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An Evaluation of the Linguistic and Cognitive Load Word-level Features of Elementary Reading Texts*

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This research explored the suitability of various English textbooks for beginning Korean EFL readers. Word-level characteristics of reading texts from several elementary-level textbooks were compared to determine whether the vocabulary displayed features that facilitated word recognition for beginning second-language readers. The texts were also weighed against each other to identify possible differences among them with respect to these vocabulary features. Results related to linguistic content show lack of decodability across textbooks and a large proportion of infrequent words in the texts. Interest variables reveal a relative lack of word imagibility, concreteness and meaningfulness for texts designed for beginning readers. Differences were also observed among texts with respect to cognitive load variables such as number of total and unique words as well as number of repeated words per text. Conclusions are that absence of key linguistic characteristics of vocabulary that promote word recognition may cause beginning readers to miss opportunities to efficiently develop their English reading proficiency. As well, discrepancies among the textbooks for cognitive load variables demonstrate their inconsistency in key indicators of their lexical difficulty. Therefore, textbook designers should also consider using tools like Coh-Metrix to easily analyze and fine-tune these key vocabulary features during textbook design.

[vocabulary characteristics/word recognition/beginning reading texts/Coh-metrix]

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I. INTRODUCTION

For the past several decades, English has had a prominent role in Korean public and private education because Koreans widely believe English to be a fundamental prerequisite to achieve their personal, academic and professional goals. Over the past decade, the demand for English has intensified into what has become known as “English Fever” (Park, 2009). The demand for English education has gone to increasingly younger learners with initial English instruction moving from middle schools to now beginning in the third grade of elementary school. Alongside this national push to learn English, there has also been considerable debate regarding the effectiveness and efficiency of current English teaching materials and instructional practices in Korea (Lee, 2011).

One area of specific concern is the instructional materials and in particular whether the textbooks used to teach learners are appropriately suited to the task (Joo & Lee, 2012; Kim, 2014). Korean teachers often rely heavily on textbooks as their primary materials in Korean English classes (Lee, 2016) so it is important that we have a clear understanding of the features of these textbooks and their potential impact on learners’ language learning. Text-level characteristics of reading texts like coherence and readability have rightly attracted research interest and as a consequence we have gained some valuable insights with regard to their effect on beginning reading (Kim & Yang, 2012). However, while certainly text-level features are important, word-level features of beginning reading texts need consideration because they also pose an equal if not greater challenge for L2 readers (Hiebert, Brown, Taitague, Fisher, & Adler, 2004).

Researchers have gained some important insights about the characteristics of beginning textbook vocabulary through the work of a number of early literacy advocates. Thus, we now recognize the importance of paying careful attention to the characteristics of textbooks used with beginning L2 readers because of the effect that these word features have on beginning reading. A few informative analyses have been conducted on beginning L2 reading texts (Lee, 2012, 2016). However, access to corpus analysis software like Coh-Metrix promises more fine-grained analyses that include important variables not addressed in existing research such as psychological variables like word imagibility. Also, texts can be statistically compared to each other to establish whether there are significant differences among them.

The present challenge is that not enough is known about important characteristics of the vocabulary used in reading texts for beginners in Korea. Therefore, a clearer and more complete understanding of word-level text characteristics that support word recognition in beginning reading elementary textbooks is vital for a number of reasons. First, inability to process word level features to decode a word is a major obstacle to its recognition (Birch, 2008). Secondly, much of the extant research has been conducted with L1 beginning

reading texts so additional investigation is necessary to establish that beginner texts for L2 readers contain word-level features that facilitate word recognition. Lastly, research has been relatively limited in the kinds of features that have received attention so some characteristics such as the psychological aspects of words have thus far been relatively overlooked. Careful scrutiny of the materials used to develop beginning learners' English literacy and general proficiency in Korea is needed to ensure that they are being exposed to materials that can facilitate their L2 development.

II. LITERATURE REVIEW

1. Linguistic Content Variables

A number of scholars have identified word-level features of beginning reading texts that make them more or less readable for beginning readers (Hiebert, 2010; Hiebert, Martin, & Menon, 2005). They did this for the purpose of investigating "…how particular features of the individual and collective body of words within a text or set of texts influence beginning and struggling readers' automatic word recognition and simultaneous recognition of a word's meaning" (Heibert & Fisher, 2005, p. 445). The relevant research findings for each of these features will be elaborated upon below.

