T.C.

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EĞİTİM BİLİMLERİ ENSTİTÜSÜ

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YÜKSEK LİSANS TEZİ

TEXT-BASED VOCABULARY SIZE AND READING COMPREHENSION OF TURKISH EFL LEARNERS

Fatih GÜNGÖR

Denizli – 2013

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YÜKSEK LİSANS TEZİ ONAY FORMU

İngiliz Dili Eğitimi Anabilim Dalı, İngilizce Öğretmenliği Bilim Dalı öğrencisi Fatih GÜNGÖR tarafından Doç. Dr. Demet YAYLI yönetiminde hazırlanan "Text-based Vocabulary Size and Reading Comprehension of Turkish EFL Learners" başlıklı tez aşağıdaki jüri üyeleri tarafından 31/05/2013 tarihinde yapılan tez savunma sınavında başarılı bulunmuş ve Yüksek Lisans Tezi olarak kabul edilmiştir.

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Bu tezin tasarımı, hazırlanması, yürütülmesi, araştırılmalarının yapılması ve bulgularının analizlerinde bilimsel etiğe ve akademik kurallara özenle riayet edildiğini; bu çalışmanın doğrudan birincil olmayan bulguların, verilerin ve materyallerin bilimsel etiğe uygun olarak kaynak gösterildiğini ve alıntı yapılan çalışmalara atfedildiğini beyan ederim.

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ÖZET

İNGİLİZCEYİ YABANCI DİL OLARAK ÖĞRENEN ÖĞRENCİLERİN METİN İÇERİSİNDE BİLDİKLERİ KELİME SAYISI VE OKUDUKLARINI ANLAMA BECERİSİ

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Okuma akademik hayatları boyunca başarıyı arzulayan öğrenciler için öğrenilmesi gereken öncelikli bir beceridir ve kelime bilgisi anlamanın olmazsa olmazıdır. Bu alandaki çalışmaların yetersiz olduğu düşünerek bu çalışma yabancı dil öğrenenlerin metin içerisinde bildikleri kelime sayısı ve okuduklarını anlama ilişkisine odaklanmıştır. Bu ilişki değişkenler arasında açıklayıcı ve yordayıcı korelasyon doğrultusunda araştırılmıştır. Bu çalışmada 178 üniversite öğrencisi iki farklı açıklayıcı metin içerisinde yer alan kelimelere dayalı bir adet kelime kontrol listesi ve her bir metin için iki okuduğunu anlama testi tamamladılar. Sonuçlar metin içerisinde bilinen kelime sayısı ile okuduğunu anlama arasında orta seviyede bir ilişki olduğu ve bu iki değişken arasında nispeten doğrusal bir ilişki var olduğunu ortaya koydu. Okuduğunu anlamanın hızlı bir şekilde arttığı ya da azaldığı bir eşik noktası bulunamadı. Basit regresyon analizinin sonuçlarına göre, yabancı dil öğrenenlerin akademik metinleri anlamak için metin içerisindeki kelimelerin 98%'ini bilmesi gerekmektedir.

Bu çalışma ayrıca yabancı dil öğretimiyle görevli öğretmenlerin öğrencilerinin kelime bilgisi ihtiyaçları ile ilgili bilgi sahibi olmasının gerekliliğini vurgulamaktadır. Bu sayede öğretmenler öğrencilerin bilmeleri gereken kelime sayısı konusunda rahatlıkla yönlendirebilirler.

Anahtar Kelimeler: kelime sayısı, okuduğunu anlama, İngilizceyi yabancı dil olarak öğrenenler

ABSTRACT

TEXT-BASED VOCABULARY SIZE AND READING COMPREHENSION OF TURKISH EFL LEARNERS

Güngör, Fatih
MA Thesis in English Language Teaching
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Reading is an indispensable skill for the learners who desire success throughout their academic life, and vocabulary knowledge is a sine qua non companion of comprehension. Considering the dearth of studies, this study focused on the relationship between text-based vocabulary size and reading comprehension of foreign language learners. The relationship was investigated based on both explanatory and predictive correlations between variables. In this study, 178 university students completed a vocabulary checklist based on the vocabulary items of two different expository texts, and then two reading comprehension tests for each text. The results revealed that the text-based vocabulary knowledge moderately correlated with reading comprehension, and there was a relatively linear relationship between them. A threshold level could not be found in terms of vocabulary coverage for a better comprehension. According to the results of the simple regression analysis, the 98% vocabulary coverage is needed for foreign language learners to comprehend academic texts.

This study also emphasizes that instructors and lecturers should be knowledgeable about the lexical needs of EFL learner. Hence, they can easily guide their students in terms of the vocabulary size which university students need to have.

Keywords: vocabulary size, reading comprehension, EFL learners

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CHAPTER 1
INTRODUCTION

This chapter provides information about the background to the study with a brief description of literacy, reading, reading comprehension and vocabulary knowledge. The purpose and significance of the study will also be presented.

1.1. Background to the Study

Traditionally, literacy used to be defined as the ability to read and write. Over the past 80 years or so, the definition of literacy has changed as a result of explorations in linguistics, psycholinguistics, cognitive psychology, and sociolinguistics (Pearson & Stephens, 1994), and the contemporary literacy refers to "a social phenomenon that exists within a context and the ability to use one's reading and writing skills to participate efficiently and effectively in today's complex society" (Law & Eckes, 2000, p. 87). The conspicuous growth of interest in literacy yielded four discrete understandings: (I) literacy as an autonomous set of skills, (II) literacy as applied, practiced and situated, (III) literacy as a learning process, and (IV) literacy as text (UNESCO, 2005).

Considering the aforementioned skills such as reading, writing and oral skills, reading is delineated as "the process of receiving and interpreting information encoded in language form via the medium of print" (Urquhart & Weir, 1998: 22), and something many of people take for granted (Grabe, 2008).

According to Grabe's definition (2008), and 2008 and 2009 statistics of UNESCO, 83% and 90.8% of adults (15 years and older) take reading for granted in the world and Turkey respectively. However, 796 million adults worldwide are not able to read and write (UNESCO, 2010). Grabe (2009a) endorses that reading ability does not guarantee success for learners, but it is tenable that success is difficult to come by without being a skilled reader. In this sense, there is no doubt that reading is an indispensable skill for language learning (Grabe, 1991; Ritter, 2009; Stoller, 1994), and academic achievement is closely related to reading performance (Adamson, 1993; Collier, 1989).

