets and rhymes frequently involved one-to-many relationships between sounds and letters, such as /s/ corresponding to 's', 'c' and 'sc', highlighting the complexity of elementary English phonics.

Keywords: phonics, 2022 revised national curriculum, elementary English words, onset, rhyme

1. Introduction

Phonics is an instructional approach that emphasizes the systematic relationship between sounds (phonemes) and their corresponding letters (graphemes). This method promotes the acquisition of foundational encoding and decoding skills by teaching the sound-letter correspondences (Morrow & Tracey, 1997). In the context of L2 English learning, especially in early English education, phonics plays a crucial role in helping young learners develop accurate pronunciation, spelling, and reading fluency (Wood, 2000). A variety of instructional methods in phonics education have been proposed to help L2 English learners develop their sound-letter knowledge in various units such as onset, rhyme, and syllable (Kwon & Kim, 2003; Murphy Odo, 2021; Park & Jeong, 2005; Woore, 2021).

Phonics is often considered an essential component of early English education (Choi & Park, 2020). It is widely implemented in both public and private English education programs in Korea. For example, phonics has been frequently included in elementary English textbooks with various activities as the previous national curricula of English explicitly incorporated phonics instruction (Yoon, 2023). Moreover, the recent 2022 revised nation curriculum of English places even greater emphasis on phonics (Ministry of Education, 2022) to ensure that phonics knowledge serves as a foundation for young learners to experience goal-oriented language use such as production and reception.

Despite its established presence, English phonics education in Korea faces several challenges. The national curriculum lacks specific guidelines on the systematic teaching of sound-letter relationships (Ministry of Education, 2022), leading to inconsistencies across educational materials and instructional practices. Different textbooks present varying amounts of phonics content, inconsistent sequences of instruction, and different types of activities, resulting in uneven learning experiences for Korean students (Choi & Park, 2020). Additionally, students often encounter difficulties in learning phonics, including the lack of exposure to certain sound-letter patterns and the tendency to overgeneralize phonics rules (Lee, 2023; Lee, 2013).

Considering that these limitations can lead to serious miscommunication and the fossilization of incorrect language patterns, it is essential to achieve a comprehensive understanding of the primary source of phonics education, namely the word list in the national curriculum. There is a pressing need for systematic research into the word list in terms of phonics to figure out whether the curriculum word list supports or inhibits effective phonics learning among elementary school students. We also need to examine whether the word list provides sufficient and appropriate patterns that facilitate phonics learning. Therefore, this paper adopts a structured approach by examining the binary systems of syllable components, i.e., onset and rhyme, in the 800 elementary-level words from the 2022 revised national curriculum. The guiding research questions for this study are as follows:

RQ1: How do the onsets vary in their sound-letter patterns among the 800 elementary-level words, and what implications do these variations have for the phonics education?

RQ2: How do the rhymes vary in their sound-letter patterns among the 800 elementary-level words, and what implications do these variations have for the phonics education?

2. Overview of Phonics

Phonics is a method of teaching sound-letter relationships, used especially in early childhood education (Audina, Ma'muroh, & Ulfa, 2022; Morrow & Tracey, 1997). The origin of phonics in language instruction can be traced back to early 16th century, when a German grammarian, *Valentin Ickelsamer* highlighted the teaching of phoneme-letter correspondences for beginning readers (Davies, 1974). In L1 English contexts, phonics has been a fundamental approach to literacy, helping learners, especially struggling readers, decode words by recognizing the relationship between letters and their associated sounds (Sitthitikul, 2014). Major approaches in English phonics include synthetic phonics and analytic phonics (Johnston, McGeown, & Watson, 2012). Synthetic phonics involves teaching children to convert letters into sounds and then blend them to form recognizable words. Analytic phonics, on the other hand, focuses on teaching whole words first, followed by the analysis of constituent sounds.

In L2 English contexts, phonics instruction often adapts to the specific linguistic backgrounds of learners (Murphy Odo, 2021). For instance, learners whose native languages have different syllabic or orthographic structures may require tailored phonics approaches to effectively bridge the gap between their L1 phonemic awareness and English phonics. This adaptation is crucial for effective L2 phonics instruction to ensure that learners understand how to apply their phonological skills to English (cf. Goswami & Mead, 1992).

The contents of phonics instruction are typically organized either by phonemes (i.e., consonants and vowels) or syllable structure (i.e., onset and rhymes). There is an ongoing controversy about which organization is more appropriate for phonics instruction (Choi & Park, 2020; Kwon & Kim, 2003; Park & Jeong, 2005). The key difference lies in whether the vowel-consonant pattern (VC) should be taught together (=rhymes) or divided into small units (=phonemes). The present study employs the syllable-structure-based approaches (i.e., onset and rhyme) because individual vowel phonemes exhibit significant inconsistency in sound-letter patterns, while greater consistency between letter and sound was observed when the vowel and final consonant were considered as a single unit (VC), namely a rhyme (Goswami, 1998; Macmillan, 2002; Stanback, 1992; Treiman et al., 1995).