1) Decodability

Text decodability has been characterized as the "proportion of words with phonically regular relationships between letters and sounds, and a degree of match between the relationships represented in text and those that the reader has been taught" (Mesmer, 2005, p. 62-63). The role of phonics and decodable text in beginning L1 and L2 reading has received some research attention. L2 reading development is argued to be particularly challenging because learners do not often have a strong command of the target language when they attempt to learn how to read and write in it (Perfetti & Dunlap, 2007). This limited command of the target language poses these difficulties for L2 reading development because learners require L2 phonological and morphological processing skills to effectively identify words, read the L2 and learn new vocabulary (Birch, 2008; Koda, 2005). Another related challenge for L2 readers as opposed to L1 leaders has to do with the nature of the differences between their L1 and the target language. As Hedgecock and Ferris (2009) point out, "depending on the distance between the L1 and L2 systems, the L2 reader may have to learn an entirely new way of processing visual information, as

predicted by the Orthographic Depth Hypothesis…" (p. 80). Thus, L1 literacy impacts L2 literacy in various ways.

2) Decodable Texts

The bulk of the research into text decodability for beginning readers has been conducted with first-language materials. An analysis of various first-grade basal readers revealed that the decoding demands are easier at the early levels than at the higher levels (Hoffman, Sailors & Patterson, 2002). Other research from a computer-based analysis indicated that prospective decodability differed across six first-grade basal readers produced by various publishers (Foorman, Francis, Davidson, Harm, & Griffin, 2004). As well, a study of at-risk 1st graders who received tutoring from texts with varying levels of decodability showed no effect of text decodability on their reading performance. This finding raises some doubts regarding whether decodable texts are helpful in L1 beginning reading instruction (Jenkins, Peyton, Sanders, & Vadasy, 2004).

In contrast to these results, Mesmer (2005) noted that, given the same phonics instruction, readers with knowledge of the alphabetic principle apply it more in a highly decodable context. They will also feel more empowered at being able to do this. Knowledge of familiar orthographic and phonological patterns affects beginners' word recognition as they extrapolate their understanding of these patterns to new texts they read (Hiebert & Martin, 2007). Text decodability also has been found to affect passage-reading fluency (Compton, Appleton, & Hosp, 2004).

Regarding the decodability of beginning L2 reading texts in Korea, Lee (2016) investigated fifth and sixth grade English textbooks and found them to be rather difficult for that age group. Reasons offered for their mismatch between texts and learners included the texts' complicated vowel patterns and insufficient word repetition. Likewise, Lee (2016) reported that grade five texts were not likely created to be decodable. She also advised that "…more emphasis needs to be placed on the degree of match between phonics elements covered and decodability levels of words in reading texts within the same textbook set" (p. 149).

3) Mean Word Frequency

A second element of beginning reading text vocabulary that has received research attention is the frequency of the vocabulary in these texts. High frequency vocabulary are those words can be found in most texts. They typically have unusual letter-sound patterns and unclear meaning (Cunningham & Allington, 2003). Examples, of such words include "does" or "said". Word frequency is thought to be important in beginning reading because

it "…indicates the likelihood that a word is new or has appeared previously in texts for beginning and struggling readers. The more frequent the word, the more opportunities students have had to encounter the word and to figure it out" (Hiebert & Fisher, 2005, p. 446).

Research into word frequency has been conducted on both first and second language texts. L1 studies reveal that high frequency words are acquired more readily than low frequency words (Hiebert & Martin, 2007). As well, the effect of word frequency depends upon the level of concreteness of words such that more concrete and high-frequency words are easier to recall (Miller & Roodenrys, 2009). Texts with a high proportion of high frequency words aid struggling readers better than texts with numerous rare words (Hiebert, 2005). These kinds of texts also facilitate L1 reading accuracy and fluency (Compton et al., 2004; Cunningham & Allington, 2003; Hiebert & Fisher, 2005). Limited existing second language research indicates that a substantial proportion of rare vocabulary may negatively impact learners' fluency development with the more common words from those texts (Hiebert & Fisher, 2005). Lee's (2016) analysis of the frequency of vocabulary in Korean English textbooks revealed that while these texts had an appropriate proportion of high-frequency vocabulary, there was an inadequate number of repetitions of those words to foster automaticity of future word identification. Therefore, texts used with beginning L2 readers should contain a large proportion of high frequency words that are repeated a sufficient number of times to ensure in their acquisition.

4) Interest

Heibert et al. (2004) include interest with linguistic content variables investigated in the text. "High-interest" words have been described as those with the features of high imagibility, concreteness and meaningfulness. Imagibility refers to how easy it is to create a word's visual representation in the mind (i.e., a mental picture)(Strain, Patterson, & Seidenberg, 2002). Research into imagibility for L1 learners has demonstrated that high imagery words can be learned in isolation with minimal context and need less repetition to be learned (Hargis, Terhaar-Yonkers, Williams, & Reed, 1988). Word identification is also faster for highly imageable words (Schwanenflugel & Akin, 1994).

Young L1 learners have been found to acquire high-imagery vocabulary more rapidly (Kolker & Terwilliger, 1981; Laing & Hulme, 1999). Their lexical decisions appeared to be based more upon imaginal information than adults and older children's. This result suggests a developmental change in the semantic characteristics that readers draw upon for word identification (Schwanenflugel & Akin, 1994). As well, proficient L1 readers can identify highly imageable words faster than less imageable words. Thus, imagibility

probably allows proficient L1 readers to compensate for confusing phoneme- grapheme patterns or uncommon vocabulary (Raman & Baluch, 2001).