As stated by Linan-Thompson and Vaughn (2007), and Grabe and Stoller (2002), reading comprehension is the main purpose for reading, and this purpose underlies and supports most of the other purposes for reading. However, since reading is a receptive skill, reading comprehension is an invisible concept that can only be inferred (Bernhardt, 2011). Moreover, reading comprehension presents some challenges for learners as many students consider reading a boring and difficult task. English as foreign language (EFL) learners feel the burden of reading twice as much as their counterparts do. According to the reports of the Organization for Economic Co-operation and Development (OECD, 2010), the overall reading scores of Turkey is statistically significantly below the OECD average in 2009. Furthermore, OECD research (2010) indicates that reading literacy skills are more reliable predictors of economic and social well-being than number of years spent in school or in post-formal education. Therefore, these results can be interpreted that reading literacy should be addressed in Turkey.

When the interaction and complexity of reading are considered with its purposes and properties, it becomes clear that reading is so complex. According to Rumelhart (1977) and Stanovich (1980), in today's evidence-based reading models, bottom-up processes such as word recognition and lexical access go hand in hand with top-down processes such as integrating background knowledge and processing strategies. Readers need automaticity in both word recognition and lexical access (Walter, 2003). From a lexical perspective, N. Anderson (2009) and DeKeyser (2007) summarize this long learning process as a path from understanding a word's meaning to learning a major meaning of a word, and then learning many aspects of a word's meaning and use. Therefore, the faster a reader recognizes a word, which is linked to learners' vocabulary knowledge, the better reading comprehension will take place. Thorndike (1973) also states that the breadth of a person's vocabulary has been recognized as a good predictor of reading comprehension. In this sense, estimating vocabulary size has been perennial concern of educational research to be able to measure reading comprehension.

It seems that the increasing interest in reading comprehension and vocabulary size has heightened the need for more studies to predict the relationship among text-based vocabulary size and reading comprehension for second language (ESL) and EFL learners around the world. To meet the needs of learners and teachers, the relationship between text-based vocabulary size and reading comprehension should be studied, and some conclusions should be drawn to develop fluent academic reading abilities.

1.2. Purpose of the Study

This study aims to investigate the relationship between text-based vocabulary size and reading comprehension of Turkish EFL learners. This issue has been studied in some other countries and in different ways. However, it is of importance to scrutinize it within Turkish context as well. Finally, this study will give an insight about what percent of vocabulary knowledge facilitates reading comprehension to a great extent. The results of this study will also shed a light on reading comprehension instruction at universities to effectuate higher comprehension level for EFL learners.

1.3. Research Questions

The research questions to which this study attempts to find answers are as follows:

1. Is there any threshold level in terms of text-based vocabulary size between adequate and inadequate comprehension of an academic text?
2. Will different percents of text-based vocabulary result in differences in reading comprehension? In particular, will comprehension increase as the number of text-based vocabulary size increases?

Hypotheses formulated in this study are as follows:

1. There is a threshold level in terms of text-based vocabulary size between adequate and inadequate comprehension of an academic text.
2. As the number of text-based vocabulary size increases, reading comprehension will increase.

1.4.   Significance of the Study

According to the reports of Turkish Statistical Institute (TSI, 2013), Turkey has a population of 75 million, and the population is expected to be 84 million by 2023. Ministry of National Education (MONE, 2012) reports that there are about 17 million students in our country and 3.5 million students study at higher education institutions. However, students cannot meet the expectations about their vocabulary and reading comprehension level as can be understood from the results of the reading tests in TOEFL (see Test and Data Summary for TOEFL iBT Tests and TOEFL PBT Tests between January 2011 and December 2011 from http://www.ets.org/s/toefl/pdf/94227_unlweb.pdf) and IELTS (see test takers performance in 2011 from http://www.ielts.org/researchers/analysis_of_test_data/test_taker_performance_2011.aspx) since the scores are significantly under the average.

In this sense, it can be understood that vocabulary as a partner of reading comprehension has been slightly neglected (Perfetti, Landi, & Oakhill, 2005). Therefore, an ordinary question of EFL learners would be: How many words should I know to understand and speak English? English teachers eschew this question as there does not seem to be a consensus about the amount of vocabulary needed by a second language (L2) learner in order to be able to read with reasonable comprehension. Since the importance of lexis in the reading process is not clearly defined in Turkey, teachers suggest that guessing is essential and happens naturally in reading. However, there are some discrepancies for the usefulness of context in helping readers to guess new words (Bensoussan & Laufer, 1984). Furthermore, it could not be found such a study which analyzes the necessary vocabulary knowledge to comprehend an expository text for Turkish EFL learners. To meet the strategic educational objectives in English, it becomes necessary to provide a clear guideline about the optimal percentage of known words in a text. By providing such a guideline, some major alterations can be suggested about curriculum to consider in the educational system, and, as a consequence, young citizens of Turkey can be prepared better for the academic world.

1.5.   Limitations for the Study

It is certain that there are a great number of variables affecting the nature of reading comprehension. The readers will be more advantageous to read texts if (I) they are familiar with, (II) they have a background knowledge or knowledge of how the world works, and (III) they conventionally share a similar or same culture (Alderson, 2000). Alderson (2000) also emphasizes the reasons of the respondents to read as one of the main problems in assessing reading comprehension. In this study, the purposes of the respondents are not their own, but the researcher's. In this sense, the process and product will be different as the respondents do not read the texts and answer the questions for self-generated reasons. Regarding this fact, the results of the study might not reveal the exact comprehension level of the students. However, to overcome this issue, the respondents were informed about the details of the study, and ascertained to receive the results of the test battery through e-mail if they share their e-mail addresses.

The second limitation is the measurement of the text-based vocabulary knowledge with a checklist. Students might tick off the words they do not know. To avoid this limitation, a vocabulary test could be given to the students in order to measure the exact receptive vocabulary knowledge. However, it would take approximately 1 or 2 hours to measure 180 words, and it would not be possible to assess all the words due to the time limitation. The word list cannot be shortened as it is contrary to the aim of the study. To beat this challenge, some plausible non-words are embedded into the checklist (Schmitt, 2011).

Even if some precautions are taken to provide optimal results, there is no one exact way of testing reading comprehension and vocabulary knowledge of students. Considering these limitations, the study aims to obtain the best results as much as possible.

CHAPTER 2
REVIEW OF LITERATURE

This chapter provides an overview of conceptual, theoretical and pedagogical foundations of reading and reading comprehension. It begins by offering a definition and clarification of what reading and reading comprehension mean. The subsequent sections scrutinize the current reading theories, reading strategies, and attitudes toward reading. Following these sections, the empirical research related to the reading skill, reading comprehension, and vocabulary knowledge is reviewed and connections are made with the current study.