The onset is the initial consonant sound of a syllable, while the rhyme is the other part of the syllable that contains the vowel and all consonants that follows it. For example, in the word *cat*, /k/ is the onset sound, and /æt/ is the rhyme

sound. It has been shown that awareness of onset and rhyme significantly aids in learning to read and write. Children's ability to manipulate these units within words can facilitate their understanding of larger phonological patterns, which is crucial for reading development (Bryant et al., 1990; Goswami, 1991; Goswami & Mead, 1992; Kwon & Kim, 2003).

According to Choi & Park (2020), the explicit incorporation of phonics into the Korean national curriculum of English began in the 2007 revised curriculum. Since then, phonics education has evolved over time through the process of curriculum revision. The previous national curricula introduced phonics to help students understand the relationship between letters and sounds, but the approach and depth of instruction varied (Choi & Park, 2020; Yoon, 2023). In particular, the recent 2022 revised national curriculum emphasizes a more structured approach to phonics instruction, expanding the scope of phonics application to include phrases and sentences (Ministry of Education, 2022). In addition, as receptive skills such as reading and listening are integrated into a single domain of *reception*, it becomes essential to provide phonics instruction in a more integrated way (Yoon, 2023).

In English classes at Korean schools, phonics instruction is primarily delivered through activities in elementary English textbook. Therefore, many studies have analyzed the phonics activities in grade 3-6 elementary English textbooks (Choi & Park, 2020; Kim, 2016; Ko, 2012; Mun & Chung, 2019; Seo & Yoon, 2017; Yoon, 2023). These studies have questioned the quantity and organization of phonics activities in elementary English textbooks. Despite the importance of phonics, it was not often covered in grade 5-6 textbooks (Kim, 2016). In addition, elementary English textbooks notably varied in the type of sound-letter patterns. For example, some grade 3 textbooks focused on single consonants, while the others also included monophthongs (Yoon, 2019). The teaching approaches also varied among the textbooks. While most textbooks included the basic steps such as presentation and practice, higher-level steps such as evaluation and application were observed in only a few textbooks (Choi & Park, 2020).

These variations of phonics instruction in elementary English textbook are attributable to several factors. Among these, the present study examines the elementary-level English words in the basic vocabulary list of the national curriculum, as these words provide the primary vocabulary source for designing and delivering phonics instruction. To the best of my knowledge, no research has investigated how the basic vocabulary list in the national curriculum supports phonics in elementary English. It appears that the selection of elementary-level

vocabulary has been based on various criteria, such as the reference corpus, word frequency, familiarity, range, and appropriacy, while little attention has been paid to phonics education (Lee, 2023; Lee & Shin, 2015). Consequently, we are uncertain whether the vocabulary list provides sufficient examples for the major phonics rules in elementary English. To fill this research gap, the present study analyzes the onsets and rhymes of the 800 elementary-level words in the basic vocabulary list of the 2022 revised national curriculum.

3. Method

3.1. Data

This study analyzed the 800 elementary-level words from the basic vocabulary list of the 2022 revised English curriculum (Ministry of Education, 2022, pp. 258-290). This list includes 3,000 words, with 800 words marked by a single asterisk (*) recommended for use in elementary schools. These 800 words, referred to as "elementary English words" in this study, form the core of phonics instruction in Korean public English education. Elementary English textbooks incorporate these words to teach major phonics patterns, such as /k/-'c' and /u/-'oo'[1]. Given that phonics is not explicitly covered at higher educational levels, these elementary words appear to provide major resources for phonics education at public schools.

Each word in the basic vocabulary list represents a word family; however, the analysis focused on the base forms like 'car' and 'swim', excluding variations such as 'cars' and 'swam'. This is because a) phonics activities are primarily designed around the base forms, and b) analyzing all variations would be inefficient and unnecessary.

3.2. Procedures

Three major procedures were followed in this study. First, a spreadsheet database of elementary English words and their phonetic transcriptions was adopted from Sung (2024). This database transcribes the sounds of the 800 elementary English words into International Phonetic Alphabet (IPA) symbols based on American

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1) Two pairs of symbols are used in this paper: sounds are noted by / / to emphasize their phonemic function, and letters by ' ' to indicate their written form.

English pronunciation as provided by the Open Carnegie Mellon University Pronouncing Dictionary.

Second, the onsets and rhymes of the 800 words were annotated in terms of sound and letter patterns at the word level, irrespective of the number of syllables. This means one onset and one rhyme per word were annotated, focusing on the onset of the first syllable and the rhyme of the final syllable. For example, the word 'grandfather' was annotated with the first onset /gr/-'gr' and the last rhyme /ər/-'er'. This approach reflects common practices in phonics instruction that emphasize the onset of the first syllable and the rhyme of the final syllable.

Third, the distributions of sound-letter patterns at onsets and rhymes were analyzed bidirectionally: a) orthographic realizations of sounds (i.e., how each sound pattern is matched to letter patterns) and b) phonological realizations of letters (i.e., how each letter pattern is matched to sound patterns). Sound and letter patterns were classified based on their length and structure, such as single consonant onsets, consonant cluster onsets, rhymes without a coda, and rhymes with a coda.

The analysis of single-consonant onsets employed a comprehensive reference list of 43 sound-letter patterns, as in (1) (cf. Choi & Park, 2020; Park & Jeong, 2005), to discuss their potential effects on the phonics education.