Research related to imagibility and vocabulary acquisition in L2 contexts demonstrates that the more imageble a word was the less likely learners are to use language learning strategies to learn it presumably because they could easily visualize the word so they did not need to (Fan, 2015). Additionally, as bilingual readers' L2 reading proficiency improves, the mental imagery they use is increasingly similar to when they read in their L1 (Krasny & Sadoski, 2008). Therefore, since readers clearly draw upon imagery when processing vocabulary and texts, we should consider instructional methods that can harness the visual comprehension strategies of novice L2 learners (Krasny & Sadoski, 2008).

A considerable amount of psycholinguistic research has been conducted to demonstrate the impact that word concreteness has on vocabulary learning. In general, results demonstrate that concrete vocabulary is recognized more rapidly than abstract (Altarriba & Basnight-Brown, 2011; Palmer, MacGregor, & Havelka, 2013). The meanings of concrete words signifying less abstract concepts are learned more easily by L2 learners (Crossley, Salsbury & McNamara, 2009; Elgort & Warren, 2014; Kaushanskaya & Rechtzigel, 2012). However, abstract L2 words are easier to learn if they are connected to emotion than concrete words (Ferré, Ventura, Comesaña & Fraga, 2015). It is also much easier for foreign language learners to learn concrete words and to retain them across time (De Groot & Keijzer, 2000). Within connected texts, unfamiliar text with abstract vocabulary is less comprehensible (Sadowski, 2000) and the degree of concreteness of words in a text affects L2 lexical development from reading (Elgort & Warren, 2014).

Meaningfulness has been defined as the strength of association a word has with other words (Graesser, McNamara, Louwerse, & Cai, 2004). It is essential in paired associative learning (PAL) when learners attempt to create mental connections between words they know and words they are learning through using flashcards (Ellis & Beaton, 1993). Salsbury, Crossley and McNamara (2011) studied adult ESL learners and found that those with greater L2 proficiency used words with fewer connections to other words in their lexicon. This result led them to contend that a word's meaningfulness is connected to how challenging it is to learn because less meaningful vocabulary is less readily linked to other known words. Thus, proficient language users can access vocabulary that is less connected to other words in their lexicon despite the fact that their lexicon generally has a larger number of words with richer associations among them. Word meaningfulness has also been negatively correlated with learners' vocabulary learning strategies in that those who learned more meaningful words used fewer learning strategies (Fan, 2015).

2. Cognitive Load Variables

"'Cognitive load' refers to the amount of different linguistic information a text requires beginning readers to apply" (Hiebert, et al., 2004, p. 11). A number of variables that have typically been associated with cognitive load include the proportion of new to total words as well as number of word repetitions (Gray et al., 1956 cited in Hiebert et al., 2004).

1) Tokens

Research has been conducted on the number of tokens (total number of words) found in beginning reading books. Hiebert's (2005) analysis of grade one texts used with native English beginning readers revealed that the texts varied from 83 to 124 tokens in length with a mean of 100 tokens per text. Similarly, Foorman et al. (2004) observed that the total number of words in texts varied among six different first-grade reading programs. Hoffman et al., (2002) also measured the total words found in L1 basal programs and discovered that they ranged widely. These findings suggest that texts for beginning L1 readers tend to be quite wide-ranging in the number of words that they contain. In the Korean EFL context, Lee (2016) reported that the number of tokens in English textbooks for grade five students were as low as 566 to as high as 955. In general, it appears that variability exists with respect to the total number of words in texts for beginning L1 and L2 readers.

2) Types

As with the research into tokens, Foorman et al. (2004) noted that the number of unique words (i.e., types) was different depending on the text used in the six first-grade reading textbooks that they analyzed. Hiebert (2005) also found that grade one entry reading texts contained 19 to 21 new, unique words per 100 words with a mean of 21. That is, approximately 20% of the words in the readers used with beginning L1 readers had not been previously used in the textbook. Hoffman et al. (2002) measured total unique words per text in L1 basal readers and found they ranged considerably. The average number of unique words per text rose significantly across levels as well. Lee (2016) reported differences in total number of unique word types ranging from 190 to 248 contingent upon the textbook. Nevertheless, based on the results for tokens and types, Lee (2016) concluded that "the number of types and tokens of the four textbooks may not pose great challenges for grade 5 students" (p. 145). That is, the differences among the various texts were not cause for concern. Taken together, these results suggest that there may be some disagreement in the extant literature with respect to whether beginning reading texts

contain comparable amounts of unique vocabulary. Additional investigation can reveal whether this is the case.