2.1.　Reading and Reading Comprehension

It is an indisputable fact that English is a global language, and there is a high demand for reading in a second language for educational and academic objectives. Grabe (2009a) gives an explanation for this demand:

> It is evident that citizens of modern societies will benefit from being skilled L1 readers now and in the future. But it is also fair to say that, for millions of people, L2 reading skills represent a significant concern as these people negotiate careers and seek advancement in modern economies. A person's future opportunities for success and prosperity will be even more entwined with skilled reading abilities. It is therefore an important societal responsibility to offer every person the opportunity to become a skilled reader, and in many cases, this means becoming a skilled L2 reader. (p. 6)

Therefore, a question comes to the mind: What is reading? Some researchers define reading as an interpretation of the information (Smith, 2004; Urquhart & Weir, 1998), and understanding the meaning of the printed words or written symbols (Patel & Jain, 2008). Basically, these definitions look simple and meaningful; however, it is difficult to make an accurate definition of reading. Daneman (1991) touches upon this complexity as follows:

Reading is a complex cognitive skill, consisting of the coordinated execution of collection of oculomotor, perceptual, and comprehension processes. These include processes that direct the eye from location to location, word level processes that encode the visual pattern of a word and access its meaning from memory, and text-level processes that compute the semantic, syntactic, and referential relationships among successive words, phrases, and sentences in a text. (p. 513)

Grabe (2009a, 2009b) also thinks that one process or definition is not enough to define reading, and gives 10 processes required for fluent reading in Table 1. To delve into these processes, it should be clarified that fluent reading is absolutely a rapid and efficient process when it is considered that a reader reads most materials with a pacing of 250-300 word per minute. Then, the reader attempts to understand the meaning in writing. In this process, the reader integrates interactive model by building up an interaction between himself/herself and the text. To understand these better, some reading strategies were made use of, and interests and purposes are observed to play an important role in this flexible process. Also, as a result of reading and comprehension, the reader evaluates the text with his/her background knowledge. Meanwhile, reading is a learning process itself, and the component which makes this process a learning process is the evaluation of the reader. The last process is a linguistic one, and it is certain that reading is not possible without making graphemic-phonemic connections, without recognizing the words and structural phrases, and without having a certain linguistic knowledge of the language in the text.

Table 1. Processes that define reading

1.	A rapid process
2.	An efficient process
3.	A comprehending process
4.	An interactive process
5.	A strategic process
6.	A flexible process
7.	A purposeful process
8.	An evaluative process
9.	A learning process
10.	A linguistic process

Source: Grabe, 2009a, p. 14.

Patel and Jain (2008) also give a number of definitions of reading in their book:

- Reading is an active process which consists of recognition and comprehension skill.
- Reading is an important activity in life with which one can update his/her knowledge.
- Reading skill is an important tool for academic success.
- Reading is most useful and important skill for people.
- Reading is a source of joys.
- Reading is the most important activity in any language class.
- Reading is not only a source of information and a pleasurable activity but also as a means of consolidating and extending one's knowledge of the language.
- Reading is very necessary to widen the mind and gain and understanding of the foreign culture.
- Reading is certainly an important activity for expanding knowledge of a language. (p. 113-115)

Even though reading has many definitions, the goal of reading is to understand (Barr, Kamil, Mosenthal, & Pearson 1991; Bowey, 2005; Grabe, 2009a; Klingner, 2007). In other words, reading comprehension is the "sine qua non of reading" (Beck & McKeown, 1998, p. 40). Therefore, reading and reading comprehension can be used interchangeably since the aim is comprehension in the reading process.

RAND Reading Study Group (2002) defines reading comprehension as reader's understanding of the message expressed by the writer, and elaborates their definition as follows:

We define reading comprehension as the process of simultaneously extracting and constructing meaning through interaction and involvement with written language. We use the words extracting and constructing to emphasize both the importance and the insufficiency of the text as a determinant of reading comprehension. Comprehension entails three elements:
• The reader who is doing the comprehending
• The text that is to be comprehended
• The activity in which comprehension is a part (p. 11)

On the other hand, comprehension is not always effortless and fast (Graesser, 2007) since it is complex and multifaceted (Nation, 2005). There are many factors influencing reading comprehension, and, basically, these factors can be classified in two categories: individual and contextual (Lesaux, Geva, Koda,

Siegel, & Shanahan, 2008). Individual factors include readiness skills, word-level skills, background knowledge and motivation, and contextual factors include socioeconomic status and text attributes. Therefore, reading comprehension requires integrating background knowledge, personal experience and vocabulary with reading strategies (Willis, 2008). To be successful at reading comprehension, readers should activate their schemata, and be equipped with reading skills, fluency, and necessary vocabulary. Furthermore, readers should be engaged in reading, and create a purpose for the reading.

To sum up, even if cognitive side can be regarded as more important for understanding reading in a second language (Daneman, 1991), only the integration of cognitive and social perspectives can push the field forward (RAND Reading Study Group, 2002). In the following sections, the current reading theories, reading strategies, and attitudes toward reading are scrutinized to shed a light into both cognitive and social dimensions of the reading process.

2.2. Current Reading Theories

It is certain that one of the most important components of reviewing the literature is to decide on which theories can be used to investigate the research questions in a scholarly work since a theory answers the questions of how and why the variables are related as a bridge between or among the variables (Creswell, 2009). In this sense, the theories about reading will be used to provide an explanation about the variables in this study. The theories in this section seem to relate to first language (L1) reading acquisition. However, many researchers (Ellis, 2008; Krashen, 1981) suggest that L2 acquisition is similar to L1 acquisition. In this sense, the current theories to be reflected in the coming sections are grounded on Tracey and Morrow's (2006) classification in terms of L1 and L2 reading acquisition: the constructivist approach, social learning perspectives, and information/cognitive processing perspectives.

2.2.1. Constructivism (1920s - present)

Constructivism is known as an epistemology, or a theory, which explains how people know what they know (Lamon, 2002). In other words, constructivism emphasizes how knowledge is constructed actively by individuals. According to constructivist viewpoint, learning emerges when learners are actively engaged in the learning process (Tracey & Morrow, 2006), and understand the consequences of the learning process through reflection (Lamon, 2002). Tracey and Morrow (2006) also mention about the three other major components: (I) learning can often take place without any external and noticeable indicator, (II) learning often results from a hypothesis-testing experience by the individual, and (III) learning results from a process known as inferencing.

The theoretical background of the constructivism can be discussed in a more detailed way. However, it is of importance to move from the theoretical background to teaching, and to understand how it affects reading. Considering the aforementioned three components of learning progress of Tracey and Morrow (2006), the student might not know the meaning of a word during the reading process. According to the constructivist view, the student tries to make a hypothesis-testing with a prediction on the word, and she/he keeps reading to find out if her/his hypothesis is correct. An important component is inferencing since it is crucial in the process of constructing the meanings (Williams, 2010). The learners make some inferences spontaneously and automatically while reading.

In the following subsections, the schema theory, transactional/reader response theory, psycholinguistic theory and whole language theory, metacognition, and engagement theory are scrutinized to have a better understanding of constructivism.