(1) 43 sound-letter pairs for single-consonant onset:
/b/-'b', /d/-'d', /f/-'f', /f/-'ph', /g/-'g', /g/-'gh', /h/-'h', /h/-'wh', /dʒ/-'j', /dʒ/-'g', /k/-'k', /k/-'c', /k/-'ch', /l/-'l', /m/-'m', /n/-'n', /n/-'kn', /n/-'gn', /n/-'pn', /n/-'mn', /p/-'p', /r/-'r', /r/-'wr', /r/-'rh', /s/-'s', /s/-'c', /s/-'sc', /s/-'ps', /t/-'t', /t/-'th', /v/-'v', /w/-'w', /w/-'wh', /w/-'o', /z/-'z', /z/-'x', /tʃ/-'ch', /ʃ/-'sh', /ʃ/-'s', /θ/-'th', /ð/-'th', /j/-'y', /j/-'u'.

However, the analyses of the other units, such as consonant-cluster onsets and rhymes, did not use such a reference list due to the lack of relevant research. Instead, the detailed distributions of sound and letter patterns were described to discuss quantitative patterns, such as type and token frequencies, as well as qualitative features, such as complexity, learnability, and word usage. This comprehensive discussion aimed to offer valuable implications for phonics education.

Both the onsets and the rhymes were broadly analyzed as binary systems: a) single-consonant onsets versus consonant-cluster onsets, and b) rhymes without a coda versus rhymes with a coda.

4. Results & Discussion

4.1. Onset

According to the sound type of the onset in the first syllable, the 800 elementary English words are divided into three groups: 575 words with a single consonant onset, 126 words with a consonant cluster onset, and 99 words without an onset (i.e., words beginning with a vowel). In the following two sections, the results of analyzing the first two onset group, i.e., the 575 words with a single consonant onset and the 126 words with a consonant cluster onset, are presented.

4.1.1. Single-consonant onset

The analysis of the single consonant onsets in the 575 words found 33 sound-letter patterns, as shown in Table 1. The five most frequent sound-letter patterns were /b/-'b' in 59 words like *ball*, /k/-'c' in 48 words like *cat*, /f/-'f' in 42 words like *fish*, /s/-'s' in 41 words like *sun*, and /h/-'h' in 41 words like *house*.

Table 1. Sound-letter patterns of single consonant onsets in 575 words

Sound	Letter	N (Word)	Sound	Letter	N (Word)	Sound	Letter	N (Word)
/b/	b	59	/f/	f	42	/ʧ/	ch	11
/k/	c	48	/t/	t	37	/ʃ/	sh	9
/k/	k	9	/m/	m	35	/ʃ/	s	2
/s/	s	41	/l/	l	30	/ʤ/	j	7
/s/	c	4	/p/	p	29	/ʤ/	g	1
/s/	sc	2	/d/	d	28	/j/	y	6
/w/	w	39	/r/	r	23	/j/	u	1
/w/	wh	5	/r/	wr	2	/θ/	th	7
/w/	o	1	/n/	n	24	/ð/	th	6
/h/	h	41	/n/	kn	2	/v/	v	6
/h/	wh	1	/ɡ/	g	16	/z/	z	1

Among the 33 sound-letter patterns, only 10 patterns show exclusive one-to-one pairings: /b/-'b', /f/-'f', /t/-'t', /m/-'m', /l/-'l', /p/-'p', /d/-'d', /ʧ/-'ch', /v/-'v', and /z/-'z'. In the other cases, one sound pattern is realized by multiple letter patterns (e.g., /k/ is paired with 'c' and 'k') or one letter pattern represents multiple sound patterns (e.g., 'th' is pronounced either as /θ/ or /ð/), as summarized in Table 2.

Table 2. Multiple pairings between sounds and letters in the first-syllable onsets

One sound to multiple letters		One letter to multiple sounds	
Sound	Letter (number of words)	Letter	Sound (number of words)
/k/	c (48), k (9)	c	/k/ (48), /s/ (4)
/s/	s (41), c (4), sc (2)	g	/g/ (16), /ʤ/ (1)
/w/	w (39), wh (5), o (1)	s	/s/ (41), /ʃ/ (2)
/h/	h (41), wh (1)	th	/θ/ (7), /ð/ (6)
/r/	r (23), wr (2)	wh	/w/ (5), /h/ (1)
/n/	n (24), kn (2)		
/ʃ/	sh (9), s (2)		
/ʤ/	j (7), g (1)		
/j/	y (6), u (1)		

The sound-letter matches in Table 2 are quite complex and interwoven. For example, the sound /k/ is matched with the letter 'c', and the letter 'c' is matched with the sound /s/, which is also matched with two other letters, i.e., 'sc' and 's', and the letter 's' is matched with the sound /ʃ/ in *sure* and *sugar*.

Such irregularities may confuse young learners of English since it is quite difficult to predict the onset sound from the letter and the onset letter form the sound. Therefore, the teacher may need to focus on the most representative cases instead of explaining every possible sound-letter pattern. For example, the /s/ sound is matched to the letter patterns of 's', 'c' and 'sc', but the /s/-'s' pattern is the most frequently used. Therefore, teachers should consider emphasizing the /s/ sound when teaching the 's' letter, or conversely, focus on the 's' letter when teaching the /s/ sound.

