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The Dimensional Depth of Words:
Vocabulary Knowledge and Reading Comprehension

B.A. Essay

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Abstract

Grasping the multi-dimensional aspects of word knowledge is a gradual and challenging facet of language acquisition for any learner. The ability to effectively read in today´s society is closely associated with learners´ educational prospects and later their likelihood of obtaining a good job. However, our contemporary computerized and globalized world demands that we gain these skills in English as well as in our first language. As the linguistic environment in Iceland has transformed considerably, Icelandic learners find the need to acquire reading proficiency in English. In evaluating their proficiency level, their overall vocabulary knowledge needs to be measured to address problematic proficiency gaps that may emerge due to morphological, semantical and syntactical differences. By using authentic native tests and various testing tools for credibility, their general receptive vocabulary breadth, productive depth, and overall comprehension of English material can be evaluated. The following pilot study investigates four tenth graders´ vocabulary size, the size-depth relationship and how their size-depth vocabulary knowledge influences their comprehension of authentic written material. Three tests are applied in distinguishing the participants´ proficiency; Meara´s and Milton´s X-Lex (2003) vocabulary test to measure the breadth of vocabulary, Paribakht´s and Wesche´s (1993) Vocabulary Knowledge Scale (VKS) to measure vocabulary depth and a native English comprehension test taken from a California Standard Test (2009) (CST) to evaluate the size-depth relationship on comprehension. The results revealed that although the participants considered themselves to have an adequate breadth of vocabulary knowledge, their overall depth of knowledge was insufficient as particular components of word knowledge affected their outcomes. Based on the results, the study presents vital information about the importance of L2 learners acquiring adequate word knowledge and connecting multi-dimensional components of depth with their breadth of knowledge in order to comprehend authentic material written for native speakers.

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1   Introduction

The ability to mentally interpret meaning from graphic forms is not just a remarkable human trait it is also multi-dimensional in every aspect. As technology advances, exposure to written language forms in English becomes more frequent. Thus, the ability to gain information quickly, abundantly and independently through printed work or, the most commonly used element of daily life, the internet, has become an essential part of our daily routine. This transformation of English exposure has significantly influenced learners´ linguistic environment in Iceland. Recent studies have shown that Icelandic learners are acquiring a substantial amount of English outside the classroom. For example, Levefer´s study (2010) demonstrates in his study that Icelandic learners are "beginning to develop early literacy skills in English without formal instruction" (p.15). While Jeeves (2010) illustrates how the positive environment towards English motivates learners to acquire efficient proficiency of the target language. For this reason, it is debated whether English, being a lingua franca, is proving itself as a second language in Iceland, rather than a foreign language (Birna Arnbjörnsdóttir, 2007). For Icelandic learners to function adequately in today´s contemporary society, the linguistic reality requires Icelandic learners to gain sufficient reading proficiency in English.

With this in mind, the learning burdens of words and their frequency can determine the words simplicity or difficulty in acquisition. While some aspects facilitate the learning of individual words, others may complicate the acquisition of them. Researchers seek to define these troublesome aspects with various descriptive frameworks. One such framework is Nation´s (2001) nine aspects of word knowledge, which describes the multi-dimensional components of form, meaning and use. Additionally, Zipf´s law (1949) explains how human behavioral facet facilitates the acquisition of more familiar and frequent the forms, than complex. That being said, helping learners to understand the multi-complex components of word knowledge and frequency of forms can enhance their reading proficiency notably.

Granted that, learners need to acquire other essential skills for fluency and comprehension of texts. In order to gain adequate L2 comprehension through reading

learners must have a family of skills (Kendeou et al., 2007). This requires developing an abundant vocabulary size of the target language and multi-dimensional key components of vocabulary knowledge to recognize words fluently, infer meaning and process texts into comprehensible networks of concepts. For this to take place, learners need to acquire automaticity and fluency in higher-level processing to construct and decipher meaning from texts. Nevertheless, interpretation is related to the learners´ background knowledge, the purpose of reading, motivation and their goals in reading. For this reason, it is important that learners are afforded the opportunity to take on complex aspects of reading comprehension gradually and assisted in attaining their goals of reading in their L2 languages efficiently at all levels.

Measuring learners´ vocabulary size and depth can identify deficiencies in learners´ vocabulary knowledge. In analyzing recurring learning burdens and enhancing learners´ awareness of them, may reduce any possible gaps from emerging in learners´ gradual lexical development. Based on this, I conducted a pilot study where I measured the breadth and depth of four tenth graders English vocabulary knowledge. Breadth in this paper refers to vocabulary size while depth defines knowledge of words. The research questions at hand were 1) what is the breadth and depth of Icelandic tenth graders, 2) is there a relationship between the Icelandic tenth graders´ vocabulary breadth and vocabulary depth, and 3) how does the tenth graders vocabulary knowledge affect their comprehension of an authentic text written for native English speakers? The evidence presented suggests that for reading comprehension to be successful, L2 learners need to associate complex components of depth with their acquired breadth of vocabulary knowledge to acquire adequate understanding of authentic material written for native speakers.

The thesis consists of six chapters. Chapter 1 introduces important background aspects of reading comprehension and the purpose of the pilot study. In chapter 2 I provide the theoretical framework for the study by briefly defining aspects of word knowledge and the complex dimensions of word knowledge. In addition, higher-level processing skills needed for reading comprehension are briefly discussed as well as the importance of purpose and motivation connected with acquiring adequate reading proficiency. Thereafter, Zipf´s law of least effort and words frequency is explained.

Furthermore, chapter 2 examines the coverage needed to comprehend texts and the importance of measuring learners´ vocabulary coverage for further acquisition as well as introducing the two tests used in the pilot study. Chapter 3 explains the method of the study, participants, and data gathered while chapter 4 presents the study´s results. Finally, the 5th chapter discusses the results of the study, and the conclusion of the thesis is presented in chapter 6.

2 Theoretical Framework

Through the ages, the complex nature of vocabulary knowledge has not only baffled researchers but also caused serious debates on how to define the multi-dimensional components of vocabulary knowledge. The relationship between recognizing a word and linking with others is a complicated aspect of language acquisition, as words do not exist on their own and have a tendency to associate with other words in relating word families. As a consequence, the complexity of defining the dimensions of word knowledge has contributed to the establishment of descriptive frameworks, which categorizes vocabulary knowledge into classifications. In this section, I will briefly examine these distinctions and frameworks of word knowledge.

2.1 Defining Vocabulary Knowledge

One prominent distinction in lexical knowledge is between receptive and productive vocabulary knowledge. The differentiation depends on whether a word is recognized passively or actively. Receptive knowledge occurs when a learner identifies an item passively during listening or in context with other words in reading. Whereas, learners apply productive knowledge to use words actively in oral communication or composition. Generally, learners´ receptive knowledge is larger than their productive knowledge, which means a learner must have acquired adequate receptive knowledge to produce language in a rich manner. However, "good passive skills often require the reader or listener to actively anticipate the words that will occur" (Milton, 2009, p. 13). In order to have adequate receptive and productive knowledge, individuals must recognize receptively and productively the multi-dimensional components that are involved in knowing a word.

Another distinction of word knowledge is breadth and depth. Anderson and Freebody (1981) categorized the smaller dimension of word knowledge by distinguishing between the breadth and depth of word knowledge. While breadth involves the amount of words learners have acquired, the depth of word knowledge implicates how well they understand and use the various aspects of words. For learners

to acquire knowledge of words, they first develop a breadth of words before they gain the multi-complex depth of them.

In verity, it seems rational to consider the breadth and depth of language as two entirely distinctive facets of vocabulary knowledge. As there is no parallel growth rate in which size and depth increase, it would seem that they grow independently to each other (Schmitt, 2014). Although some learners may have a large vocabulary size, they, nonetheless, may not have a deep discernment of the words they know and, as a result, use them incorrectly or none at all. Conversely, learners with small vocabularies may have better proficiency in producing words, as they may have more perception and understanding of their meaning due to more focused teaching of their vocabulary.