2.2.1.1. Schema theory

As Kant (1963) suggests, new information, concepts and ideas embrace a meaning when they can be related to something the individual already knows. This suggestion revives with the schema theory which emphasizes the role of background knowledge in language comprehension (Rumelhart, 1980). According to schema theory, a text just shows directions for readers about how they should construct meaning from their own, previously acquired knowledge, and comprehending a text is an interactive process with this previously acquired knowledge and the text (Carrell & Eisterhold, 1983). In the schema theory, comprehension does not only include linguistic knowledge but also knowledge of the world (Anderson, Ralph, Diane, & Ernest, 1977). Rumelhart and Norman (2004) summarize three changes in knowledge structures: accretation, tuning and restructuring, and these three changes account for how schema theory works. In accretation, individuals learn a new thing, and do not change something in their schemata. If an existing schema is modified to understand new information, this is called as tuning. When the schema is not sufficient to understand new concepts, a new schema is created by restructuring.

In practice, schemata take different names such as background knowledge, prior knowledge and existence knowledge. In 1970s, research related to schema theory helped the specialists understand how knowledge is organized, and it also enabled researches to have an idea about the cognitive routines that children use during the reading process (McVee, Dunsmore, & Gavelek, 2005). It is known that readers have schemata for content such as people and places. In addition to content schemata, Anderson and Pearson (1984) comes out with a new idea that readers have schemas for reading processes and different types of text structures. In other words, schemata have a clear effect on comprehension since decoding, skimming, inferencing and summarizing as reading processes have a significant effect on comprehension. As an example for the schemata about different text types, the individuals who have schemata related to expository texts can be more successful based on this theory.

Nowadays, schema theory is still being applied in reading classes. Teachers might not use the word schema; however, background knowledge regarding a text is given to activate students' minds.

2.2.1.2. Transactional/ Reader response theory

The transactional theory is also known as reader response theory. Rosenblatt (1978) tried to explore the nature of reading process based on the concept of transaction which is the important idea of the dynamic interfusion of reader and text. According to this view, there is not a certain type reader, and the factors such as gender, ethnic and socioeconomic background are significant factors in the transaction. Carson also explains that text does not have a meaning without a reader's experience (as cited in Hirvela, 1996, p. 129).

As a constructivist theory, reader response theory emphasizes the reader's role in constructing the meaning of a text (Atkinson, 2012). When the reader focused on what information he or she can remember after the reading process, this is called an efferent transaction, and aesthetic transaction takes place when the reader's attention is focused on the experience of reading itself (Carlisle, 2000). Efferent and aesthetic transaction reflects in expository and narrative texts consequently. For instance, when texts are expository texts, students need to focus on efferent transaction. Aesthetic transaction is a matter of literary studies since it is related to the experience of students on reading. To conclude, transactional theory can be regarded as the application of schema theory into reading.

2.2.1.3. Psycholinguistic theory and whole language theory

In early 1970s, psycholinguistics was adopted as a common concern to understand how individuals learn and use language, and it is based on meaning and whole language approach (Smith, 2004). Goodman (1967) defines reading as a psycholinguistic guessing game which involves an interaction between thought and language. In this game, learners try to guess what the text means

by using cues, and seeing text from a different point of view is highly vital. In addition, the game requires three main components of reading: language, thought and experience. In the psycholinguistic guessing game, readers apply their knowledge about language and the world, and make predictions about what the text will explain about the world knowledge of readers (Tracey & Morrow, 2006). If readers' expectations and the text are consistent, then reading process becomes easier and more enjoyable for readers. Otherwise, it becomes harder and more painful.

Based on the psycholinguistics theory, whole language theory is suggested as a similar point of view, and it focuses more on the active involvement of learners than on the content (Goodman, 1989). Until readers construct their own meaning, a text does not have a meaning itself (Pearson, 1989). In other words, the interpretations of texts are not identical; however, readers perceive them in their own idiosyncratic ways. The whole language theory contributes to the language teaching in terms of authenticity and integration of curricula.

2.2.1.4. Metacognition

Metacognitive knowledge (metacognition) refers to "knowledge of the mental processes which are involved in different kinds of learning" (Richards & Schmidt, 2010, p. 370). According to Baker (2010), metacognition is concerned with both the ability of learners to reflect their own thinking and strategies, and the self-regulation of learners' cognitive efforts which includes planning actions, checking the outcomes, evaluating the progress, overcoming difficulties and testing and changing our strategies for learning. Thus, metacognition is a strong predictor of foreign language achievement, too (Pishghadam & Khajavy, 2013) since learners use metacognitive strategies to achieve their cognitive goals such as understanding a material.

2.2.1.5. Engagement theory

To foster reading comprehension, Guthrie (2004) evaluates what successful comprehenders do in the classroom, and names these successful comprehenders as engaged readers. Engagement can be also defined as the "act of reading to meet internal and external explanations" (Guthrie, Klauda, & Ho, 2013, p. 10). Based on the observations, Guthrie (2004) describes the four main qualities of engaged readers: cognitive competence, motivation, being knowledge-driven, and being socially interactive in learning. Engaged students use comprehension skills and cognitive strategies to understand texts. While reading a text, they are able to use cognitive strategies such as using background knowledge, forming questions to search for information, organizing and summarizing knowledge in text, and monitoring their comprehension as in the metacognition. The second quality of engaged readers is motivation, and it improves the prediction of text comprehension (Anmarkrud & Bråten, 2009). In other words, the more motivated a reader is, the more successful he or she is in terms of comprehending a text. The third attribution is being knowledge-driven which means that learners construct on their background knowledge, and expand their conceptual structures during the reading process. Fourth, engaged readers can socially discuss on a topic, and use this attribution as an advantage for understanding the text. To sum up, the learners who use these four main qualities in reading can be more successful than disengaged learners.

2.2.2. Social learning perspectives (1960s - present)

Social learning perspectives are distinguished with their emphasis on the central role of social influences and social interaction. Many theories have been grounded on the social learning perspectives; however, there are no clear cut distinctions between these theories. In the following subsections, Sociolinguistic Theory, Socio-cultural Theory, Social Constructivism, Social Learning Theory, and Critical Literacy Theory will be scrutinized briefly.

2.2.2.1. Sociolinguistic theory

Sociolinguistic theory is based on the question to which linguists, psychologists and educationalists have sought to find an answer: How can languages be taught (Verhoeven, 1998)? Basically, the oral language knowledge gives a chance to readers to understand the structure of language, and helps them figure out texts and read fluently (Tracey & Morrow, 2006). Therefore, the theory focuses on the relationship between oral language and reading development. In this vein, there is a strong relationship between linguistic abilities and reading progress.