3) Number of Words Repeated

A third important variable related to the cognitive load of texts is the number of word that are repeated in the text. Despite the importance of this topic, reading researchers have lamented the rather scarce research on the repetition of words in novice reading textbooks (Hiebert & Martin, 2007) or the number of word repetitions necessary for beginning readers to acquire new vocabulary (Hiebert et al., 2004). Huckin and Coady (1999) highlight that no definitive number of word repetitions ensures learning, but five to 20 repetitions to learn an unfamiliar word appears to be supported by research (de Groot, 2006; Nation, 2001). Ehri (2002) points out that word repetition is necessary in order for decoding skills to become automatized. Repeated decoding of words enables learners to make phoneme grapheme connections necessary for unfamiliar vocabulary to eventually become recognizable on sight.

In the limited extant research, findings from Foorman et al.'s (2004) L1 study indicate that texts across six L1 programs varied in their amount of word repetition and most of the vocabulary only had one occurrence in each six-week instructional period. Summarizing findings for grade one beginning reading textbooks from six different publishers, Hiebert (2005) notes that "…about one in every 10 words will be a new word that, once figured out, will not appear again in either the text or unit" (p. 259). This observation demonstrates that unfamiliar new words do not get enough repetition.

As with L1 research, there also seems to be a dearth of studies investigating word repetitions in second language texts. L2 research explored the relationship between various types of reading texts and the recycling of vocabulary. After analyzing authentic children's beginning reading materials, Gardner (2008) concluded that authentic informational materials has more vocabulary recycling than authentic fiction materials. Another analysis of a widely-used ELT course book revealed that the text offered exposure to common vocabulary through spaced repetition (Matsuoka & Hirsh, 2010). Unfortunately, the study did not compare the textbook with any others.

At least two studies compared textbooks in terms of their vocabulary repetition in a somewhat circumscribed way. Lee (2016) reported the percentage of unique words that were repeated 3 or more times was low across all of the texts analyzed. As well, almost half of all words only appeared once in most texts and the majority of commonly repeated words were function words like "the," "it" and so forth. Therefore, Lee (2016) concludes that "…students are not given enough chances to encounter the same words repeatedly in reading texts of the textbooks" (p. 147). Although she correctly points out the lack of

sufficient repetition of vocabulary in the various textbooks, she neglected to discuss the substantial differences in numbers of words repeated among the various textbooks surveyed. Similarly, elementary school English textbooks were found to be difficult relative to learner's reading proficiency partly because they had low numbers of word repetitions (Lee, 2016). Furthermore, in comparing the textbooks to each other, Lee (2016) notes that although the four textbooks differed slightly, the repetition rate of each textbook was very low and became even lower as the grade increased.

3. Gap Statement

While there has been some research with word-level features of beginning L2 reading texts (Y. Lee, 2016, Y. A. Lee, 2016), there appears to be limited analysis of a number of other word-level textbook features that may facilitate beginning L2 readers' reading development. Furthermore, "…only scant attention has been paid to how various aspects of elementary English textbooks facilitate or hinder students' progress in learning to decode" (Y. A. Lee, 2016, p. 130).

Thus, there are a number of unique contributions to the research literature that this study stands to give. For instance, as yet, analyses of many of the word-level features of beginning L2 reading texts have not included statistical comparisons of the differences between various aspects of the ease of has not been conducted. Statistical comparisons allows researchers to decide on the likelihood observed group differences did not occur merely by chance (Trochim, 2001). Secondly, the present analysis builds upon previous findings on word-level features of beginning L2 reading texts by including analysis of other important word characteristics such as imagibility, concreteness and meaningfulness whose relevance to beginning L2 reading texts has received limited attention. Inclusion of these elements can provide additional insight into psychological characteristics of the vocabulary of beginning L2 reading texts that has been demonstrated to impact lexical recognition, learning and recall. Lastly, unlike previous studies of word-level features of beginning reading texts for L1 and L2 learners, the present research brings the resources of the Coh-Metrix computerized text analysis software to bear on analyzing these texts. The use of such a tool enables rapid and reliable analysis of vocabulary characteristics avoiding the higher risk of error typically associated with human analysis.

Based upon these identified oversights in prior research discussed above, the main purpose of the present investigation is to examine elementary Korean English textbooks in wide circulation to ascertain whether they have included vocabulary features that support beginning English Language Learners' reading acquisition.

III. METHODS

1. Materials

TABLE 1
Elementary English Textbooks Analyzed

Textbook	Publisher	Grade	Sections (Number of texts)
A	F	5	Let's Read (12)
B	G	5	Reading Around Us (13)
C	H	5	Let's Read (14)
D	H	5	Let's Read (14)
E	H	5	Let's Read (13)

Five textbooks from three different Korean publishers were chosen for this study. Published in 2014, these books were based upon the most recent National English Curriculum for fifth grade English learners in Korea. The texts used in this analysis were selected from the fifth grade because they were the first intact and stand-alone texts used in the curriculum and thus are often the primary means by which many beginning L2 readers initially learn to read in English. Thus, these texts should contain features that facilitate beginning reading development and promote enjoyment of reading. The main reading text from each lesson was used because it was typically the only coherent and complete text beyond the sentence level in the lesson. As can be seen in table 1 above, 12 texts were included in the analysis from textbook A, 13 from B, 14 from C and D, and 13 from E comprising 66 texts total. Upon selecting texts for the investigation, they were inputted into computer text files for analysis.