The analysis of the 575 single-consonant-onset words also revealed that 10 sound-letter patterns of the single-consonant onset that can occur in the first syllabus of English vocabulary are absent in the elementary English words. A qualitative examination of the 10 sound-letter patterns further grouped them into three types.

First, two patterns, /f/-'ph' and /k/-'ch', should be taught to young learners because the patterns are quite relevant to elementary-level English education. The /f/-'ph' pattern exemplifies easy words such as *phone, photo, pharmacy*, and *physical (education)*, which can be covered in elementary English even though they are not listed as elementary-level in the curriculum. The /f/-'ph' pattern may be familiar to young learners as it is observed in the onsets of the second or later syllables of some elementary English words such as *elephant* and *telephone*. The other pattern,

/k/-'ch', also makes several easy words such as *Chris, character, chorus*, and *chameleon*. Second, there are four sound-letter patterns that appear in only a few easy words: /g/-'gh' in *ghost*, /r/-'rh' in *rhythm*, /t/-'th' in *Thomas*, and /z/-'x' in *xylophone*. Therefore, instead of teaching the phonics rules, we can just exhibit younger learners with the sound and letter knowledge of the words. Third, the rest four sound-letter patterns, i.e., /n/-'gn', /n/-'pn', /n/-'mn', and /s/-'ps', appear to be irrelevant to elementary English as they tend to be used in academic words.

4.1.2. Consonant-cluster onset

A total of 126 elementary English words start with a consonant-cluster onset. Among them, 123 words (97.6%) have two consonant sounds in the onset, while the rest three words have two types of three consonant sounds, i.e., /spr/-'spr' and /str/-'str'. This may show that it is essential to learn the onset cluster of two consonants.

The onset consonant clusters show 28 sound patterns, such as /st/ and /br/, and 30 letter patterns, such as 'st' and 'br'. More specifically, every sound pattern is matched with a single letter pattern, except for /sk/, which is matched with three letter patterns, 'sc', 'sch', and 'sk' as in *score, school*, and *sky*. Table 3 presents the number of words for every sound-letter pair of an onset consonant cluster.

Table 3. Numbers of words for sound-letter patterns of consonant-cluster onsets

Sound-Letter	N of Words	Sound-Letter	N of Words	Sound-Letter	N of Words
/st/-'st'	12	/sk/-'sk'	5	/sk/-'sc'	1
/br/-'br'	10	/pl/-'pl'	5	/sn/-'sn'	1
/kl/-'cl'	10	/kw/-'qu'	5	/sw/-'sw'	1
/ɡr/-'gr'	9	/kr/-'cr'	4	/θr/-'thr'	1
/tr/-'tr'	8	/fl/-'fl'	3	/hj/-'hu'	1
/dr/-'dr'	8	/bl/-'bl'	3	/mj/-'mu'	1
/pr/-'pr'	7	/sm/-'sm'	3	/spr/-'spr'	1
/sp/-'sp'	6	/ɡl/-'gl'	2	/fj/-'fu'	1
/fr/-'fr'	6	/str/-'str'	2	/bj/-'bea'	1
/tw/-'tw'	6	/sl/-'sl'	2	/sk/-'sch'	1

Among the 30 sound-letter pairs, the 10 most frequent pairs account for 82 words (66.7%). This may mean that these 10 pairs are important phonics contents in elementary English. The words for the 10 pairs are listed in (2):

(2) Words for the 10 most frequent sound-letter pairs in consonant-cluster onset
/st/-'st': style, study, story, store, stop, stone, steak, stay, start, star, stand, staff
/br/-'br': brush, brown, brother, bring, bright, bridge, breakfast, break, bread, brave
/kl/-'cl': club, cloud, clothes, close, clock, climb, clever, clear, clean, class
/ɡr/-'gr': grow, group, ground, grey, green, great, grass, grape, grandfather
/tr/-'tr': try, true, truck, trip, tree, travel, train, track
/dr/-'dr': dry, drum, drop, drive, drink, dress, dream, draw
/pr/-'pr': project, programme, problem, print, prince, pretty, present
/sp/-'sp': sport, spoon, speed, speak, spaghetti, space
/fr/-'fr': fruit, front, from, friend, fresh, free
/tw/-'tw': twice, twenty-two, twenty-three, twenty-one, twenty, twelve

Most of the pairs are used to express a variety of meaning, but the /tw/-'tw' pair appears to be limited to number-related meanings.

On the other hand, the 10 least frequent pairs, from /sk/-'sc' to /sk/-'sch', are sparsely used in the elementary word list, only one word per pair. A further examination of these 10 pairs found that some of the pairs are teachable by adding easy and learner-relevant words, as presented after the '+' mark in (3).

(3) Curriculum and additional word examples for infrequent onset consonants
/sk/-'sc': score + scale, scare, scarf, scoop, scout
/sn/-'sn': snow + snack, snail, snake, snap, sneaker, sneeze
/sw/-'sw': swim + swan, sweat, sweep, sweet
/θr/-'thr': three + thrill, throw
/hj/-'hu': human + huge, humor
/mj/-'mu': music + museum, mute

Among these additional words that are not included in the elementary English words of the 2022 revised national curriculum, ten words (=scarf, scoop, snack, snake, sneaker, sweat, sweet, throw, huge, museum) appear to be particularly relevant to elementary English, compared to some controversial cases of the elementary words in the 2022 revised curriculum such as *against, might*, and *wine*.