With this in mind, Meara and Wolter (2004) mention that "[v]ocabulary size is not a feature of individual words: rather it is a characteristic of the test taker´s entire vocabulary" (p. 87). This distinction is graphically represented in Figure 1:

Vocabulary breadth and depth   Vocabulary size and organisation
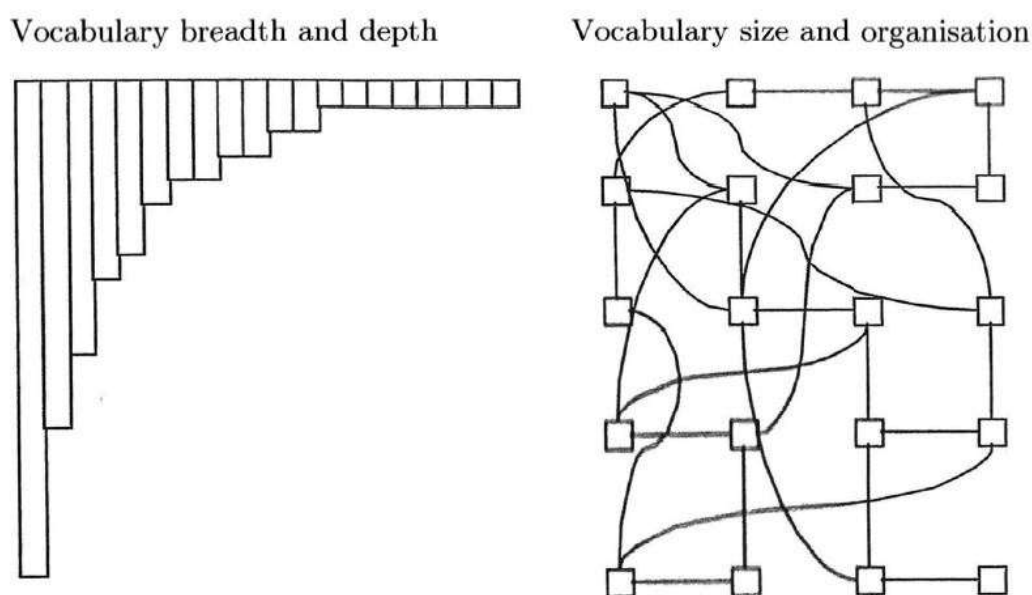
Figure 1 Two ways of looking at vocabulary (Meara and Wolter, 2004, p. 89).

In short, Meara and Wolter (2004) describe on the left side, how a learner acquires more depth of words that are learned earlier. As learners gradually learn new words, the figure illustrates how the depth of the newly acquired words lessons. However, the second picture shows how depth develops into an organization of words, where they connect and associate with each other. The stronger the connection, the likelier the word

is to become productive, however, other words with fewer links or associations remain at the receptive level (Meara, 1997). Therefore, it is important to understand the size-depth relationship of vocabulary knowledge.

2.2   Dimensions of Word Knowledge

In contemporary linguistics, vocabulary knowledge is defined as multi-dimensional components or interconnecting knowledge of various elements. They consist of not only receptive and productive aspects, but also the morphological knowledge of words, their semantic properties, collocations, grammatical structures, connotations and associations, and, lastly, social constraints in everyday usage. This definition of word knowledge components illustrates the complexity of acquiring sufficient vocabulary knowledge for comprehension. In determining the fundamental description, different systems, and levels, approaches have been developed to find the elusive nature of words and the acquisition of word knowledge (Alderson, 2000; Nation, 2001; Read 1989, 2000; Schmitt, 2000). Although, there are numerous descriptions that define word knowledge, most researchers make similar distinctions.

Categorization of word knowledge began in 1917 when Palmer suggested a three-part model for word knowledge and later developed further by other researchers (Milton & Fitzpatrick, 2014). Cronbach (1942) built upon Palmer´s ideas by distinguishing further components of word knowledge as well as drawing attention to the polysemy of words. In seeking to distinguish and define word knowledge into a conceptual framework, Cronbach classified word knowledge as such: generalization (the denotation of a word), application (connotation), breadth of meaning (various implications of words), precision of meaning (a correct application) and availability (production). Richards (1976) later extended Cronbach´s principles and explained the fundamental facets of word knowledge with eight assumptions of vocabulary knowledge; from what a word means, the connotations of words, their restrictions on use, recognition of them receptively and productively, various word associations, different derived forms of words to their syntactic behavior or collocations.

Three approaches have emerged to construe further the complexity of word knowledge. Each approach varies in method and describes the characteristics of word

knowledge by either identifying the components themselves, learners´ development of word knowledge or the metaphorical lexical space of word knowledge.

The first approach is the metaphorical approach. It characterizes word knowledge as being a "web of words" that "cannot be either seen nor touched or even measured very readily" and "usefully characterized by metaphors" (Aitchinson, 1987, p. 84). Nevertheless, this approach has not been defined to any extent of its usefulness and is still debated whether collocations and word association should be included in testing learners´ webbed connections.

The second approach used to understand the acquisition of language is the development approach. In 1965, Dale presented a four-stage developmental model that demonstrated how developmental stages of componential features of word knowledge classified into four categories:

Stage 1: I never saw the word before

Stage 2: I´ve heard the word before but don´t know what it means

Stage 3: I recognize the word in context, it has something to do with _____

Stage 4: I know the word

(Milton & Fitzpatrick, 2014, p. 8)

Equally, the development approach demonstrates the stages of how individual components of word knowledge are acquired before others, e.g. development of vocabulary breadth precedes the occurrence of vocabulary depth. Paribakht´s and Wesche´s (1993) Vocabulary Knowledge Scale (VKS) is based on this approach and requires participants to self-assess their vocabulary knowledge.

Finally, the third approach, the component approach, seeks to determine several aspects of knowing a word, as well as contrasting features of word knowledge. This approach describes how vocabulary depth of knowledge is conceptualized by dividing word knowledge into individual components (Read, 2000). It also distinguishes between the four skills of reading, writing, speaking and listening: features frequently disregarded in vocabulary knowledge studies (Milton & Fitzpatrick, 2014). Nation (2001) refined this approach further by differentiating between receptive (passive) and

productive (active) knowledge, which became a valuable separation often applied in today´s testing of learners´ vocabulary competence. This approach, with its multi-dimensional facets, is considered the leading description of the diversity and extent of word knowledge.

As Nation´s (2001) detailed analysis of the components of word knowledge is currently a more contemporary method, it is often used to evaluate the dimensions of word knowledge. Nation (2001) took his predecessors framework and produced a more comprehensive version to that of Richard´s assumptions. The framework includes certain features lacking in Richard´s framework, e.g. connotations and associations that words carry, phonological elements and constraints. What is more, he classifies the components of knowing a word under three primary descriptors that include receptive and productive categorization: form, meaning, and use. In doing so, Nation assists L2 learners in gaining native-like competence and fluency in the target language by categorizing the nine aspects of word knowledge (see Figure 2) from the perspective of second language learning (Brown, 2011, p. 83; Schmitt & Meara, 1997).

Form	Spoken	R	What does the word sound like?
		P	How is the word pronounced?
	Written	R	What does the word look like?
		P	How is the word written and spelled?
	Word parts	R	What parts are recognizable in this word?
		P	What word parts are needed to express the meaning?
Meaning	Form and meaning	R	What meaning does this word form signal?
		P	What word form can be used to express this meaning?
	Concept and referents	R	What is included in this concept?
		P	What items can the concept refer to?
	Associations	R	What other words does this make us think of?
		P	What other words could we use instead of this one?
Use	Grammatical functions	R	In what patterns does the word occur?
		P	In what patterns must we use this word?
	Collocations	R	What words or types of words occur with this one?
		P	What words or types of words must we use with this one?
	Constraints on use (register, frequency …)	R	Where, when, and how often would we expect to meet this word?
		P	Where, when, and how often can we use this word?

Figure 2 Aspects of vocabulary knowledge (Nation, 2001, p.27).

Consequently, this distinction demonstrates the complexity of actually knowing a word and reveals important elements often taken for granted when defining word knowledge. The next section briefly introduces some of these defining features.

2.2.1   Form.

The first category of Nation´s (2001) nine aspects, form, contains the receptive and productive aspects of spoken form, written form, and word parts. These factors are crucial for reading development as they enhance phonological, orthographical and morphological awareness. Research has demonstrated that by exposing learners extensively to orthographical, phonological and morphological facets influences their ability to learn new words and increases reading fluency. For example, phonological processing is an all-important factor of word recognition and contributes considerably to learners´ literacy. Being an important contributor, it is as well a helpful anticipator on whether learners may encounter difficulties in becoming fluent readers. In enhancing learners´ word recognition, studies show that extensive reading develops phonological awareness in learners, as exposure is a critical factor in increasing word recognition fluency. With this in mind, learners should be frequently exposed to both speech and texts to develop not only their word knowledge but also their word recognition fluency.

2.2.2   Meaning.

Although it is essential for learners to recognize forms, determining their semantic meaning and associations with other words are important components to acquire. In identifying meaning from texts, learners make distinctions between the concepts and the referents by categorizing the words in the text and cognitively building networks with associations (Pajoohesh, 2014, p. 76). Van Patten et al. (2004) study illustrates that the form-meaning relationship is multi-dimensional and created when 1) the form has only one meaning, 2) one distinct form has multiple meanings in various contexts, and 3) multiple forms have the same meaning. However, association or the relationship that occurs between the immense numbers of words often complicates comprehension of texts. Several researchers have verified that L2 mental lexicon often lacks the semantic connection with the target language, which means that learners are dependent on their L1 translation in acquiring L2 vocabulary. However, fluency in L2

cannot be acquired until the necessary webs of words or networks of associations have been obtained. Until then, learners rely on the recognition of the words form rather that their meaning (Meara, 1978). This lack of depth affects the learner´s comprehension.