2. Textbook Analysis Procedures

This analysis compared the reading lesson texts from four different textbooks in terms of their word-level features related to both the linguistic content of the text as well as the cognitive load. The analysis explored whether there were differences among the various texts in terms of these vocabulary features in order to establish the suitability of these to support beginning L2 reading development

3. Linguistic Content

The construct of linguistic content was further subdivided into three components which are high-interest words (i.e., imaginable and meaningful), high-frequency words and

phonetically regular words (Heibert at al., 2004). High-Interest words was comprised of three indicators of vocabulary knowledge which included word imagibility, word meaningfulness, and word concreteness. Results for all of these indices were taken from the results of the Coh-Metrix analysis of the main reading texts found in each of the textbooks analyzed. All of these indices were all on a scale from 100 to 700 with higher scores representing more of the aspect of vocabulary knowledge. All of the indexes were originally based upon a 7-point scale that Coh-Metrix multiplied by 100 and rounded to integers (Coh-Metrix Website, 2017).

The index for "meaningfulness" is based upon ratings from Toglia and Battig's (1978) corpus. It is a measure of how closely words were associated in their meaning. For example, the word "people" (612) is more meaningful than "abbess" (218) (Cohmetrix, n.d.). The "imagery" index is an indicator of the ease with which a word aroused a mental image taken from the ratings of the Medical Research Council (MRC) Psycholinguistic Database (Colthart, 1981). Low imagery ratings for these texts indicate that many of the words in them are not easily imaginable by beginning readers. Children typically learn to read high imagery words faster than low imagery words so this is an important consideration for beginning reading texts (Hiebert et al., 2004). Also taken from the MRC database, Coh-Metrix supplies an index of the average ratings for content words in a text that gives the Concreteness of a word. The rating represents the tangibility of the word and its ability to be experienced by the senses (Gilhooly & Logie, 1980).

Mean CELEX word frequency for all words were calculated using Coh-Metrix. The software provides word frequencies from the CELEX corpus (based on written and spoken texts). Coh-Metrix computes a mean logarithm (to a base of 10) for all the word tokens in the text that are also found in the CELEX database (Crossley, Salsbury, Titak & McNamara, 2014). The index used in this research was "word frequency for all words". When interpreting the word frequency results, Coh-Metrix uses a logarithm to produce a mean ranging from 0-6 for each text (Green, 2012, p. 62). A lower word frequency value represents less frequent words and higher values designate more frequent words… "Thus a sample text that reports a logarithmic mean frequency value of 2.504 contains less frequent words than a sample text that reports a logarithmic mean frequency value of 2.699" (Crossley, Cobb, & McNamara, 2013, p. 970).

The decodability of the vocabulary in the text was established by replicating the processes and scale developed by Menon and Hiebert (1999) and Martin and Hiebert (1999). All of the individual words from each text were categorized on a scale from 1 (most decodable – e.g., consonant/vowel words) to 8 (least decodable – e.g., unconventionally spelled and multisyllabic words). These decodability ratings were then averaged to determine the overall word decodability for each text.

4. Cognitive Load

The construct of cognitive load was primarily represented by the number of different words and number of repetitions per word (Hiebert et al., 2004). The total number of different words in each text (regardless of how often they are repeated) or "tokens" was calculated. The total of unique words per text or "types" was also calculated using the Lextutor software (Cobb, 2008) to perform both of these calculations. The number of repetitions per word was also computed by using the Text Analyzer software (Adamovic, 2009).

The results of these totals for both the linguistic (interest, frequency and decodability) and cognitive load variables (i.e., tokens, types and repetitions) were then compared among the textbooks through a series of ANOVAs using the R statistical analysis software (R Core Team, 2013). The aim of these comparisons was to establish whether there were any significant differences among the textbooks on these key word-level features of the vocabulary in the texts.

IV. RESULTS

TABLE 2

Descriptive Statistics for Linguistic Content Variables

		A		B		C		D		E	
		M	SD	M	SD	M	SD	M	SD	M	SD
Decodability		4.03	0.463	4.35	0.479	4.29	0.835	3.89	0.337	4.55	0.660
Mean word frequency		2.72	0.398	2.41	0.383	2.53	0.224	2.47	0.288	2.36	0.279
Interest	Imagibility	442	41.6	445	33.3	450	27.5	432	47.0	457	50.4
	Concreteness	388	49.6	399	39.3	409	24.7	397	53.0	416	57.5
	Meaningful.	441	28.5	440	22.3	440	24.9	437	19.4	445	25.4

Results of the descriptive statistics for the linguistic content variables are located in Table 2. In terms of the linguistic content of the words in the text, the analysis showed that there were no statistically significant differences among the texts according to the five criteria that were evaluated.