As an application in language learning, students are encouraged in oral discussion before and after reading. Then, these oral discussions might be supplemented with teaching of some skills, writing activities, group works and authentic activities. In addition to these, graphic organizers which were used for testing in this study can be used in classroom settings.

In short, as mentioned in the beginning of this section, there are no clear cuts among social learning theories; however, the little difference is that sociolinguistic theory emphasizes the significance of language, and linguistic abilities are attempted to be taught through social interaction while sociocultural theory focuses on the cultural side of learning.

2.2.2.2. Sociocultural theory

Proposed by L. S. Vygotsky, sociocultural theory underlines the significance of sociocultural components in shaping learners' development and learning (Kozulin, 2002), and explains the mental activity of humans regarding how individuals acquire and use languages (Lantolf, 2011). In Vygotsky's theory related to the development of human mind, the interaction of the natural, individual and social forces leading to consciousness is studied, and the social interaction is thought to be the way how a child constructs and co-constructs meaning (Mahn, 1999).

In human consciousness, the internalization which is a bridge between nonmental and mental plays a vital role to form higher mental functions (Kozulin, 1990). Hence, the use of higher level cultural tools (i.e., language, literacy, and logic) is a bridge between the person and the environment, and these cultural tools function to mediate the relationship between the individual and the social-material world (Lantolf & Thorne, 2007). To mediate this relationship, Vygotsky views private speech as "a step on the continuum from public (social) speech to inner speech and eventually to verbal thinking" (as cited in Kozulin, Gindis, Ageyev, & Miller, 2003, p. 160). In this continuum, Zone of Proximal Development (ZPD) refers to a concrete dialogic relationship between expert and novice, and the goal of the relationship is to move novice toward greater self-regulation with the help of a new language (Lantolf & Thorne, 2007).

As a language learning dimension of sociocultural view, Ellis (2008) explains sociocultural second language acquisition (SLA) as follows:

> Sociocultural SLA does not distinguish between 'input' and 'output' but rather views language acquisition as an inherently social practice that takes place within interaction as learners are assisted to produce linguistic forms and functions that they are not unable to perform by themselves. Subsequently, 'internalization' takes place as learners subsequently move from assisted to independent control over a feature. (p. 206)

To conclude, The Sociocultural Theory investigates why people learn or do not learn a new language. The way how individuals learn a new language is shaped by individuals' motivation, goals and ZPD, and individuals and their social environment establish a dialectical unity (Lantolf, 2005).

2.2.2.3. Social constructivism

Like other social learning perspectives, social constructivism is based on the interaction of an individual with others. In social constructivism, learning is a key term for sense-making rather than for the acquisition of role knowledge, and this theory allows teachers to endorse a meaningful learning and intrinsic motivation (Oldfather, West, White, & Wilmarth, 1999). Hall (2011) explains the process in the theory as follows:

> Social constructivist perspectives contend that learners operate within their Zone of Proximal Development, performing at a higher level due to support from, and interaction with, their peers and 'more expert others' that *scaffolds* learning. Learners thus co-construct new knowledge through 'shared' activity; this is eventually appropriated by individuals (i.e., they make it 'their own'). Thus from a social constructivist perspective, learning is very much the consequence of, and is mediated by, collaborative social activity. (p. 112)

Furthermore, Oldfather, West, White, and Wilmarth (1999) point to the learning process of babies. Young children read aloud in the activities such as drawing a picture or playing with toys since they have difficulty to read silently. Only when babies or young children internalize speech, they do not feel the need to verbalize. In the internalization process, the influence of families is significant to help babies or children to understand the language.

To conclude, language is considered as the primary medium, and learners develop a complex understanding of the universe and their place in it (Oldfather, West, White, & Wilmarth, 1999). Through language, learners find a role for themselves in classrooms and communities.

2.2.2.4. Social learning theory (social cognitive theory)

Social learning theory was firstly developed by Albert Bandura (1986), and was called as social cognitive theory at later times. Briefly, the social learning theory accounts for human adaptation and change based on triadic reciprocal causation in which environmental, behavioral, cognitive, biological

and other personal factors play a significant role (Bandura, 1996). As understood, individuals contribute to their own development and psychosocial functioning through the influencing factors.

In social learning theory, Bandura's views are totally in line with social constructivist thought. However, Bandura is inspired by behaviorism, and combine features of behaviorism with those of social learning (Tracey & Morrow, 2006). In this vein, Bandura (1996) considers observation a basis for learning:

> Humans have evolved an advanced capacity for observational learning that enables them to expand their knowledge and skills rapidly on the basis of information conveyed by modeling influences. Indeed, virtually all behavioral, cognitive and affective learning resulting from direct experience can occur vicariously by observing people's behavior and its consequences for them. (p. 5514)

On the other hand, Bandura emphasizes that individuals are not only knowers and performers but also self-regulators of their learning. In this sense, individuals take an active role in their learning through self-regulating their affect, performance and motivation (Bandura, 1991). In addition to self-regulation, people's judgments of their capabilities which Bandura called self-efficacy play a central role to accomplish specific goals. Briefly, individuals are able to be successful by realizing their potential with the help of social environment which enriches competencies of individuals.

2.2.2.5. Critical literacy theory

Critical literacy theory considers literacy from a different angle: politics. Roberts (2000) explains the frameworks of Freire's critical literacy as follows:

- Freirean critical literacy implies not merely engagement with printed texts, but the development of a reflective, dialogical, praxical mode of social being, grounded in a narrative of hope, an ethic struggle, and a pedagogy of transformation. (p. 19)
- Word and world become dynamically intertwined in Freirean critical literacy. Critical reading involves a constant interplay between text and context. (p. 94)

- … critical literacy implies a conscious, practical, dialogical attempt to understand, challenge, and change oppressive social structures. (p. 94)
- For Freire, critical literacy can be seen as a mode of discursive practice: a way of being in (and with) the world. To read and write critically is to engage in a form of dialogical praxis. (p. 94)
- Critical literacy, as Freire understands it, is one element in the struggle for liberation from oppression. (p. 94)

To put it simply, Freire's critical literacy theory is based on the notion of "reading the word and the world".

2.2.3. Information/Cognitive processing perspectives (1989 - present)

The information processing theories seek to describe the cognitive structures and processes lying behind cognitive performance (Torbeyns, Arnaud, Lemaire, & Verschaffel, 2004). Woolfolk (1998) argues that "the cognitive view sees people as active learners who initiate experiences, seek out information to solve problems, and reorganize what they already know to achieve new insights" (p. 247). One of the cognitive theories, the information processing theory is defined as "the cognitive theory of learning that describes the processing, storage, and retrieval of knowledge from the mind" (Slavin, 1997, p.185). Many researchers (Carver, 1977; Holmes, 1953; Kintsch, 1994; LaBerge & Samuels, 1974; Rumelhart, 1977; Stanovich, 1980) study cognitive structures and theorize some models to understand how learning takes place. However, some current theories regarding information/cognitive processing perspectives which emerged in 1989 and later are delved into in this section.