4.2. Rhyme

Table 4 presents the distribution of the 800 elementary English words based on the rhyme of the final syllable. The rhyme information is classified by two criteria: a) type of vowel, i.e., monophthong or diphthong, and b) type of coda, i.e., no coda, single-consonant coda, or consonant-cluster coda. In terms of vowel, the number of the words with a monophthong was larger (604 words). In terms of coda, the number of the words with a single-consonant coda was the largest (524 words).

The following two sections examine the rhymes with and without a coda.

Table 4. Distribution of elementary words based on vowel and coda of the final rhyme

Vowel	No coda	Single-consonant coda	Consonant-cluster coda	Total
Monophthong	80	408	116	604
Diphthong	62	116	18	196
Total	142	524	134	800

4.2.1. Rhyme without a coda

The analysis of the 142 final rhymes without a coda, i.e., vowel-only rhymes, found that there were 10 sound patterns and 23 letter patterns, which made 32 sound-letter pairings. Table 5 presents the number of words per sound and per sound-letter pairing. For example, the most frequent vowel rhyme sound is /i/, as it is the final rhyme of 60 elementary English words.

Table 5. Number of words per sound and letter in rhyme without a coda

Sound	Number of words	Letter pattern (Number of words)
/i/	60	y (39), ee (8), e (4), i (3), ey (3), ie (2), ea (1)
/oʊ/	23	o (12), ow (11)
/aɪ/	16	y (8), ie (2), uy (2), igh (1), ye (1), eye (1), i (1)
/eɪ/	16	ay (13), ey (2), a (1)
/u/	14	o (4), ue (3), wo (2), oo (2), ou (1), ew (1), oe (1)
/ə/	5	a (4), e (1)
/aʊ/	3	ow (3)
/ɔɪ/	2	oy (2)
/iə/	2	ea (2)
/ɔ/	1	aw (1)

The six frequent sound patterns, from /i/ and /ə/, are paired with plural letter patterns. Three of them (/oʊ/, /eɪ/, and /ə/) are paired with only two or three letter patterns, while each of the other three (/i/, /aɪ/, and /u/) is paired with seven letter patterns.

The latter type of vowel-only rhymes showing one-to-many pairing should be treated in a more structured. For example, the /i/ sound is paired with seven letter patterns from 'y' (39 words like *party*) to 'ea' (1 word, *sea*). Instead of presenting all the letter patterns together, we can try more structured approaches based on the word frequency and the orthographical similarity. That is, the most frequent letter pattern 'y' is first taught together with 'ey' (e.g. *monkey*) based on the orthographical similarity. Then, the second most frequent letter 'ee' is taught with 'e' and 'ea' (e.g., *three, he, sea*). Finally, the rest two letter patterns, 'i' and 'ie', can be taught (e.g., *taxi, cookie*).

On the other hand, the analysis of the 23 letter patterns found that nine letter patterns are paired with different sets of two sound patterns, while each of the rest 14 letter patterns is paired to a single sound, as in (4).

(4) Two types of letter-sound pairs in vowel-only rhyme (word number)
- 9 letter patterns, each paired with two sound patterns: 'y'-[/i/ (39), /aɪ/ (8)], 'o'-[/oʊ/ (12), /u/ (4)], 'ow'-[/oʊ/ (11), /aʊ/ (3)], 'e'-[/i/ (4), /ə/ (1)], 'ey'-[/i/ (3), /eɪ/ (2)], 'a'-[/ə/ (4), /eɪ/ (1)], 'ie'-[/i/ (2), /aɪ/ (2)], 'i'-[/i/ (3), /aɪ/ (1)], 'ea'-[/iə/ (2), /i/ (1)]

- 14 letter patterns, each paired with one sound pattern: 'ay'-/eɪ/ (13), 'ee'-/i/ (8), 'ue'-/u/ (3), 'oy'-/ɔɪ/ (2), 'uy'-/aɪ/ (2), 'wo'-/u/ (2), 'oo'-/u/ (2), 'igh'-/aɪ/ (1), 'ye'-/aɪ/ (1), 'ew'-/u/ (1), 'aw'-/ɔ/ (1), 'eye'-/aɪ/ (1), 'ou'-/u/ (1), 'oe'-/u/ (1)

These variation underscores the importance of teaching and learning the frequent sounds first for each letter pattern.

4.2.2. Rhyme with a coda

Among the 800 elementary English words, 658 words (82.3%) ends with a coda: 524 words with a single-consonant coda and 134 words with a consonant-cluster coda.

The analysis of the 524 rhymes with a single-consonant coda identified notable variations both in sound and letter, reporting 155 sound patterns and 185 letter

patterns. Table 6 summarizes how the 10 most frequent sound patterns are paired with different sets of letter patterns (see Appendix A for a complete list).

Except for /ɪŋ/ and /ɔl/, most of the frequent single-consonant rhyme sounds are paired with multiple letter patterns. For example, the rhyme sound /ər/ is paired with five different letter patterns, and the 'er' letter pattern is most frequent. In fact, the /ər/-'er' pairing (41 words) is the most frequent rhyme pattern in the 800 elementary English words (cf. the second most frequent rhyme pattern is /i/-'y' [39 words]). This sort frequency distribution highlights that it is essential to focus on the frequent letter patterns when teaching a rhyme sound in phonics instruction. For example, teachers can focus on 'er' to teach /ər/ or 'ight' to teach /aɪt/, e.g., *water* and *right*.