2.2.3   Use.

Other underestimated components are the knowledge of grammatical patterns and collocations in use. While learners often presume that they can transfer particular words from their L1 to the L2, the grammatical differences in languages often prevents the possibility of such simple transferences (Treffers-Daller & Rogers, 2014). The learning burden of a language´s grammatical behavior depends on the similarity of the learners L1 and L2 (Nation, 2001). Even though grammar teaching is considered unpopular in Communicative Language Approach, Ellis´s (2005) and William´s (2005) research has demonstrated that learners can benefit from an appropriate amount of explicit teaching of language items (Nation, 2001, p. 2). In recent years, researchers have given collocations greater attention as their connection to grammatical functions and word associations intertwines. Various research based on the phraseological approach and the frequency-based approach has verified that certain multi-word units occur and can "co-occur within a certain distance of each other" (Brown, 2014). As learners encounter difficulty with everyday conventional language and collocations, teaching explicitly phrasal vocabulary or selected chunks may make them more memorable. In doing so, learners may comprehend the regularities of word occurrence and, thus, reduce their learning burden.

2.3   Reading Comprehension

Previously, I have briefly defined the multi-complex features of word knowledge (lower-level processing) learners need to acquire for vocabulary knowledge. However, for learners to comprehend a text other features of reading must also take place. Alternatively, as Kendeou et al. (2007) describe it:

> Comprehension is not a unitary phenomenon but rather a family of skills and activities… At the core of comprehension is our ability to mentally interconnect different events in the text and form a coherent representation of what the text is about. (p. 28-9)

For this reason, I will now proceed to discuss other vital facets, or higher level processing aspects learners need for reading comprehension and fluency.

2.3.1 Higher level processing for reading comprehension.

Unlike the lower-level processing of word knowledge, higher-level processing is an automatic mechanism of multiple aspects. When learners need to memorize information for a test, they inadvertently connect the main ideas together with a text and form a text model. A text model is established by referencing newly formed propositions to preexisting ideas in their network and linking the new information to coexisting ideas. Although word recognition, sentence parsing, and propositional encoding are necessary facets of reading, the learner also uses previously acquired background knowledge to activate concepts when drawing a final comprehensive conclusion. In obtaining comprehension, the reader inferences a basic conclusion from known facts or evidence and adds further information through predicates (Grabe, 2009). Finally, the reconstructed summary gives the reader a general conclusion.

Conversely, learners can encounter texts that are difficult to interpret. This occurs when a learner´s language proficiency is limited due to low vocabulary knowledge. As a consequence, the learner may overly depend on building a situation model to acquire consistency for interpretation, giving the learner an opportunity to understand the text through previous knowledge. Although structuring situational models may prove to have positive effects, it could also give learners false preconceptions of the text as they fill in the gaps incorrectly and build up inconsistent situation models that establish incorrect text models of comprehension (Rapp et al., 2007). This may assist the learner in acquiring coherency, however, it does not present an indication of their comprehension in any way.

Another important aspect of reading and reading comprehension is the readings purpose. The purpose of the reading influences how the learner approaches the reading task. For example, the purpose for reading a text determine how the reader structures a situation model or whether they skim the text, scan it or depend on a narrow reading for specific reasons. While some tasks require specific and detailed comprehension, other tasks may only require surface knowledge of main ideas. As reading comprehension is

highly dependent on the types of texts learners read or their complexity, it is critical for them to understand the purpose of the task.

However, purpose alone is not enough, rather the motivation to achieve further proficiency goals. In acquiring adequate reading comprehension, learners must be motivated to expand and strengthen their vocabulary knowledge, comprehension, and fluency through extensive exposure. Yet, by nature, motivation varies considerably in learners. That being the case, texts of little motivational value, interest, or beyond the learner's ability to read without well-explained goals, may cause frustration. So that, when the object of reading is to increase language knowledge, it is necessary to be familiar with the group of learners and avoid causing frustration by imposing texts on them.

Considering the above, for a reading task to be pleasurable and successful, it is imperative not to impose frustrating texts on to learners of different ability levels. Whether simplified or unsimplified texts are used, goals should be attainable for all learners by means of helping them experience a desire to progress further. However, if pleasure reading becomes an imposed obligation, learners´ will become discouraged, thus, preventing the gradual progression of reading proficiency.

2.4   Relationship between Word Frequency and Reading Coverage

As previously mentioned, words may vary in many ways and this variation can increase a learner's burden of acquiring new words. A combination of aspects, such as sounds, letters, word length and similarity to native language, affect their readability. Similarly, inflections and derivational elements may also complicate a learner´s attainment of new forms. In fact, the manifested language patterns and morphological complexity of languages greatly influence how learners conceive and comprehend words. Altogether, these factors can affect a learner´s attainment of new words.

However, the words frequency level and how often learners come across them in texts is another important factor. In truth, learners are more likely to learn words if they encounter them more often as to those that seldom occur. Some words characteristics and nature, make them more frequent, and hence, easily learned while others tend to be acquired later in learning. In understanding learners´ vocabulary acquisition and

comprehension, it is essential to identify the words frequency level and measure their vocabulary knowledge, as well as their overall coverage of texts. These facets will be discussed in this chapter and begin by addressing Zipf´s law (1949) and the frequency factor of words.

2.4.1   Zipf´s law.

The question of what words and word levels are most useful to learners is an ongoing debate and explained in Zipf´s law (1949). As word distribution differs considerably at different frequency levels, it is essential to understand the nature of their distribution and efficiency. While some words, such as the conjunction *and* and the definite article *the*, are highly frequent and extremely useful, other low frequency words, such as *torpid* and *zygote*, may not be as frequent in daily use. Then there are the medium frequency words, such as *quilt* and *cabaret*, which are useful words, but not very frequent. This type of regularity in the frequency of words is explained in Zipf´s law.

Particularly, the law systematically illustrates the relationship between the word´s occurrences in a text and its classification in a frequency list (Milton, 2009). When examining a ranked frequency list based on a collection of texts, the rank of the word is multiplied by its frequency. The lists show that the ten most frequent word types cover 25% of tokens in texts and that the 100 most frequent word types provide coverage of 50% of tokens. As a large number of high-frequency words are mostly function words and content words, it is necessary for learners to acquire an abundant quantity of them to facilitate language quickly before gaining acquisition of mid- and low frequency words. If not, learners may acquire a skewed distribution of frequency words. Therefore, concentrating on the most frequent words and gradually enhancing learners´ vocabulary, gives learners a certain advantage in comprehending texts.

For this reason, it is important to take into account Zipf´s law of least effort to assist learners in acquiring more vocabulary. The principle of least effort has been adjusted to contemporary psychology and explains frequency in human psychological behavior as well as their ability to understand and retrieve relations between objects or words. Generally speaking, Zipf´s law demonstrates the human tendency to strive for

immense achievements with the least amount of effort. The more often humans frequently perform useful behaviors; the easier the behaviors become. A learner´s acquisition of language is similar. Instead of learning long, complex words that are more inclined to be less frequent and useful, learners acquire first high-frequency words that are primarily shorter, single-syllable words (Nation, 2001, p. 34). Specifically, high-frequency words simplicity generates their acquisition, usefulness and frequency in everyday usage.

2.4.2   Word frequency.

With this in mind, a basic principle of measuring learners´ L2 vocabulary size, is measuring the "relationship between a word´s frequency and the likelihood that a learner will encounter it and learn it" (Milton, 2009, p. 25). This method is a 100-year-old pre-structuralist approach in teaching languages. Although Palmer (1917, p. 123) pointed out the frequency hypothesis as being the relationship between frequency and learning, it demonstrated "…the more frequently used words will be the more easily learned". In learning the most frequent and useful words, enables us to convey or receive meaningful messages. However, Palmer´s hypothesis was thought only to be an assumption until Meara (1992) created a frequency profile by graphing this relationship (see Figure 3), as cited in Milton (2009). In doing so, Meara (1992) demonstrates how learners´ L2 knowledge slopes left to right and flattens considerably after the 5,000 word frequency level (Milton, 2009). That being said, various studies have demonstrated the tendency to acquire word knowledge of high frequency columns first and word knowledge in lower frequency columns later in language acquisition, with small differences between levels after the 5,000 word frequency level. Therefore, verifying the acquisition of higher frequency words first and lower frequency words at a slower rate. However, in comprehending texts, how the frequencies of words relate to the learners´ acquisition of them is an ongoing research question.
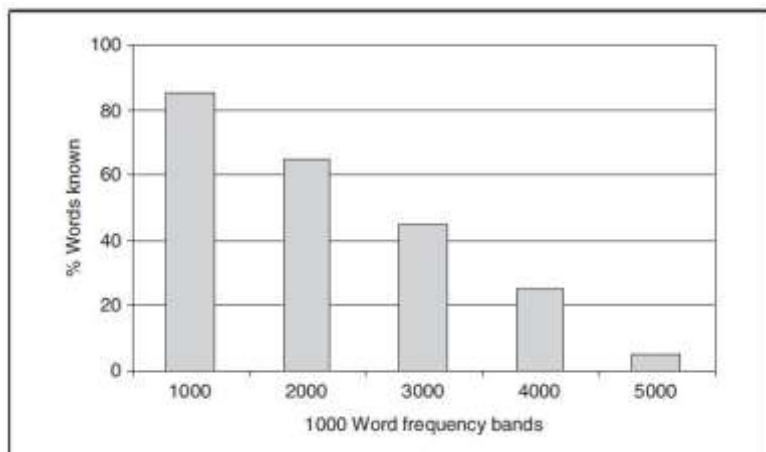
Figure 3 Vocabulary profile of a typical learner (Meara, 1992, p. 4; Milton, 2009, p. 26).