2.2.3.1. Parallel distributed processing model

This model is a virtual model based on the computer that can read texts, and researchers attempt to understand cognitive processing of reading through the model. In this cognitive processing, connections between different information play a significant role to store information, and the model can be

regarded as a connectionist theory (Tracey & Morrow, 2006). McClelland et al (1987) explain their model as follows:

> … (In parallel distributed models,) information processing takes place through the interactions of a large number of simple processing elements called units, each sending excitatory and inhibitory signals to other units. In some cases, the units stand for possible hypotheses about such things as the letters in a particular display or the syntactic roles of the words in a particular sentence. In these cases, the activations stand roughly for the strengths associated with the different possible hypotheses, and the interconnections among the units stand for the constraints the system known to exist between the hypotheses. In other cases, the units stand for possible goals and actions, such as the goal of typing a particular letter, or the action of moving the left index finger, and the connections relate goals to subgoals, subgoals to actions, and actions to muscle movements. In still other cases, units stand not for particular hypotheses or goals, but for aspects of these things. Thus a hypothesis about the identity of a word, for example, is itself distributed in the activations of a large number of units.

For reading process, parallel distributed model includes four essential processors (Adams, 1990). According to Adams (1990), the reading process starts with orthographic processor which refers to perceiving letters and numbers, and it continues with meaning processor in which readers attach meaning to the letters and numbers identified in the orthographic processor. In the phonological processor, readers relate the sounds with the words. Lastly, readers construct and extrapolate the meanings of phrases, sentences, paragraphs, and full texts. In sum, a reader should perform well in these four processors to be able to comprehend a text.

2.2.3.2. Dual route cascaded model

Having some similar features with parallel distributed processing model, the dual route cascaded model is a different model in terms of its application. Even if dual route cascaded model encodes a text and reads it aloud, the model consists of three routes: the lexical semantic route, the lexical non-semantic route and the Grapheme-Phoneme Conversion (GPC) route (Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001). In the first route, familiar words are read by the system, and processed as a whole (Tracey & Morrow, 2006). Hence, the

correct meaning and pronunciation are provided by the computer, namely the reader. In the lexical non-semantic route, the process is similar to the parallel distributed processing model in terms of analyzing words and letters which are unfamiliar to the reader. In the GPC route, a letter is converted into a phoneme. Coltheart, Rastle, Perry, Langdon, and Ziegler (2001) summarize how the whole model operates as follows:

> On Cycle 1, the visual feature units are clamped with the features corresponding to the input letter string. This clamping means that on Cycle 2, activation from the feature level will reach the letter level. On Cycle 3, activation will reach the orthographic lexicon and will also be fed back to the letter level, and so on. This process of cascaded activation eventually leads to a build-up of activation in the phonemic layer, and of course to activation feeding back from the phoneme layer to the letter layer. At the same time, as parameters allow, the GPC system will be contributing activation to the phoneme layer. (p. 217)

The theories touched upon try to understand how reading emerges. However, it is too difficult to understand cognitive processes in human minds. In this sense, the field needs more models combining theory and practice to help individuals learn to read. In addition to the theories and models, the other components of reading should be regarded as highly significant to understand the reading process. Therefore, the reading strategies and the attitudes toward reading are scrutinized in the following parts.

2.3. Reading Strategies

In addition to background knowledge and rich vocabulary, strategies are a prerequisite for the reading process (Marzola, 2005). Ellis (2008, p. 703) defines learner strategies as "the approach learners adopt in learning an L2" while Oxford (1989, p. 235) considers learning strategies as "behaviours or actions which learners use to make language learning more successful, self-directed and enjoyable". Titled as behaviours, tactics, and techniques, learning strategies are strongly related to self-efficacy beliefs of the learners (Yang, 1999). Ellis (2008, p. 707) summarized two most commonly cited taxonomies of O'Malley and Chamot (1990) and Oxford (1990) in Table 2.

Table 2. Two taxonomies of learning strategies (Reprinted with permission)

O'Malley and Chamot (1990)	Oxford (1990)
A. Metacognitive strategies, e.g. 'selective attention' (deciding in advance to attend to specific aspects of language input)	**A.** Direct
	1. Memory strategies, e.g. 'grouping' (classifying or reclassifying materials into meaningful units)
B. Cognitive strategies, e.g. 'inferencing' (using available information to guess meanings of new items, predict outcomes, or fill in missing information)	**2.** Cognitive strategies, e.g. 'practising' (repeating, formally practising, recognizing and using formulas, recombining, and practising naturally)
C. Social/affective strategies, e.g. 'question for clarification' (asking a teacher or another native speaker for repetition, paraphrasing, explanation and/or examples)	**3.** Compensation strategies, e.g. 'switching to mother tongue'
	B. Indirect
	1. Metacognitive strategies, e.g. 'setting goals and objectives'
	2. Affective strategies, e.g. 'taking risks wisely'
	3. Social strategies, e.g. 'asking for clarification or verification'

In this chapter, on the other hand, the most common reading strategies classification (i.e., top-down strategy, bottom-up strategy and interactive strategy) is touched upon as to have a clear view regarding its effect on comprehension.

2.3.1. Top-down approach

The top-down strategy is also called as whole part approach. Gunning (2006) explains the top-down strategy as follows:

> ... students start at the top of the reading process and proceed downward to letters and sounds. Instruction is initiated by reading whole stories with teacher assistance. Through reading whole stories and by using their knowledge of language patterns, students learn individual printed words and letter-sound relationships. (p. 9)

In this sense, it is based on a holistic approach which readers play a psycholinguistic guessing game by using their background knowledge and language skills (Goodman, 1974).

2.3.2. Bottom-up approach

In the bottom-up approach, students are taught letters and sounds at first, and then they are expected to read words. Gunning (2006) accounts for bottom-up strategy as follows:

> ... students learn the nuts and bolts of reading and assemble them into a whole. Proceeding from the bottom of the process, they learn letter sounds and then blend them into whole words, which are then read in brief stories. (p. 8)

> Hudson (2007) clarifies the bottom-up approach with a similar viewpoint:
>
> ... the reader constructs meaning from letters, words, phrases, clauses and sentences by processing the text into phonemic units that represent lexical meaning, and then builds meaning in linear manner. (p. 33)

In this sense, the bottom-up strategy emphasizes on processing rather than the readers' use of background knowledge.