With respect to word decodability, on a scale from one to seven, the majority of texts contain words that are above 4.0 which appears to be high for beginning reading texts. As well, there was not a significant effect of textbook for decodability at the $p<.05$ level for the five conditions $F(4,61) = 2.50$, $p = 0.051$. Word frequency ranged from 2.36 to 2.72 which indicates that the average frequency of the words in these texts is rather high. In general, considering the word frequency scale ranges from 0 to 6, these values appear to be

a bit high for beginning-level texts. As well, there was no significant effect of textbook for word frequency at the $p<.05$ level for the five conditions $F(4,61) = 2.37$, $p = 0.062$.

The next group of variables related to linguistic content were those associated with learner interest. These were imagibility, concreteness and meaningfulness. The mean imagibility values for content words ranged from 432 to 457 on a 700 point scale. This result indicates that the vocabulary in the texts were not particularly high in imagibility. No significant effect of textbook for level of imagibility was found at the $p<.05$ level for the five conditions $F(4,61) = 0.633$, $p = 0.641$. Values for mean concreteness for content words fall within a 388 to 416 range on a 700 point scale with higher values indicating more concreteness. Here as well, words are not very concrete. No significant effect of textbook was observed for level of concreteness at the $p<.05$ level for the five conditions $F(4,61) = 0.714$, $p = 0.585$. Average meaningfulness for content words fell between 437 to 445 on a 700 point scale. Higher values indicating more meaningfulness. Thus, while vocabulary scores tended toward more meaningfulness, they were not as high as might be expected for vocabulary in a beginning reading text. Comparisons across textbooks revealed that a significant effect was not found on textbook for level of meaningfulness at the $p<.05$ level for the five conditions $F(4,61) = 0.177$, $p = 0.950$.

TABLE 3

Descriptive Statistics for Cognitive Load Variables

	A		B		C		D		E	
	M	SD	M	SD	M	SD	M	SD	M	SD
Tokens	43.5	8.92	43.5	8.31	44.3	8.33	35.3	5.37	34.6	9.03
Types	25.7	4.55	30.3	5.18	25.1	5.31	23.0	3.38	22.8	5.86
# of words repeated	8.38	2.47	7.93	2.70	11.14	3.63	6.17	2.79	6.23	3.70

Results for cognitive criteria can be seen in table 3. Mean number of tokens per text in each textbook ranged from 34.6 to 44.3. Comparisons across textbooks demonstrated statistically significant differences in the mean number of tokens per text depending on the textbook at the $p<.05$ level for the five conditions $F(4, 61) = 4.56$, $p = 0.003$. Post hoc comparisons using the Tukey HSD test indicated that there were statistically significant differences in the mean score for the B textbook (M = 43.5, SD = 8.31) and the E textbook (M = 34.6, SD = 9.03). As well, there were significant differences between the C textbook (M = 44.3, SD = 8.33) and E. Conversely, the A textbook (M = 3.60, SD = 0.89) did not significantly differ from the B, C, E or D (M = 35.3, SD = 5.37) textbooks. The B did not contrast from C or D. C was not different than D nor was D significantly different than E.

Comparisons of the mean number of unique words (i.e., types) per text found in each textbook demonstrated a range of 22.8 to 30.3 across the various textbooks used in the

analysis. There was a significant effect of textbook type on unique words in the reading passages at the $p<.05$ level for the five textbooks $F(4, 61) = 5.03$, $p = 0.001$. Post hoc comparisons using the Tukey HSD test showed that the mean score for the B textbook (M = 30.3, SD = 5.18) was significantly different than both the D textbook (M = 23.0, SD = 3.38) and the E textbook (M = 22.8, SD = 5.86). However, no other significant differences in textbooks were observed among these and the other textbooks including the A (M = 25.7, SD = 4.55) and C (M = 25.1, SD = 5.31) books.

Number of words repeated in the various textbooks went from a mean as low as 6.17 to as high as 11.14. A statistically significant effect was detected for textbook type on the number words repeated at the $p<.05$ level for the five different textbooks $F(4, 61) = 5.72$, $p < .001$. Post hoc comparisons conducted with the Tukey HSD test revealed that the number of words repeated for the C textbook (M = 11.14, SD = 3.63) was significantly different than the D (M = 6.17, SD = 2.79) and E (M = 6.23, SD = 3.70) textbook. Nevertheless, the C textbook did not significantly differ from the A (M = 8.38, SD = 2.47) or B textbooks (M = 7.93, SD = 2.70). No other words repeated results significantly differed among the textbooks.