2.4.3   Comprehension and coverage.

As reading comprehension is an important aspect of reading, a large vocabulary size is required for sufficient coverage. In analyzing the vocabulary size required for sufficient comprehension, researchers rely on the coverage or a percentage of vocabulary in a text that a learner needs to understand (Schmitt, Jiang, X. & Grabe, 2011). Until recently, Laufer (1989) concluded that a vocabulary size of 3,000 word families would give adequate coverage for reading and that a 95% coverage rate was adequate. Still, Hu and Nation (2000) later argued that learners must have coverage of 98-99% to understand texts adequately. Although 3,000 word families would be sufficient for listening, Nation (2006) contradicted Laufer´s (1989) notion and asserted that a size of 8,000-9,000 word families and 98% coverage was necessary for the comprehension of texts. Even though these studies do not show similar results, admittedly, they verify that a relationship between vocabulary size, or coverage, and reading comprehension exists.

Milton (2009) visually conceptualizes this relationship by showing different levels of vocabulary proficiency. Often enough, the act of reading is taken for granted. However, by visibly portraying the various levels of coverage learners might have of texts, gives a better perception of how a text may appear to them. Milton (2009, p. 48-50) establishes this by using Lincoln´s (1863) Gettysburg Address. If learners have full comprehension and coverage of the text, the first sentence of the Address would read as such:

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Nevertheless, if learners recognize only the ten most frequent words (function words), they would hold the following understanding:

XXXX XXXX and XXXX XXXX XXXX, XXXX XXXX XXXX XXXX on XXXX XXXX a XXXX XXXX, in XXXX, and XXXX to the XXXX XXXX XXXX XXXX XXXX XXXX XXXX.

As illustrated, with knowledge of only ten words, learners would have 20-25% coverage of an average text, therefore, making the text incomprehensible. On the other hand, if learners acquire 50% coverage of a text or word knowledge of 100-150 words, they begin to obtain more comprehension, as shown in the next example:

Four XXXX and seven years XXXX, our fathers XXXX XXXX on this XXXX a XXXX XXXX in XXXX, and XXXX to the XXXX that all men are XXXX XXXX.

In comparing these two examples, it would seem that 50% coverage could give low proficiency learners adequate information to build a situational model to recognize this famous text and comprehend its meaning. That is if they would have the background knowledge to interpret the meaning from the known words. Otherwise, the learners would compose an incorrect conclusion of the text´s meaning or for which it stands. Therefore, many would not fully recognize the words missing from the text on their own. At any rate, the next example gives learners 80% coverage or knowledge of 2,000 words. This sample could be sufficient for learners to fill-in-the-gaps and discover the text´s cultural relevance to history if they knew the Gettysburg Address beforehand. As presented below:

Four XXXX and seven years ago, our fathers brought forth on this continent, a nation, XXXX in XXXX and XXXX to the XXXX that all men are created equal.

In this example, the learners have not acquired full comprehension. Even so, by increasing their coverage to 90-95% or word knowledge of 6,000, the text becomes easier to infer meaning from and comprehend. As demonstrated below:

> Four score and seven years ago, our fathers brought forth on this
>
> continent, a nation, XXXX in liberty and dedicated to the XXXX that
>
> all men are created equal.

Overall, the examples visually demonstrate how comprehension of a text is highly related to learners´ coverage. As illustrated, 95% coverage gives learners the general understanding of the text without having to distinguish the meaning of all the words in the text. If the text is full of gaps, the learner will struggle with deciphering meaning in relation to their coverage or vocabulary size. Although meaning could be interpreted through the known words, the full meaning of what is actually being represented will remain elusive to the learner. In truth, this demonstration defies the previous assumption of Ogden (1930), who determined that 850 words were sufficient for comprehension and speech in his book of Basic English (Milton, 2009). In all honesty, such a low coverage would alienate any learner from wanting to read for pleasure, not to mention reading for an exam. Consequently, it is necessary to find different methods to increase learners´ coverage level. Measuring learners´ vocabulary could give vital insight into their true reading capability and comprehension proficiency in a target language.

2.5   Measuring Vocabulary

To help learners acquire adequate English proficiency, educators need various tools to measure learners´ abilities. Such tools can assist learners in enhancing their vocabulary size and help them gain sufficient language acquisition. As knowledge of words, coverage, and comprehension are closely associated, learners need to gain reasonable understanding of received information and later become efficient in producing it. Admittedly, obtaining automaticity in word recognition and fluency in word knowledge is a time-consuming process. However, measuring learners´ vocabulary knowledge regularly, individually and in groups, can help identify gaps and underdeveloped levels of learners´ knowledge. So much so, that these problematic

levels can be addressed specifically to increase learners´ fluency, coverage, and comprehension.

There is a distinction to be drawn between the types of diagnostic vocabulary testing used in measuring vocabulary size. Today, there are numerous existing frameworks that measure vocabulary size, which are applicable and valid. Although, some debate that the difference between learners´ breadth and depth is little, various regression analyzes demonstrate that depth provides more descriptive information than breadth (Schmitt, 2014, p. 913). As evidence has shown, there is a substantial correlation between the breadth and depth of vocabulary knowledge and it has prompted researchers such as Vermeer (2001) to argue that there is little difference between the two. Of course, as Schmitt (2014) notes, it depends on how the relationship between the two is interpreted and measured (p. 913). Thus, it is necessary to explain how these two facets of vocabulary size, breadth (receptive skills) and depth (productive skills), are measured.

2.5.1   Measuring breadth.

To measure the breadth of learners´ vocabulary size, multiple-choice tests or Yes/No tests are commonly applied to demonstrate the level of vocabulary learners possess. The tests define the extent of learners´ passive vocabulary recognition. In testing learners' knowledge, the typical vocabulary breadth test would focus on how well learners recognize a cluster of letters as a word and not as the clutter of symbols (Milton, 2009). Without recognition, a learner could not define a word, translate it or understand its meaning, much less use it.

Although some of the most prominent word recognition tests are checklist test, there are various advantages as well as disadvantages to their application. The checklist tests take less time and effort on behalf of the learners, therefore, giving researchers an opportunity to test larger samples of words at various frequencies. This in turn offers more reliable results than having to test smaller samples at a time. Additionally, learners are least likely to lose interest or become frustrated with checklist tests since they are comparatively simple and brief in application. However, the disadvantage is attributed mainly to learners´ overestimating, or guessing, their knowledge of words. For this

reason, pseudo-words are often added to checklist test to eliminate any uncertainties in the overall estimation of their vocabulary size.

That being said, a typical orthographic vocabulary breadth test is Meara´s and Milton´s (2003) X-Lex test. The X-Lex is a 120-word test, designed specifically to test learners´ orthographic vocabulary knowledge of the first five thousand word frequency levels (Milton, 2009). Each frequency level is presented in a row of 20 words each and builds upon Hindmarsh´s (1980) and Nation´s (1984) previous work on word frequency levels. In addition to the 100 words from the five frequency levels, the test also includes 20 pseudo-words. The pseudo-words purpose is to allow leeway to calculate possible guessing and overestimation on behalf of the learners. Removing the learners´ misjudgment, gives the test an opportunity to base the learners´ score on a realistic estimation of their knowledge, not on their assumption. In calculating learners´ raw vocabulary score, the Yes responses are counted and multiplied by 50. However, their overestimated selection of pseudo-words is calculated and multiplied by 250. By obtaining their overall passive, receptive vocabulary size, this figure is deducted from their raw vocabulary score, giving an adjusted general score. An example of an X-Lex test:

| had | govern | system | interval | mosquito | warboy |
| which | industry | position | overcome | proceed | cordonise |

Milton, 2009, p. 255

Although there are no completely accurate methods of testing breadth, there are various advantages of using them. Specifically, they are simple in design, easy to apply and can be adjusted with any frequency list (Milton, 2009). What is more, vocabulary size tests can be short or long, depending on the group of learners, the level of reliability required and, lastly, its purpose.

2.5.2   Measuring depth.

However, assessing the learners´ vocabulary depth is a more complicated task than measuring their breadth of knowledge. Vocabulary depth tests are inherently productive in nature and provide various tasks, such as translating and productive writing. In determining learners´ vocabulary depth, a researcher would select a test from

either the component approach or the development approach, depending on the purpose. These two approaches are defined briefly in chapter 2.1.

Although it is debated which approach gives the best results, Paribakht´s and Wesche´s (1993) Vocabulary Knowledge Scale (VKS) is a distinguished test in determining the stages of learners´ developing knowledge. The VKS is a self-report test where learners read a word and evaluate their depth of knowledge of that word. It is a five-category elicitation scale and provides a representation of learners´ knowledge by using a five-point scoring scale as shown below in Figure 4.

Self-report categories	Possible scores	Meaning of scores
I.	1	The word is not familiar at all.
II.	2	The word is familiar but its meaning is not known.
III.	3	A correct synonym or translation is given.
IV.	4	The word is used with semantic appropriateness in a sentence.
V.	5	The word is used with semantic appropriateness and grammatical accuracy in a sentence.