2.3.3. Interactive approach

Furthermore, the interactive approach refers to the interaction between the text and what a reader brings to the text through the use of top-down and bottom-up (Hartini, 2012; Rumelhart, 1977). In addition to the text, the significance of the reader emerged with the interactive approach since the reading process combines the textual information and the background knowledge of the reader. In other words, readers make use of reasoning skills in decoding a text based on their background knowledge. Therefore, some researchers such as Rumelhart (1977), Stanovich (1980) and Eskey (1988) proposed the interactive approach opposed to top-down and bottom-up processes.

Rumelhart (1985) defines reading as a simultaneous use of language knowledge, contextual and letter-sound hints. Stanovich (1980) also mentions drawbacks of using only top-down and bottom-up approaches, and suggest that top-down might be easy for readers who have knowledge of the text topic; however, the bottom-up process might be easy for readers who are good at word recognition. In this sense, he emphasizes the simultaneous flow of the information from different sources. However, Stanovich (1980) suggests that the strength in one area might compensate for the weakness in the other area or vice versa, and calls this as interactive compensatory approach. According to Eskey (1988), "[d]eveloping readers must therefore work at perfecting both their bottom-up recognition skills and their top-down interpretation strategies. Good reading – that is, fluent and accurate reading – can result only from a constant interaction between these processes" (p. 96).

Furthermore, Urquhart and Weir (1998) consider background knowledge or schemata a key factor in L2 reading. Schemata activation enables learners to make necessary connections between the text and the relevant background knowledge. It is agreed upon that activated knowledge facilitates the reading process (Carrell, 1988).

To conclude, the interactive approach brings to the field more than bottom-up and top-down approaches since it integrates both background knowledge and low-high processing skills with an effective use of strategies. In this way, a successful comprehension takes place as a result of interaction and collaboration between both types of processing (Bernhardt, 1991).

2.4. Attitudes toward Reading

The learners' attitudes towards reading are highly crucial but a complex construct, and it is particularly unfortunate not to understand its significance (Yamashita, 2004). According to Reeves's (2002) classification, there are three components of reading attitudes: cognitive, affective and conative. In the field, the most common models identifying reading attitudes in terms of these three

components are Mathewson's (1976) model of attitude influence and McKenna's (1995) model of reading attitude acquisition.

2.4.1. Mathewson's model of attitude influence

The first reading model of Mathewson aims to clarify the relationship between attitude and reading using some components such as attitude, motivation, attention and comprehension (1976) while the second model builds on the original model with acceptance variable (1985). In the acceptance process, readers compare the meaning with the previous components, and modify their attitude. In 1994, Mathewson makes up for the shortcomings of the model and widens its scope to provide a basis for further research.

Basically, cognitive, affective and conative components influence the intention to read, and the intention to read has a significant effect on reading behaviour itself (Hudson, 2007). Therefore, readers' goals might have an effect on their attitudes. For instance, in the case of a comprehension exam, students need to take high marks to pass the course at the university. In this context, the aim of the readers changes in favour of reading with a positive attitude. However, as a limitation of this study, if the students do not have any interest on a research study, their attitudes might be exactly opposite. Hence, the model underlines the significance of affective issues.

2.4.2. The McKenna model

The McKenna model (1994) is formed by synthesizing Mathewson's model and others. According to McKenna et al (1995):

> Specifically, the McKenna model … identified three principal factors influencing attitudinal change: (a) beliefs about the outcomes, (b) beliefs about the expectations of other in light of one's motivation to conform to those expectations, and (c) the outcomes of specific incidents of reading. (p. 938)

Therefore, the outcomes of reading play a vital role for the attitudes of readers towards reading. In other words, readers should be satisfied related to their purpose. However, the outcomes might vary depending on individuals and social environment, and Festinger (as cited in McKenna, Kear & Ellsworth, 1995) clarifies it as follows:

> An opinion, a belief, an attitude is "correct", "valid", and "proper" to the extent that it is anchored in a group of people with similar beliefs, opinions, and attitudes. (p. 939)

In addition to the outcomes, teaching techniques can have a positive effect on reading attitudes. McKenna, Kear and Ellsworth (1995) explain this effect as follows:

> The McKenna model predicts that these techniques might cause improved attitudes by virtually any of the three channels available: (a) a direct effect due to the positive nature of the experience afforded by the technique; (b) an indirect effect on the beliefs a student harbors about the outcomes of reading (for example, the technique might induce the student to believe that reading will be less frustrating); and (c) an indirect effect on a student's beliefs about how influential others view reading (a collaborative technique might afford one student the opportunity to hear another's positive comments about reading). (p. 953)

In this respect, the frustration of readers can be alleviated through different teaching techniques, and this means that teachers have a fundamental role to change reader attitudes positively.

2.5.   Relationship between Reading Comprehension and Vocabulary Size

The relationship between vocabulary size and reading comprehension is complex and reciprocal (Eskey, 2005; Hu & Nation, 2000; Nation, 2001; Nation & Angell, 2006) since this relationship is a two-sided one. While some studies focus on the effects of vocabulary size on reading comprehension, others study the effects of reading comprehension on vocabulary growth. It is well understood that the best way to learn new vocabulary items is to read, and knowing extensive vocabulary is a prerequisite to understand a text (Eskey, 2005). In this study, the vocabulary size is seen as the predictor of reading comprehension based on some studies (Hu & Nation, 2000; Schmitt, 2000;

Stahl, 2003), and the effects of text-based vocabulary size on reading comprehension are scrutinized within this context.

In L1 settings, it is possible to observe many findings about vocabulary as a predictor of early reading achievement (Bowey, 1995; Caravolas, Hulme, & Snowling, 2001; Stanovich, 1986, 2000; Thorndike, 1973; Wagner, Torgesen, & Rashotte, 1994). For instance, Thorndike (1973) studied the relationship between vocabulary and reading in 15 different countries and demonstrated a strong relationship with the correlation ranging from r=.66 and r=.75. Also, Stanovich (1986, 2000) delved into the relationship between L1 vocabulary size and reading, and reported strong correlations (ranging from r=.64 to r=.76) for the students studying at third through seven grades.

On the other hand, there are not many studies investigating the effects of vocabulary knowledge on reading comprehension in L2 settings. Furthermore, different researchers followed different ways to get optimum results, and only Schmitt, Jiang, and Grabe (2011) conducted studies with a direct approach in terms of text-based vocabulary size. What is meant with the direct approach is that the relationship between the exact number of the words known in a text and the number of the right answers in the reading comprehension test is analyzed; however, indirect studies investigate the relationship based on the vocabulary size level only. In this vein, existing literature was examined based on the similarity to the current study, and the first study is Schmitt, Jiang, and Grabe (2011) since Schmitt and their distinguished study provided the necessary inspiration to the current study.