V. DISCUSSION

1. Linguistic Variables

Findings indicate that the majority of textbooks require substantial decoding skills for texts that are to be used with beginning L2 readers. This result corroborates others that beginning second-language reading texts are often overly demanding for L2 learners (Lee, 2012, 2016). In fact, Lee (2012) observed that both series she analyzed were less decodable than reading materials for beginning L1 readers. Based upon her analysis of Korean textbooks, Y. A. Lee (2016) concluded that grade five texts were not likely created to be decodable. These findings are unsettling given our current understanding that knowledge of sound letter relationships aids beginning readers' word recognition (Hiebert & Martin, 2007; Mesmer, 2005) and text-reading fluency (Compton et al, 2004).

There was no significant difference found here among the textbooks with respect to their level of decodability. Y. A. Lee (2016) noted similar results to those reported here. However, she did not record whether there were any significant differences among the textbooks. Y. Lee's (2012) results for fourth through sixth grade textbooks were also generally similar across two publishers. He found high decodability for fifth grade textbooks which indicates that the two textbooks are generally similar. These findings for L2 beginning reading texts contrast with those in L1 studies where there appears to be

greater variability in decodability across programs for L1 texts (Foorman et al., 2002; Hoffman et al., 2002).

Word frequency results showed that words were less frequent than might be expected in beginning L2 reading texts and differences existed among some of the textbooks in terms of their word frequency. Most of the previous research that investigated word frequency in texts did not compare levels of frequency among various textbook publishers. Nevertheless, extant findings suggest that infrequent vocabulary begins to appear in as early as first-grade L1 readings (Hiebert & Fisher, 2005). In contrast, results from a Korean study of L2 texts were that a high proportion of words in the reading texts were high-frequency words. However, texts were not compared to each other to establish whether differences existed among them (Y. A. Lee, 2016).

Inclusion of too many low frequency words is problematic for a number of reasons. First, the proportion of high frequency vocabulary in reading passages predicts the accuracy with which they are read (Compton et al., 2004). In addition to its impact on accuracy, word frequency also impacts reading fluency (Compton et al., 2004; Cunningham & Allington, 2003) particularly if unfamiliar vocabulary is not repeated in the text (Hiebert & Fisher, 2005). Thirdly, a significant presence of low frequency words impedes comprehension because processing capacity spent decoding those words could be used to comprehend the text (Rasinski, 1999). The results of the present research tell us is that the proportion of high-frequency words is a bit low and there is some inconsistency among the textbooks with regard to their word frequency content. This lack of consistency is potentially troubling because the texts are all supposed to be closely tied to the same national curriculum.

The vocabulary in the texts were not particularly high in imagibility and there were no differences among the various textbooks' levels of imagibility. While no research compared imagibility across textbooks, prior studies did show that the imagibility of vocabulary has benefits for beginning L1 (Kolker & Terwilliger, 1981; Laing & Hulme, 1999) and L2 (Fan, 2015) readers such as being easier to learn. Readers also use mental imagery as they process texts (Krasny & Sadoski, 2008) and it may help them to compensate when they meet undecodable words or uncommon vocabulary (Raman & Baluch, 2001). Given these previous research findings demonstrating the value of incorporating high imagibility vocabulary, the relatively low imagibility apparent in the texts is not encouraging.

Similar to their lack of imagibility, words from the textbooks were not especially concrete nor were there any significant differences among the textbooks with respect to their level of concreteness. These findings are somewhat discouraging because first-language students recognize concrete vocabulary more rapidly (Altarriba & Basnight-Brown, 2011; Palmer et al., 2013) and learn it more readily (Crossley et al., 2009; Elgort &

Warren, 2014; Ellis & Beaton, 1993). The same is also true for language learners (De Groot & Keijzer, 2000) and bilinguals (Kaushanskaya & Rechtzigel, 2012) unless the words are connected to emotion (Ferré et al., 2015). Similarly, unfamiliar text with abstract vocabulary is less comprehensible (Sadowski, 2000) and vocabulary concreteness in a text affects L2 word learning from reading (Elgort & Warren, 2014). Bearing all of this in mind, it seems that textbook designers are missing an opportunity to boost learners' word recognition, comprehension, acquisition, and retention by failing to include a sufficient amount of concrete vocabulary in these texts.

Unlike imagibility and concreteness, average meaningfulness scores were rather high indicating that words tend to be more meaningful. As well, no significant differences were found among the five textbooks in terms of the meaningfulness of their vocabulary. The meaningfulness of the textbooks' vocabulary is promising given the importance of this vocabulary characteristic for word learning. That is, more meaningful words are typically learned more readily (Ellis & Beaton, 1993; Salsbury et al., 2011). Additionally, students learning meaningful words do not have to rely on as many language learning strategies and their use of more self-initiated strategies such as accessing meaningful contextualized vocabulary through authentic input (Fan, 2015).