Figure 4 VKS scoring categories – Meaning of scores

In evaluating learners´ correct answers, their score is dependent on how well they answer in each category. For example, if learners answer incorrectly in categories III, IV or V, they receive a score of 2. That is to say, the word may be familiar to them, however, the words meaning is unknown to them. If learners have seen the word and can translate the meaning of the word or produce its synonym, they receive a score of 3. Given that learners know the word and can produce a translation or synonym, they receive a score of 4. Conversely, if they use the word semantically incorrect in a sentence in category 5, learners will also receive a score of 4. Learners receive a score of 5 if they produce a sentence where the target word is used semantically correct, even though other aspects of the sentence are incorrect (Paribakht & Wesche, 1993). Although the VKS, may demonstrate learners depth of vocabulary and development, it does not illustrate learners overall word knowledge of the target words. On the other hand, the VKS may give an accountable, self-reported outcome. Schmitt (2010) considers it to evaluate more what learners can potentially do with their language

proficiency without assessing their awareness of vital metalinguistic components (p. 222). However, by using the VKS in parallel with vocabulary breadth tests, the test can provide a better understanding of the relationship between learners´ receptive vocabulary (breadth), against their productive vocabulary (depth).

2.6   English in Iceland

As learners' educational prospects are closely associated with their ability to read effectively, it is essential to examine learners´ vocabulary knowledge and reading proficiency. Today´s contemporary computerized and globalized world requires learners to acquire these skills not only in their L1 but also in their L2. Like other countries, globalization of English has affected the linguistic reality in Iceland and in turn, the Icelandic educational environment needs to take into account learners´ needs and expectations by enhancing their English proficiency.

That being said, English instructional approaches used in each country depend on the learners´ exposure to the L2 language in their naturalistic environment. Through the years, English has established itself as a lingua franca throughout the world and gradually transformed the linguistic status of English in Iceland, from it resembling a foreign language to be regarded as a second language (Birna Arnbjörnsdóttir, 2007). This change in status is evident in Jeeves (2010) study where she illustrates that motivation alone does not determine a learner's desire to learn English, rather the environment they live in, as "English plays such a large and unquestioned role in the lives of young Icelanders" (p. 12). Additionally, Levefer´s (2010) study illustrated how Icelandic learners are developing literacy skills outside the classroom without formal instruction. These changes affect the linguistic reality within the schools and call for further evaluation of approaches used in Icelandic schools.

In view of this transition of exposure and environmental influences, Icelandic learners are near to being defined as second language learners instead of foreign language learners. In establishing this, their general English reading proficiency needs to be tested. The theoretical literature in this chapter discussed various facets that affect Icelandic learners´ acquisition of English: the multi-dimensional components of word knowledge, relationship between word frequency and coverage, and the interaction

between learners´ coverage and reading comprehension. With this in mind, the following pilot study presented in the next chapter measures the nature of Icelandic tenth graders breadth and depth of English vocabulary knowledge and reading comprehension. The research questions are threefold:

1. What is the English vocabulary breadth and depth of Icelandic tenth graders?
2. Is there a relationship between the Icelandic tenth graders´ vocabulary breadth and vocabulary depth?
3. How does the 10th graders vocabulary knowledge affect their comprehension of an authentic text written for native English speakers?

The participants have not received any previous preparation; rather they are evaluated by their acquired knowledge through their former educational instruction. As previously discussed, multiple methods of collecting data give studies more credibility or valid results. Therefore, three tests are applied to characterize the participants´ proficiency.

3   Method

3.1   Participants

The participants in this study were four native speakers of Icelandic in the tenth grade at an upper primary school in Iceland. Two were female, and two were male. One female participant was 16 years old, and the other three were 15 years of age. As motivation and purpose can influence results, participation in this study was not a mandatory obligation. Therefore, the participants were selected randomly and invited to take part in the study freely. Those who wished to take part were sent home with a permission slip for their parents´ consent (Appendix I).

3.2   Instruments

In measuring three different types of variables of the participants´ reading, three tests were chosen to investigate the complex relationship between the variables. In evaluating their proficiency level of the first 5,000 word families, the first test applied was Meara´s and Milton´s X-Lex (2003) (Appendix II) vocabulary test from page 255 in Milton´s (2009) book. In addition to the X-Lex, the Vocabulary Knowledge Scale (Appendix III) was selected to measure the participants´ vocabulary depth of 20 words that were taken from the X-Lex test: four words from each frequency level. Finally, a comprehension test with three multiple-choice questions and two written questions was presented to measure their comprehension of an authentic text.

The text chosen to evaluate the participants comprehension was taken from a selection of the California Standards Tests issued 2009 by the California Department of Education for the ninth grade. Before the text was administered, it was established whether the text, "A Visit to the Folks", was too difficult for the participants by administering it through the Lextutor. In all, the text contained an overall count of 478 tokens. As the text contained a few words higher than the 8,000-frequency level, the words were simplified to keep the coverage level closer to the participants´ proficiency level (Appendix IV). Knowing and recognizing the first 412 tokens or 168 types at the first frequency level, provided participants with 86.19% coverage (412/478). The next frequency level gave them an additional vocabulary coverage of 5.86% (25 types), and

the third frequency level brought their vocabulary coverage to 94.35% (11 types). In all, the eight frequency levels provided a coverage rate of 96.66% and the 3.35% (16) outstanding were pronouns.

3.3   Procedure

All three tests were administered in a single session. They were administered in pencil-and-paper format to the randomly chosen group of L2 learners respectively. The participants were tested individually in a room by the principal´s office. The participants testing time varied from 25 minutes to a more lengthy testing time of 45 minutes. They first completed the questionnaire, secondly they checked words known to them on Meara´s and Milton's (2003) X-Lex vocabulary test Yes/No checklist. Thirdly, the participants evaluated how well they knew 20 randomly chosen words taken from the X-Lex test and applied to the VKS´s self-report of vocabulary depth. Last, the participants read "A Visit to the Folks" text and answered the related five comprehension items: three multiple-choice questions and two written questions.

3.4   Data

In this study, descriptive results of the three tests are analyzed. Providing accurate estimates of the participants´ vocabulary size and knowledge, the results were calculated accordingly to the pre-described criteria in the previous chapter. In calculating the participants overall vocabulary score, their raw score in the X-Lex was counted first and then multiplied by 50. In eliminating overestimation, the pseudo-words chosen by participants were multiplied by 250 and subtracted from their raw score. In doing so, the X-Lex can produce individuals´ vocabulary size scores from 0-5,000 word-families. Likewise with the VKS, participants answers were assessed on a scale from 1-5. They evaluated themselves how well they knew the randomly chosen words from each frequency level on the X-Lex. Still, some items were incorrect and were marked according to Parikeht´s and Wesche´s prescribed criteria. The test provides an overall score from 0-100. In addition, the correct answers from the comprehension test were calculated. This test could give an overall score from 0-100.

In further evaluating the data, the mean scores are worked out to identify the fundamental tendency of the values by adding them up and dividing the score by the

total number of values. Additionally, the standard deviation (SD) of the participants score is calculated to measure how values vary within datasets and to show whether the datasets were clustered or dispersed around the mean value.

4   Results

The following chapter presents the results from the research questions. I begin by specifying the participants´ background information. The three research questions are addressed by presenting calculated results of the learners overall vocabulary size and depth, the relationship between the learners´ breadth and depth is established as well as the effect the relationship has on their reading comprehension.

4.1   Survey Questionnaire

Participants answered a short questionnaire on their background (see Table 1). According to their answers, two had begun to learn English at school in the fourth grade and one in the second grade. However, one participant had lived in an English speaking country for 1 ½ years before he began primary school. He reported having learned English since he lived abroad. In addition to this, the learners reported to have first known that they understood or could use English between the ages of 6-9, and one participant who had lived abroad reported to have done so before the age of five:

Table 1 Survey questions

	A	**B**	**C**	**D**
	Male	**Female**	**Female**	**Male**
Age	15	15	16	15
Have you lived in an English speaking country	1.5 years	No	No	No
When did you begin to learn English	2 years old	4rth grade	4rth grade	2nd grade
How good is your English	Good	Very Good	Good	Good
How good is your Icelandic	Good	Fair	Good	Good
When did you first know you could understand or use English	Before 5	6-9	6-9	6-9
How interested am I in learning English	Neither interested nor uninterested	Very interested	Very interested	Very interested
How important is it to learn English	Very important	Very important	Very important	Very important

The self-report illustrated that three participants evaluated their overall English proficiency to be good while one described her English to be very good, but her Icelandic to be only fair. All participants agreed that English was a very important language to learn. Nevertheless, three participants reported to be very interested in learning English while the fourth was neither interested nor uninterested in learning English. The following section presents results pertaining to the first research question, where I explore the breadth and depth of participants´ English vocabulary knowledge.

4.2 Learner´s Vocabulary Breadth and Depth

After administering the X-Lex, the participants´ receptive vocabulary size was calculated. For the receptive vocabulary test, the maximum score for each frequency level is 1,000 word families and the score for all 5 frequency levels gives 5,000 word families. The participants range of word families varied from 3,500-4,550, giving a dispersion of 1,550 word families and an average knowledge of 4,162.5 word families (Table 2). Moreover, the participants´ raw knowledge slopes to the right, except at the 3,000-word frequency level where participants reported having seen and known all the words demonstrated at that level.