Table 6. Number of words per sound and letter in 10 frequent single-consonant rhymes

Sound	Number of words	Letter (Number of words)
/ər/	49	er (41), ure (4), or (2), ar (1), wer (1)
/ən/	28	en (8), on (8), ion (5), ain (3), an (3), in (1)
/əl/	19	le (12), al (4), el (2), il (1)
/ɪt/	12	it (6), et (5), ite (1)
/aɪt/	12	ight (8), ite (4)
/ɪŋ/	11	ing (11)
/ɔl/	10	all (10)
/eɪt/	9	ate (5), eight (2), ait (1), eat (1)
/ɛr/	9	air (3), are (2), ear (2), ere (2)
/ɔr/	9	ore (3), oor (2), or (2), ar (1), our (1)

However, some single-consonant rhyme sounds show more balanced distributions among the letter patterns. For instance, the /ən/ sound is frequently paired with two letter patterns, i.e., 'en' (8 words like *seven*) and 'on' (8 words like *lesson*), and the /ɪt/ sound is also paired with two frequent letter patterns, i.e., 'it' (6 words like *visit*) and 'et' (5 words like *jacket*). In such cases, teachers can raise young learners' awareness by presenting a single rhyme sound with two letter patterns. For other cases where a single sound pattern, such as /ɛr/, is represented by various low-frequency letter patterns, such as *hair, care, bear*, and *there*, a sound-centered approach may be effective to help learners recognize that a single sound pattern can be realized through multiple letter patterns.

On the other hand, there are also a few cases where one letter pattern is paired

with two or three rhyme sounds in a quite balanced manner. For example, the letter pattern 'et' is paired with /ɪt/ in five words and /ɛt/ in five words. In such case, if possible, relevant phonological information can be explained for young learners to understand how the same letter pattern leads to different sound patterns. The case of 'et' appears to be relevant to word stress: the final rhyme with the primary or secondary stress sounds /ɛt/ as in 'forget /fər'gɛt/' and 'internet/'ɪntər,nɛt/', while the unstressed final rhyme sounds /ɪt/ as in 'market /'mɑrkɪt/' and 'basket /'bæskɪt/'.

Finally, the 134 rhymes with a consonant-cluster coda were analyzed. There were 80 sound patterns from /ænd/ to /ɛlv/ and 81 letter patterns from 'and' to 'elve' (see Appendix B for a complete list). Most of the patterns show one-to-one paring between sound and letter, except for 13 sound and 11 letter patterns in (5).

(5) Consonant-cluster rhyme patterns with plural pairings
- 13 sound patterns: /ənt/, /ɑrt/, /ɛnd/, /ɜrn/, /ɪks/, /ɜrd/, /ɔrt/, /əst/, /ɜrθ/, /ɔrm/, /ɔrs/, /ənd/, /ʌnt/
- 11 letter patterns: and, ind, est, ent, arm, ant, ork, ast, ost, ult, ange

The most frequent sound pattern in a consonant-cluster coda is /ænd/ (six words like *stand*), followed by /ənt/, /ɑrt/, /ɛnd/, /ɜrn/, /aɪnd/, and /oʊld/, each appearing in four words, such as *present, start, send, turn, kind*, and *gold*. The most frequent letter pattern is 'and' (seven words like *husband*), followed by 'ind', 'est', 'ent', and 'old', each appearing in five or four words, such as *wind, forest, tent,* and *cold*. Given that the other sound and letter patterns of consonant-cluster rhymes appear in only three or fewer words, phonics instruction should focus on those frequent sound and letter patterns.

5. Conclusion

This study systematically analyzed the distributions of sound-letter patterns in the first-syllable onsets and final-syllable rhymes of the 800 elementary English words, focusing on their implications for phonics education. The primary research questions addressed the variations in single-consonant and consonant-cluster onsets as well as vowel-only rhymes and rhymes with a coda.

The distribution of the onsets revealed significant variability in their sound-letter

patterns. Among the 800 elementary English words, 575 had single consonant onsets with 33 distinct sound-letter patterns. However, only ten patterns showed exclusive one-to-one pairings, such as /b/-'b' and /f/-'f'. The remaining patterns involved multiple letters representing a single sound or multiple sounds represented by a single letter, which may increase complexity in phonics instruction of word onsets. For instance, the sound /k/ was matched with both 'c' and 'k', and the letter 'c' was matched with the sounds /k/ and /s/. This complexity implies that phonics instruction should focus on the frequent and representative sound-letter pairs to avoid confusion. Teachers may need to prioritize common pairings such as /s/-'s' and /k/-'c', gradually introducing less frequent and more complex patterns.

On the other hand, the 126 words with consonant-cluster onsets, predominantly with two consonant sounds, highlighted the importance of teaching frequent clusters like /st/, /br/, and /kl/. These frequent cluster onsets should be presented as important patterns in phonics instruction, while infrequent clusters such as /θr/-'thr' and /hj/-'hu' can be introduced with specific examples to enhance learner familiarity.