2. Cognitive Load Variables

There were significant differences between two pairs of textbooks with respect to the number of tokens they had. First language texts beginning L1 readers vary considerably in the total number of words found therein (Foorman et al., 2004; Hiebert, 2005; Hoffman et al., 2002). Similar findings were reported for textbooks used in Korea (Y. Lee, 2016). Thus, findings from the present study agree with others that sizable inconsistencies exist among beginning reading textbooks with respect to the number of unique words present in the different texts. These results are troubling because they demonstrate inconsistencies in the amount of exposure to new vocabulary that learners receive. These discrepancies in vocabulary exposure may in turn lead to varied outcomes for vocabulary acquisition and L2 development which run contrary to the aims of the curriculum.

Statistically significant differences were present in the number of unique words in some of the textbooks. Findings from previous research on L1 textbooks illuminated how the number of unique words differed depending on the text (Foorman et al., 2004) and increased across levels (Hoffman et al., 2002). In the second-language literature, Y. A. Lee (2016) also reported moderate differences in the number of unique word types depending on the textbook. Therefore, the findings reported here are in agreement with the other research in that inconsistencies are apparent in the number of unique words per text in both first and second language beginning reading texts.

The mean number of words repeated in each text was rather low and there were also significant differences in the number words repeated among the five textbooks. These findings generally conformed with previous research in that L1 beginning reading texts varied in their amount of word repetition (Foorman et al., 2004) and new vocabulary is not repeated enough (Hiebert, 2005). The same was true with L2 textbooks where the percentage of word repetitions was low and many new words only appeared once (Y. Lee, 2016) making elementary school English textbooks more difficult for learners to understand (Y. A. Lee, 2016).

Ⅵ. CONCLUSION

Even though these textbooks account for many text features that are important to initial second language literacy development, they also appear to overlook some linguistic content and cognitive load features that are necessary for beginning language learners. In general, the texts were quite similar in terms of many of their linguistic features such as decodability, imagibility, concreteness and meaningfulness. Regrettably, while the texts were the same, the majority of these variables were at unacceptable levels. That is, many of the texts require unrealistic decoding skills for beginning L2 readers. Likewise, the vocabulary was not particularly imageable or concrete making it more difficult to recognize, learn and remember than it could be. On the other hand, the textbooks are less similar with respect to average word frequency. As well, even though the average meaningfulness scores were similar across the textbooks they were also rather high indicating that words tend to be more meaningful and therefore easier to learn.

With respect to cognitive load variables, the mean number of tokens was low in general but the mean number of types seemed slightly high in proportion to the number of tokens in each textbook. As well, the mean number of words repeated in each text was rather low. No similarities among the textbooks were apparent with regard to cognitive load variables. That is, differences were found between some textbooks for number of tokens, number of types as well as the number words repeated within each textbook. These results suggest that the textbooks are rather varied in terms of the characteristics of their vocabulary that affect the ease with which the words in the texts are processed by the reader. This excessive cognitive is cause for concern because it contributes to the unanticipated difficulty of these texts for their target audience of beginning readers.

These findings help to provide a better understanding of important issues with regard to linguistic and cognitive load characteristics of the vocabulary in beginning reading texts. First, the findings help us to more clearly establish whether there are differences among commonly used textbooks with respect to key features of word identification used by L2

readers. Second, this research demonstrates how corpus analysis tools like Coh Metrix can aid careful investigation of important features of beginning English reading texts in Korea and provide a more nuanced and sophisticated understanding of vocabulary in these texts. Lastly, this research illuminates the importance of previously unexplored vocabulary characteristics such as meaningfulness, concreteness and imagibility. Textbook designers and users should take these factors into consideration because of their contribution to beginning reading word identification (Heibert et al., 2004).

This study is not without some potential limitations that should be acknowledged. The first is that while care was taken to include widely-used textbooks in the research, the five that were ultimately selected do not necessarily represent all English textbooks used in Korean public schools. As well, the Coh-metrix text analysis tool has a lot of potential as a text analysis tool but it has limitations that must be recognized. Mainly, as the developers point out, “the scores are often subject to the output of third party parsers, lexicons, and word frequency databases, all of which are outside of the control of Coh-Metrix” (McNamara, Louwerse, Cai, & Graesser, 2013, Preliminary Information section, para. 1).

Some implications also follow from these findings. Findings of variability in these key characteristics of beginning reading textbook vocabulary can encourage textbook users (i.e., teachers and policy makers) to reflect on the presence of these differences and the potentials consequences of this variability in classrooms when these texts are being used to instantiate a common national curriculum. Textbooks designers should also pay more attention to previously overlooked linguistic variables such as meaningfulness, concreteness and imagibility when creating texts for beginning English readers because of the potential impact of these variables on learner recognition, learning and long term recall of text vocabulary. Designers can use the multiple indicators of word identifiability afforded by Coh-Metrix to analyze their texts to obtain a more refined awareness of vocabulary characteristics and their effect on word identification. Accordingly, through using this tool, we can productively supplement more intuitive approaches to determining the ease with which words can be identified in beginning reading texts

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Examples in : English
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Applicable Level : Elementary

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