In determining their overall mean score for known words in the X-Lex, their overestimation was deducted from the raw score. In all, there were 120 words used in the test (100 words and 20 pseudo-words). Before the participants´ guessing was subtracted from their raw score, the test demonstrated a mean knowledge of 90.8 of the words in the five frequency levels. However, as two out of four participants overestimated their word knowledge by checking six pseudo-words, their guessing was subtracted from the raw mean knowledge score, lowering their mean score by 7.5. Therefore, giving them an overall score of mean words known of 83.25 (SD =10.01) as demonstrated in Table 2.

Table 2 Means and standard deviations for the X-Lex and VKS

	Number of known words		Calculated test scores	
	M	SD	M	SD
Vocabulary Knowledge Scale	18.25	0.96	82.00	8.12
Yes/No Vocabulary Test (minus guessing)	83.5	10.01	4162.5	500.62
Yes/No Vocabulary Test (raw score)	90.8	0.03	4537.5	25

For the productive vocabulary depth test or VKS, the participant evaluated 20 words taken from the X-Lex on a scale of 1-5. They evaluated knowing 18.25 (SD=0.96) of the 20 words presented in the VKS. In calculating their answers, each word was marked according to the VKS´s scale and the participants´ response to how well they knew each word. The maximum score for each frequency level was 20, and the test gave a total maximum score of 100. On average, the participants mean score was 82 (SD=8.12), ranging from a score of 70-88 (Table 2).

4.3   Relationship between Breadth and Depth

Table 3 presents a graphical representation of the collected data by comparing the mean scores of each frequency level for the X-Lex and the VKS. A parallel declining pattern is found in the data as the participants´ raw knowledge slopes to the right, except at the 3,000 word frequency level where participants reported having seen and known all the words demonstrated at that level. Figure 5 illustrates the X-Lex (250) sloping upwards at that level while there was a sudden drop noted at the 3,000 word frequency level in the VKS (15.25) (see Figure 6). Although the 1st and 2nd level show a linear decline, the 3,000 word frequency level demonstrates a considerable difference in the participants´ skills.

Table 3 X-Lex and VKS calculations divided by each level

Frequency Level	Yes/No Vocabulary Test (raw score)		Vocabulary Knowledge Scale	
	Mean score	SD score	Mean score	SD score
Level 1	246.88	6.25	18.5	3
Level 2	231.25	16.14	17.25	2.06
Level 3	250	0	15.25	2.06
Level 4	206.25	7.22	15.5	1.73
Level 5	200	22.82	15.5	1.73
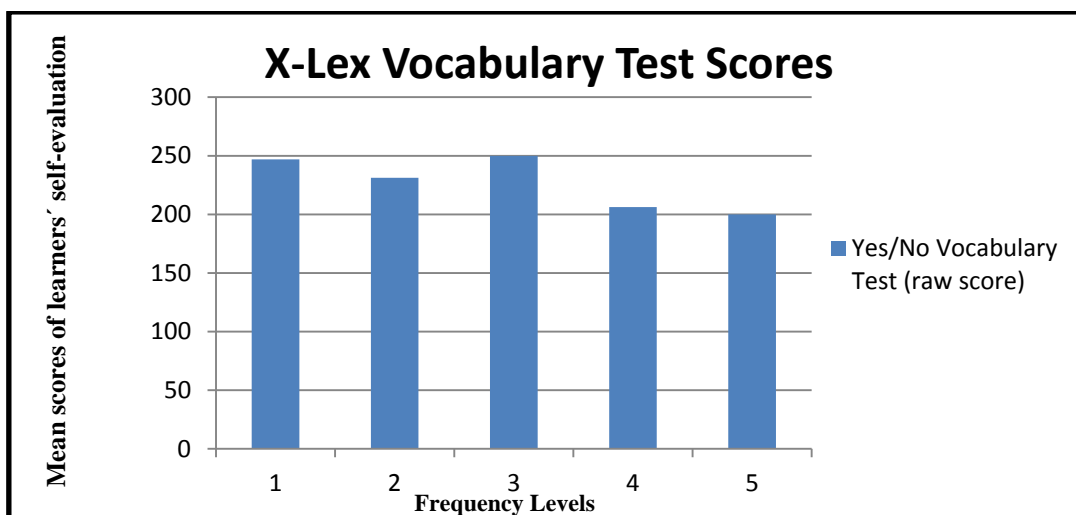
Figure 5 X-Lex Vocabulary Test Score (raw score)
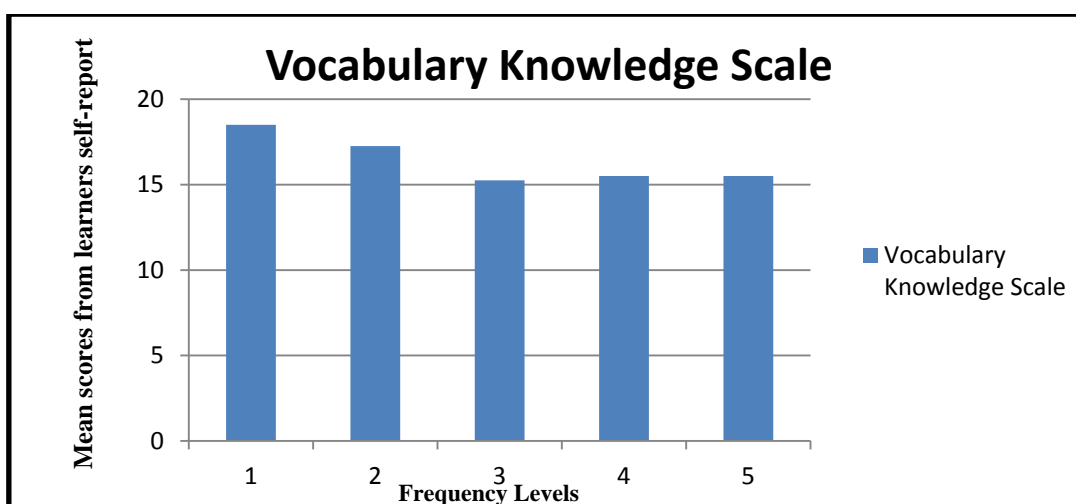
Figure 6 Vocabulary Knowledge Scale

In identifying the reason for the sudden drop in the 3rd level, two words affected the scoring in the VKS. These words are *relation* and *vain*. Similar to the previous discussion, the word relation contains a suffix, *relat(e)+ion.* Only two participants could compose a grammatically correct sentence with the word while the two other participants knew they had seen the word but did not know its meaning. However, the homophone *vain* was marked as a known word to all participants in the X-Lex. When they were to define their knowledge of the word, the participants inserted it into a grammatically correct sentence but with a different meaning. They associated the word *vain* with the noun *vein* (a tube in the circulation system that carry blood), instead of the adjective *vain* (being conceited or egotistical).

4.4   Vocabulary Effect on Reading Comprehension

Interestingly, as the levels heightened, the words that posed most difficulty were those with attached affixes. In the first 1,000 word frequency level, only one word was not marked by a participant (*bring*) (Table 4). In the second level, participants marked six words that they identified as words they did not know. In the third level, participants marked all the words as known words. On the other hand, the fourth level presented more difficulty to them as all four could not identify *interval* as a word they knew or could use, and three were not familiar with the word *frank*. However, the fifth level rendered the most complicated as three did not recognize *rot* or *enclose*, four could not identify with *enigmatic*, and two with *cord* and *troublesome*. Other words they did not know were *simplicity* and *wedge*. In examining these problematic words, four out of seven were affixed words: *enclose* (en+close), *enigmatic* (enigma+matic), *simplicity* (simple+icity), *troublesome* (trouble+some).

Table 4 Words not marked in X-Lex by levels

1 level	Bring (1)
2 level	Industry (1), Frequent (1), Govern (1), Collar (1), Artificial (1), Pan (1)
3 level	
4 level	Interval (4), Border (1), Pat (2), Liner (1), Display (1), Sum (2), Frank (3)
5 level	Rot (3), Enclose (3), Enigmatic (4), Wedge (1), Simplicity (1), Cord (2), Troublesome (2)

*number in brackets presents how many participants did not mark the word

In examining the relationship between their self-evaluation of knowing the words in the X-Lex and reporting how well they knew the words in the VKS, gave contradictory results (Table 5). Three participants had marked knowing the word *frequent* in the X-Lex. However, only two could use the word in a sentence along with another participant who had not marked it as a known word in the X-Lex. Similarly, with *sum*, two had marked it as a word familiar to them in the X-Lex, none of the participants knew the meaning or could use it in a sentence. Conversely, no participants marked *rot* as a word they knew in the X-Lex. However, one participant used it grammatically correct in a sentence in the VKS.

Table 5 Marked words in X-Lex and VKS score

Participants	A		B		C		D	
Test	X-Lex	VKS	X-Lex	VKS	X-Lex	VKS	X-Lex	VKS
frequent	1	5		5	1	2	1	5
collar	1	5	1	2		5	1	2
sum	1	2	1	2		2		2
rot		5	1	2		2		2

In evaluating the participants reading comprehension, their results of the comprehension test was calculated. This test gave a total score of five in answering all five questions correctly. In all, the participants scored a mean score of 55% (SD = 34), ranging from a low score of 20% to the highest score of 100%.