The analysis of sound-letter patterns in rhyme also showed notable variations both in vowel-only rhymes and those with a coda. For vowel-only rhymes, 10 sound patterns and 23 letter patterns were identified, resulting in 32 sound-letter combinations. For example, the /i/ sound, found in 60 words, was paired with seven different letter patterns. This diversity suggests the need for structured teaching approaches, starting with the most frequent patterns that show orthographical similarities and gradually covering other variations.

Rhymes with a single consonant coda showed even greater variability, i.e., 155 sound patterns and 185 letter patterns. Therefore, frequent sound-letter pairings, such as /ər/-'er' and /ɪŋ/-'ing', should be prioritized in phonics instruction of rhymes with a coda. The knowledge of such frequent patterns is expected to provide a foundation for understanding other sound-letter pairings in rhyme.

Rhymes with a consonant-cluster coda also showed a number of sound and letter patterns, most of which fell under straightforward one-to-one pairings. Therefore, phonics instruction of rhymes with a consonant-cluster coda should focus on frequent patterns like /ænd/-'and' and /aɪnd/-'ind' to ensure that young learners become aware of major patterns and understand essential pairings.

These findings highlight that systematic and structured phonics instruction balancing between frequency and complexity should be developed from a precise analysis of the target vocabulary range. This instructional approach may prevent

confusion or misconception and help young learners develop robust decoding and encoding skills in L2 English. Alongside these endeavors, we should explore diverse methods to improve the curriculum word list, thereby more effectively supporting phonics education.

Despite the comprehensive analysis provided in this study, there are several limitations that need to be addressed in future research. First, the study was limited to the 800 elementary English words in the 2022 revised national curriculum, potentially overlooking other relevant words that could influence phonics education in Korea. Future research should expand to include the entire word list in the national curriculum and provide a more holistic view of phonics education. Second, this study examined only the first-syllable onsets and the final-syllable rhymes. While this approach aligns with common practices in phonics instruction, it may disregard important patterns that occur in the onsets and rhymes of the other syllables. Future research should consider a more detailed analysis of multisyllabic words to capture a complete picture of sound-letter relationships in English vocabulary.

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Appendix 1. 177 sound-letter patterns in the 524 rhymes with a single-consonant coda

Sound	Letter	Word#	Sound	Letter	Word#	Sound	Letter	Word#	Sound	Letter	Word#
ər	ar	1	aɪn	ign	1	ul	ool	3	ɪdʒ	ege	1
ər	er	41	ɔŋ	ong	5	ɪr	ear	3	ɪdʒ	idge	1
ər	or	2	it	eat	3	uz	ews	1	ɪg	ig	2
ər	ure	4	it	eet	2	uz	oose	1	ɛk	eck	2
ər	wer	1	æn	an	5	uz	use	1	ɪd	id	1
ən	ain	3	ɛt	et	5	ɪs	is	1	il	eel	1
ən	an	3	æs	as	1	ɪs	iss	2	uv	ove	1
ən	en	8	æs	ass	4	æk	ack	3	ɔf	off	1
ən	in	1	ɪl	ill	5	ɪʃ	ish	3	æθ	ath	1
ən	ion	5	æd	ad	4	ɑk	ock	3	æŋ	ang	1
ən	on	8	æd	add	1	id	ead	1	eɪd	aid	1
əl	al	4	ɪn	in	5	id	eed	2	eɪz	ays	1
əl	el	2	ʊk	ook	5	aɪr	ire	2	ʌd	ood	1
əl	il	1	ət	ate	1	us	uce	1	ɔɪl	oil	1
əl	le	12	ət	et	1	us	uice	1	ʌʃ	ush	1
ɪt	et	5	ət	ot	2	ik	eak	1	is	ice	1
ɪt	it	6	ət	uit	1	ik	eek	1	ʊl	ull	1
ɪt	ite	1	əm	em	1	aʊθ	outh	2	ɔɪn	oin	1
aɪt	ight	8	əm	om	1	əd	ad	1	ur	oor	1
aɪt	ite	4	əm	ome	1	əd	ed	1	ɔɪs	oice	1
ɪŋ	ing	11	əm	um	1	ɔg	og	1	if	eef	1
ɔl	all	10	əm	umn	1	ɔg	ogue	1	ɑd	od	1
eɪt	ait	1	eɪn	ain	2	eɪv	ave	2	uθ	ooth	1
eɪt	ate	5	eɪn	ane	1	ir	ear	1	æf	aff	1
eɪt	eat	1	eɪn	aign	1	ir	ere	1	eɪf	afe	1
eɪt	eight	2	eɪl	ail	3	aʊt	out	2	ɔn	on	1
ɛr	air	3	eɪl	ale	1	ɛg	eg	1	aɪp	ype	1
ɛr	are	2	ʊd	ood	2	ɛg	egg	1	ɑl	oll	1
ɛr	ear	2	ʊd	ould	2	ʊt	oot	1	æv	ave	1
ɛr	ere	2	ɑt	at	1	ʊt	ut	1	iv	ieve	1
ɔr	ar	1	ɑt	ot	3	ɔk	alk	2	ɛθ	eath	1
ɔr	oor	2	ip	eap	1	æp	ap	2	ɑn	on	1
ɔr	or	2	ip	eep	3	eɪp	ape	2	ədʒ	age	1
ɔr	ore	3	ap	op	4	oʊz	ose	2	ɑb	ob	1