Two of the multiple questions asked participants to define the meaning of idioms: *slows the juices down* and *old timers*. Only one participant marked the correct multiple choice for the former idiom and produced an answer for the latter. As idioms are expressions that cannot be understood from the meanings of its separate words, readers need to have knowledge of how words occur together not only as collocations but also metaphorically.

1. It slows the juices down something marvelous
2. It XXXX XXXX XXXX something marvelous

That being said, all the words in the first sentence belong to the first (5 words) and second frequency level (2 words) and give 100% coverage. However, if the idiom is removed from the text, it is apparent that the reader only has 42.86% coverage of the sentence. Therefore, if readers are not able to associate the meaning to the words by building a text model, they would need to build a situational model to deduct its meaning from the surrounding text if possible.

Additionally, the participants answered three other comprehension questions to verify their overall understanding of the text. Two questions were multiple-choice where participants could find the answer to the question in the text, and the third involved inferring the answer from the story´s theme, which became the most difficult question to answer.

Another finding was in the participants´ responses to their English proficiency. Three replied that their general English proficiency was good, while one reported having very good proficiency. In comparing their responses to their outcomes in the three tests, the three who considered their proficiency to be good attained high scores in the X-Lex (3,500-4,550 out of 5,000), the VKS (85-88 out of 100) and the comprehension test (20-100 out of 100). Conversely, the participant who claimed having very good English proficiency scored the lowest on all three tests (X-Lex = 3,500; VKS = 70; Comprehension Test = 20%). Moreover, when participants were asked how good their Icelandic was, 3 answered good while 1, who had answered their English to be very good, reported having fair Icelandic. Granted that, the participant who claimed to have very good English proficiency scored the lowest on all three tests.

This chapter has explicitly outlined of the basic results from the data collected in the pilot study. The next chapter presents a further descriptive analysis and discussion of the results.

5   Discussion

In this pilot study, three questions regarding the relationship between the scopes of vocabulary knowledge and reading comprehension in tenth grade learners were addressed. The first question addressed the tenth graders´ breadth and depth of vocabulary knowledge. The second question asked whether there was a relationship between the participants´ breadth and depth of word knowledge. Finally, the third question asked how their breadth and depth affected their comprehension of an authentic native text.

5.1   Vocabulary Scores

In general, the participants´ vocabulary size varied and a considerable difference was found in the participants´ evaluation of their word knowledge. Their overall knowledge of word families ranged from 3,500-4,550 in the X-Lex and 70-88 in the VKS. These X-Lex scores suggest that three participants hold a high level of receptive vocabulary while the fourth requires additional vocabulary knowledge. In interpreting the vocabulary score of the two tests, it is apparent that the connection between form and meaning weakens at lower frequency levels and that their receptive vocabulary was larger than their productive.Supporting Schmitt´s (2014) argument that receptive and productive knowledge grows independently and not parallel. However, one participant´s score was continuously low, or a vocabulary size of 3,500 in the X-Lex and a score of 70 in the VKS. According to Zipf´s law (1949), learners need to acquire an abundant amount of high frequency words for comprehension, as acquisition of high frequency words (first 2,000) gives learners 80% coverage (Milton, 2009). Although the participants´ size-depth growth rate is not parallel, the form-meaning linkage gradually strengthens with frequent exposure.

5.2   Size-depth Relationship

In measuring the connection between participants´ size-depth relationship, the study shows how the word knowledge components of form and meaning affect Icelandic learners´ acquisition of words in English. The results suggest overestimation in linking meaning to its form. Although they knew the words in sight in the X-Lex,

connecting forms to their meaning in the VKS required more effort than visually recognizing the form. This may be attributed to Meara´s and Wolter´s (2004) claim that the depth of newly learned words is less as they have fewer links to associate with whereas earlier learned words have established deeper association in the lexicon. Adding to the complexity of word knowledge, Van Patten et al. (2004) study on the multi-dimensional components of word knowledge established how the polysemous features of forms influence learners´ learnability, interpretation and comprehension of words in texts. Therefore, Meara´s (1978) argument that learners tend to rely on their phonological and orthographical recognition of words form rather than determining their meaning until they have obtained the networks of association may be an influential factor in the outcomes of the participants.

5.3 Effects

In further assessing how specific facets affect participants´ vocabulary knowledge, it is clear that not only phonological, orthographical features influenced the participants´ outcomes, but also morphological. Although sight-reading is an important part of processing words orthographically, learners also need to acquire morphological awareness to infer meaning from not only simple unfamiliar derivatives such as *relation* and *enclose*, but also lengthy words with derivational suffixes, e.g. *enigmatic, simplicity and troublesome*. This is managed by increasing learners´ knowledge of the languages morphological structure and by understanding its semantic aspects (Verhoeven & Carlisle, 2006). Enhancing their general knowledge of rule-based, regular inflections (-ing, -ed,) and derivational affixes (-ion, -ly, en-) promotes fluency in word recognition and increases learners size-depth relationship.

Linking a words form to its meaning demands effort and acquired knowledge. For example, phonological and conceptual features can influence how learners associate forms with their meanings. This was evident in the VKS test, where all participants associated *vain* with the incorrect concept. In determining meaning, Pajoohesh, (2014) argues the necessity of learners distinguishing between various concepts and referents by classifying the words and cognitively structuring networks with association. Acquiring knowledge of homophones and affixes can enhance learners´ word recognition in reading. If the participants had gained prior knowledge of homophone

vain, the results from the X-Lex and VKS would have illustrated a more balanced and parallel decrease in the students´ receptive and productive vocabulary.

In evaluating all three tests together, it is clear that having low proficiency in word knowledge and coverage can effectively influence the learners´ comprehension of texts. The results from the three tests present an equal disperse of the participants´ vocabulary size, depth, and comprehension. That is to say, participants scoring high on the X-Lex also scored high on the VKS and consistently on the comprehension test. Kendeou et al. (2007) have determined that readers need to acquire a family of skills to recognize forms, infer meaning, interconnect information in texts and form a conclusion. The participant scoring an average of 55% on the comprehension test demonstrates how the gap in their word knowledge proficiency increases the risk of misinterpretation or comprehension of an authentic text. As collocations added to the complexity of the comprehension text, Nation´s (2001) and Brown´s (2014) claim that the classroom needs to direct more attention to grammatical functions and word association is a notable recommendation in enhancing learners´ reading comprehension.

In applying the VKS in this study, it became apparent that the test is not without certain limitations. In some instances, participants demonstrated uncertainty and their sentences often ambiguous. Therefore, it is essential that participants translate or produce synonyms in question four whenever they are able to link a meaning to a form. Particularly, if they can produce a sentence with the target word in question five. This would eliminate uncertainty in future studies.

Given these findings, the pilot study illustrates that although the participants consider themselves to hold an adequate vocabulary size, it is essential for them to connect their breadth of knowledge with the complex components of depth to comprehend authentic native written texts. As the participants´ proficiency varied considerably, the results revealed how individual word knowledge components affected their outcomes. Although the participants overestimated their vocabulary size in the X-Lex, the results from the VKS illustrated their depth of the words to a certain extent. Considering this, the size-depth relationship of linking together the three aspects of form with the six aspects of meaning and use, requires extensive proficiency and high acquisition of skills. Therefore, in acquiring sufficient reading comprehension, it is

essential for learners to have sufficient knowledge of the two major contributors of vocabulary knowledge: vocabulary breadth and the multi-dimensional components of depth.

6   Conclusion

To determine the relationship between Icelandic learners´ vocabulary size and depth, I conducted a pilot study with four Icelandic tenth graders. In view of the literature review in this paper and findings of the pilot study, it is clear that learners´ breadth and depth of vocabulary knowledge are major contributors in their reading comprehension. In all, the findings suggest that multi-dimensional size-depth relationship ultimately determines learners overall coverage and ability to understand texts.

In light of the findings, enhancing learners´ vocabulary by explicitly focusing on the most frequent words as Zipf´s law (1949) suggests, gives learners a certain advantage in recognizing words quickly and gradually enhances their vocabulary knowledge. The overall simplicity of high frequency words facilitates their acquisition and efficiency. Focusing on the first 2,000 most effective and useful words in the classroom provides learners with 80% coverage. As demonstrated in Milton´s (2009) illustration of the Gettysburg Address, a strong interrelationship exists between coverage and comprehension on one hand, and frequency and coverage on the other. For a L2 language learner to comprehend texts Milton (2009) suggests knowledge of 6,000 words and coverage of 95%, while Nation (2001) claims learners´ ideal vocabulary coverage rate needs to be 98% or a vocabulary size of 8,000-9,000 words for more fundamental comprehension.

Although various defining descriptive frameworks exist, breadth and depth of vocabulary knowledge is a distinctive method to evaluate the quality of learners´ receptive and productive vocabulary knowledge. The findings in the X-Lex suggest that some learners had a high receptive vocabulary. Their overestimation may be attributed to the complex facets of word knowledge that influence their ability to link form to meaning, which led to lower production in the VKS. Therefore, an important aspect of L2 language learning is promoting learners´ knowledge of the multi-complex components of word knowledge. Nation´s (2001) nine aspects of word knowledge, illustrates the multi-dimensional facets from the perspective of second language learning. By helping Icelandic learners to understand the complex relationship of

contributing components in their language acquisition can assist them in establishing more coverage and fluency in English reading comprehension.

Increasing learners´ form-meaning link is a beneficial aspect in developing learners´ lexical competence. Exposing learners frequently with previously learned words and deepening their vocabulary knowledge with explicit teaching of Nation´s nine aspects, e.g. word parts, association and collocations, can strengthen their form-meaning link, reduce learning burdens, and increase learners´ production and use of acquired vocabulary knowledge. Measuring Icelandic learners´ proficiency can provide vital information on gaps and problematic levels in their vocabulary knowledge. The outcomes can identify deficiencies, which need to be addressed explicitly in the classroom to strengthen learners´ depth of vocabulary knowledge. In turn, learners gain the necessary networks of association needed for comprehension and reduce their reliance on phonological and orthographical recognition alone.

However, for reading comprehension to occur, learners require a family of skills as Kendeo et al. (2007) argue. Under normal circumstances, learners would use both text models and situational models to infer meaning of a text, depending on the readings purpose and learners´ coverage. The results from the comprehension test suggest that Icelandic learners with low proficiency in vocabulary knowledge and little background knowledge can have a skewed understanding of authentic native texts if they only interpret meaning from texts models alone. Therefore, when the purpose of a reading is to increase learners´ language knowledge, it is necessary to avoid causing discouragement by imposing difficult texts on them, and instead give learners more opportunities to experience the target language gradually in its normal environment of context and use.

The pilot study presented in this paper suggests that various gaps exist in Icelandic learners´ word knowledge, which affected their results in the three tests. Nevertheless, only four Icelandic tenth graders participated in the pilot study and, therefore, no general assumption can be determined from the results. Further research is needed to evaluate Icelandic learners´ actual vocabulary knowledge and size-depth relationship.

Considering the above literature, it is essential to measure the intertwining multi-dimensional facets of word knowledge and reading comprehension to help learners acquire deeper vocabulary knowledge. Although learners´ receptive vocabulary is high, gaps in their proficiency increased the burden of linking form to meaning, e.g. semantically associating correct meanings to homophones or understanding morphologically complex words. In all, the study suggests that learners with low proficiency in vocabulary knowledge receive equally low results on their comprehension test. Indicating how linguistic gaps in vocabulary knowledge can influence learners´ coverage of texts, therefore, affecting their interpretation and overall comprehension. In view of this, it is essential to identify learners´ gaps in proficiency with various measuring tools and address them appropriately. More importantly, for learners´ language acquisition to be successful, they need to understand the purpose and be motivated to strive for higher levels of reading comprehension.

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Appendix I

Reykjavík, 16. mars 2015

Ágæta foreldri/forráðamaður.

Ég undirrituð, nemandi við Háskóla Íslands, er að ljúka BA ritgerð í enskum málvísindum. Hluti af ritgerðinni minni er að skoða samspil orðaforða og lesskilnings með það að markmiði að greina þá þætti sem auka lesskilning barna í ensku.

Ég óska eftir 4 nemendum til að taka þátt í forkönnun sem tekur um 45-55 mínútur. Um er að ræða tvíþætt orðaforðapróf sem mælir bæði breidd og dýpt orðaforða nemenda í 10. bekk. Að lokum er stutt lesskilningspróf í anda samræmdra prófa lagt fyrir nemendur.

Nöfn þátttakenda og aðrar persónuupplýsingar koma hvergi fram við úrvinnslu úr neinum af þeim gögnum sem safnað verður.

Með þessu bréfi er óskað eftir samþykki foreldra/forráðamanna fyrir þátttöku barna þeirra í könnununni. Ég bið því vinsamlegast um leyfi fyrir að barnið þitt taki þátt í rannsókninni. Ef þú ert samþykk/ur þátttöku þarftu ekkert frekar að gera. Ef þú vilt **ekki** að barn þitt taki þátt, vinsamlega ritaðu þá nafn þitt hér fyrir neðan og skilaðu bréfinu til kennara fyrir 18. mars 2015.

Nánari upplýsingar um verkefnið veitir undirrituð.

Súsanna Björg Vilhjálmsdóttir
BA nemi í ensku

_____

Ég vil **ekki** að barn mitt taki þátt í rannsókninni.

Skóli: _____

Nafn barns: _____

Undirskrift foreldris/forráðamanns: _____

Appendix II

X-Lex Vocabulary Test

Please look at these words. Some of these words are real English words and some are invented but are made to look like real words.
Please tick the words that you know or can use. Here is an example.

   X dog

Thank you for your help.

system		manly		reference		upset		liner		postherent	
govern		trudgeon		inertible		eckett		castle		instant	
had		relation		steam		thick		callisthemia		faint	
mosquito		just		wife		bring		cap		flag	
warboy		opponent		previous		vain		display		fog	
interval		pat		worry		varney		recommend		gorman	
which		rabbit		gallimore		wedge		artificial		low	
proceed		turn		enclose		odd		boy		pan	
overcome		perform		manager		wet		nurse		dip	
cordonise		stillhard		screen		meet		envelope		sake	
position		word		surman		network		audience		wrong	
little		plenty		miserable		educate		cord		goat	
industry		sneeze		take		normal		troake		murrow	
border		style		climb		simplicity		troublesome		excite	
frequent		astell		squeeze		collar		frank		sum	
knowledge		steady		serve		person		girl		forwards	
rot		wire		combine		leadership		qualify		property	
skemp		open		enigmatic		widgery		moffant		interest	
grass		overlook		main		you		sleeve		wagget	
dozen		drag		chicorate		dial		prepare		native	

Appendix III

Self-report

Below is a list of words. Rate how well you know these words on a scale of 1-5 by marking an x in the correct box. If you know the word, mark the correct box and write the meaning or try and use the word in a sentence.

		X	Write the meaning in the box
Main			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

Girl			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

Frequent			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

Collar			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Relation			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Property			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Manager			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Qualify			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Opponent			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		
Network			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		
Word			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		
Wrong			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Plenty			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Nurse			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Drag			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Vain			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

		X	Write the meaning in the box
Dozen			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		
Sum			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		
Rot			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		
Dial			
1	I don´t remember having seen this word before		
2	I have seen this word before, but I don´t know what it means		
3	I have seen this word before. It means		
4	I know this word. It means		
5	I can use this word in a sentence.		
	Sentence:		

Appendix IV

A Visit with the Folks
by Russell Baker

Periodically, I go back to a churchyard cemetery on the side of an Appalachian hill in northern Virginia to call on family elders. It slows the juices down something marvelous. They are all situated right behind an imposing brick church with a tall square brick bell-tower best described as honest but not fancy. Some of the family elders did construction repair work on that church and some of them, the real old timers, may even have helped build it, but I couldn't swear to that because it's been there a long, long time. The view, especially in early summer, is so pleasing that it's a pity they can't enjoy it. Wild roses blooming on the stone fences, fields white with daisies, that soft lively air turning the mountains pale blue out toward the West.

The tombstones are not much to look at. Tombstones never are in my book, but they do help in keeping track of the family and, unlike a family, they have the virtue of never upsetting at you. This is not to say they don't talk after a fashion. Every time I pass Uncle Lewis's I can hear it say, "Come around to the barber shop, boy, and I'll cut that hair." Uncle Lewis was a barber. He left up here for a while and went to the city. Baltimore. But he came back after the end. Almost all of them came back finally, those that left, but most stayed right here all along. Well, not right here in the churchyard, but out there over the fields, two, three, four miles away.

Grandmother was born just over that rolling field out there near the woods the year the Civil War ended, lived most of her life about three miles out the other way there near the mountain, and has been right here near this old shade tree for the past 50 years. We weren't people who went very far. Uncle Harry, her second child, is right beside her. A carpenter. He lived 87 years in these parts without ever complaining about not seeing Paris. To get Uncle Harry to say anything, you have to ask for directions. "Which way is the schoolhouse?" I ask, though not aloud of course. "Up the road that way a right good piece," he replies, still the master of indefinite navigation whom I remember from my boyhood. It's good to call on Uncle Lewis, grandmother and Uncle Harry like this. It improves your perspective to commune with people who are not alarmed about the condition of NATO. The elders take the long view. Of course, you don't want to indulge too extensively in that long a view, but it's useful to absorb it in short doses. It corrects the blood pressure and puts things in a more sensible light.

1. What are "old timers"?

   _____

2. Who did construction repair on the church

   A the narrator

   B uncle Harry

   C the old timers

   D the family elders

3. When the narrator says, "It slows the juices down…" he means

   A the trip makes him tires and hungry

   B the visit makes him feel depressed

   C the trip gives him something to do

   D the visit changes his pace of life

4. What does not upset you according to the narrator?

   A Churchyard

   B Tombstones

   C Churches

   D Schoolhouse

5. Why does the narrator find it easy to talk to his Uncle Harry, grandmother and Uncle Lewis?

   _____

   _____