Sound	Letter	Word#	Sound	Letter	Word#	Sound	Letter	Word#	Sound	Letter	Word#
ɔr	our	1	oʊn	one	4	aɪm	ime	1	ɪð	ith	1
eɪk	ake	6	aɪd	ide	4	aɪm	imb	1	ɪz	iz	1
eɪk	eak	2	ɛn	ain	1	aɪz	ise	1	ʊr	ure	1
ɪk	ic	3	ɛn	en	3	aɪz	ize	1	oʊd	oad	1
ɪk	ick	4	ɑr	ar	4	æm	am	1	ʊʃ	ush	1
eɪs	ace	4	ɛs	es	1	æm	amme	1	æʃ	ash	1
eɪs	ase	2	ɛs	ess	2	um	oom	2	ɪf	if	1
ʌn	on	1	ɛs	uess	1	itʃ	each	2	oʊm	ome	1
ʌn	one	2	ʌt	ut	3	up	oup	2	ætʃ	atch	1
ʌn	un	3	aɪs	ice	3	ɪtʃ	ich	2	ɔʃ	ash	1
ʌm	om	1	ʌk	uck	3	ut	uit	1	ʌb	ub	1
ʌm	ome	3	aɪl	ile	2	ut	ute	1	oʊp	ope	1
ʌm	um	2	aɪl	yle	1	ɪv	ive	2	ʌf	ough	1
əs	ess	1	oʊt	oat	2	ɔs	oss	2	oʊs	ose	1
əs	ice	2	oʊt	ote	1	iz	ease	1	aʊd	oud	1
əs	ious	1	im	eam	3	iz	eese	1	ɔtʃ	atch	1
əs	is	1	un	oon	3	eɪdʒ	age	2	ʌŋ	oung	1
əs	us	1	eɪm	ame	3	oʊl	oal	1	ɔz	ause	1
æt	at	6	aɪk	ike	3	oʊl	ol	1	aʊr	our	1
ɛd	ead	4	ʌv	of	1	ʌp	up	2	oʊθ	oth	1
ɛd	ed	2	ʌv	ove	2	aʊs	ouse	2	ɪm	im	1
ɛl	ell	5	aɪv	ive	3	ʌs	us	1	ud	ood	1
in	ean	1	aʊn	own	3	ʌs	uss	1	æz	as	1
in	een	4	aɪf	ife	3	ʌtʃ	ouch	1	ɛʃ	esh	1
aɪn	ine	4	ɪp	ip	3	ʌtʃ	uch	1	æɡ	ag	1

Appendix 2. 93 sound-letter patterns in the 134 rhymes with a consonant-cluster coda

Sound	Letter	Word#	Sound	Letter	Word#	Sound	Letter	Word#	Sound	Letter	Word#
ænd	and	6	æst	ast	2	ænt	aunt	1	ɔrθ	orth	1
ə	antnt	1	ɛkt	ect	2	oʊðz	othes	1	ɛlt	elt	1
ənt	ent	3	ɑrk	ark	2	əlt	ult	1	ɔst	ost	1
ɑrt	art	3	ɜrst	irst	2	ɛsk	esk	1	ʌnθ	onth	1
ɑrt	eart	1	ɑrm	arm	2	ɔft	oft	1	ild	ield	1
ɛnd	end	3	ɑks	ox	2	ɪns	ince	1	ɔrd	oard	1
ɛnd	iend	1	æns	ance	2	əndʒ	ange	1	ɪlk	ilk	1
ɜrn	earn	1	ɑrd	ard	2	ʌmp	ump	1	ɛnst	ainst	1
ɜrn	urn	3	ɔrm	arm	1	əns	ence	1	ɪnd	ind	1
aɪnd	ind	4	ɔrm	orm	1	ɜrtʃ	urch	1	ɛnt	ent	1
oʊld	old	4	ɔrk	ork	2	ɔɪnt	oint	1	ɪnt	int	1
ɪks	ics	1	ɔrs	orse	1	æmp	amp	1	ɔrk	ork	1
ɪks	ix	2	ɔrs	ourse	1	ərz	ors	1	ist	east	1
aʊnd	ound	3	ɜrt	irt	2	ɪlm	ilm	1	ɑrdʒ	arge	1
ɪŋk	ink	3	ənd	and	1	ɔlt	alt	1	ɑnt	ant	1
ɜrd	ird	2	ənd	ond	1	eɪndʒ	ange	1	ɜrl	irl	1
ɜrd	ord	1	ɛst	est	2	ɛft	eft	1	ʌlt	ult	1
ɔrt	ort	2	æŋk	ank	2	oʊst	ost	1	ɜrld	orld	1
ɔrt	ourt	1	ʌnt	ont	1	ɛkst	ext	1	eɪnt	aint	1
əst	ast	1	ʌnt	unt	1	ʌntʃ	unch	1	aɪld	ild	1
əst	est	2	ækt	act	2	ɔnt	ant	1	eɪst	aste	1
ɜrθ	earth	1	ʌst	ust	2	ænts	ants	1	ɜrs	urse	1
ɜrθ	irth	1	ɪld	uild	1	ɛlp	elp	1	ɛlv	elve	1
									æsk	ask	1