In their study, Schmitt, Jiang, and Grabe (2011) investigated the relationship between the percentage of vocabulary known in a text and the level of comprehension of the same text. They used two different passages; one from a reading textbook and the other one from *the Economist* without any modifications. The readability levels of these two passages were similar to each other according to Flesch-Kincaid Grade Level. The study group was comprised of 661 participants including pre-university, intensive English program, freshman, sophomore, junior, senior and graduate students with L2 different

L1s. They gave 10 multiple-choice and 10 graphic organizer questions for each passage to measure the participants' comprehension level. In order to investigate the relationship between reading comprehension and vocabulary size, they needed to develop a vocabulary test, and, as a result of a detailed search for the best test to measure the text-based vocabulary size, they opted for an extended vocabulary checklist test. As they thought that participants might overestimate their vocabulary knowledge, they inserted some plausible nonwords as a guard to the problem. The study group was comprised of 661 students from different countries including Turkey.

The number of students who were from Turkey was 292, almost half of the total participants. As the first research question of their study, they investigated the correlation between the reading comprehension and text-based vocabulary size, and Spearman's correlation produced the correlation of .41 (p<.001). Schmitt et al could not find a threshold which comprehension dramatically accelerated; however, each increase in vocabulary coverage between the 90% and 100% level offered relatively uniform gains in comprehension, and there was a remarkably consistent linear relationship between growing vocabulary knowledge and growing reading comprehension. As for their second research question, they examined how much reading comprehension was possible at low percentages of vocabulary coverage, and they found that the learners could answer 50% of the comprehension items correctly at 90% vocabulary coverage. Even learners who knew 100% of the words in the texts could not understand the texts completely and they just obtained a mean score of 22.58 out of 30 possible (75.3%). For the second research question, Schmitt et al concluded that having a deeper lexical knowledge does not mean that it would presumably enhance the chances of comprehension. As for their third research question, they investigated the effect of background knowledge on the comprehension level, and having background knowledge on the texts had a great advantage ranging from 7.8 to 13.9 percentage points in the comprehension level. Therefore, there was not a reliable coverage estimates that would be informative for instruction and material development, and they emphasized the need for further studies within several other contexts.

In another study, Hu and Nation (2000) aimed to see what percentage of coverage of text was needed for reading for pleasure. 66 adult participants who were attending a pre-university English course in an English speaking country participated in the study. These 66 students were chosen on the basis of their Vocabulary Levels Test scores (Nation, 1983) from among the most proficient learners on the course, seventeen reading the 100% version, seventeen the 95% version, sixteen the 90% version and sixteen the 80% version. A 673-word story was used as the passage to be read; however, some modifications and simplifications were made in the passage by changing some of running words with nonsense words. To measure the comprehension level of the participants, two comprehension tests including a multiple choice test and a cued written recall test were prepared. The multiple choice questions were scored by giving one mark for each correct answer, and weighting of the cued written recall questions were different ranging from 1 point to 4 points. The first research question of the study attempted to find an answer to the question if different densities of unknown words resulted in differences in comprehension. Fifteen out of the seventeen participants reading 100% version got at least twelve correct out of fourteen questions, and gained adequate comprehension. Six out of seventeen participants reading 95% version gained adequate comprehension. With 90% version, just 4 out of sixteen participants got twelve correct answers. None of the participants reading 80% version gained adequate comprehension. Therefore, the first hypothesis was confirmed that the comprehension declined as the number of unknown words increased. As the second aim of the research, they attempted to find a threshold level for vocabulary coverage in a fictitious text. As the result of the regression analysis, they found that around 98% coverage may be needed for most learners to gain adequate comprehension. They put an emphasis on the term "most" learners, and suggested two reasons for the situation. First, some learners might gain adequate comprehension with 90% or 95% coverage through their background knowledge and a range of reading skills. Secondly, it was possible to fit a model to the data where an increase in coverage of vocabulary led to a predictable increase in comprehension. In sum, they have claimed that readers need to

have approximately 98% coverage of the words in the text to be able to read for pleasure.

In an earlier study, Laufer (1989) aimed to measure the relationship between the number of words understood by a reader in an academic text and the quality of comprehension of the text. 100 first year university students from various departments who were taking a course in English for academic purposes participated in the study, and they were native speakers of Hebrew and Arabic. A reading comprehension test which consisted of multiple-choice questions and open-ended questions were given to the students. The learners were assigned to answer comprehension questions and to underline the words they could not understand in the text. Secondly, they were given a lexical coverage test which consisted of 40 words from each text, and were asked to translate the words or paraphrase their meaning in text-context. Another result was that the group which scored 95% and above in lexical coverage test scored better in the reading comprehension test than the groups which scored 90-94% and 89% and below. In this vein, Laufer supports the threshold hypothesis in reading comprehension, and suggests that 95% and above lexical coverage of the text is necessary.

Two other studies (Laufer & Ravenhorst-Kalovski, 2010; Nation, 2006) revisited the lexical threshold, and attempted to investigate which vocabulary level provides reading comprehension well. Based on the 98% coverage suggested by some researchers, Nation (2006), by using a computer program, investigated how much unknown vocabulary could be tolerated in a text, and what vocabulary size might be needed to reach a 98% coverage level. According to the results, the most common 2000 words in the British National Corpora accounted for nearly 83% of the tokens and 4000 words for 95% of the tokens. To reach a level of 98% coverage level, readers should know at least 8000 words plus proper nouns. Therefore, knowing about 8000 to 9000 words was found necessary to read newspapers. Instead of a computer program, Laufer and Ravenhorst-Kalovski (2010) conducted a study to analyze the lexical threshold. 735 students who studied in an academic college in Israel studying in different departments, and took a course in English as academic purposes

participated in the study. Reading comprehension was measured by the English part of the entrance test of the related university. The participants' vocabulary size was tested by Nation's (1983) Vocabulary Levels Test revised by Schmitt, Schmitt, and Clapham (2001). The vocabulary test contained vocabulary items from the 2000, 3000, 5000 and 10000 most frequent words. As the result of the study, 4000 words were found to be necessary to obtain 95% coverage, and 98% coverage could be reached by knowledge of 7000-8000 words and of the proper nouns. In sum, Nation's and Laufer and Ravenhorst-Kalovski's studies give nearly same vocabulary size which is on average 8000 to reach 98% coverage level.

CHAPTER 3
METHOD

This chapter presents the method of the study. After giving detailed information about the context of the study, data collection and analysis methods are discussed. The instruments used in data collection process are presented in order to deeply penetrate into data collection and analysis procedures.

3.1. Research Design

This research study was designed to answer two research questions. Firstly, the relationship between text-based vocabulary knowledge and reading comprehension was explored. Regarding text-based vocabulary knowledge, it was also investigated if there was a threshold level in terms of text-based vocabulary size between adequate and inadequate comprehension. In order to explore these, a reading comprehension test and a questionnaire were applied.

Thus, in order to examine aforementioned research questions, this quantitative research based its design on a correlational research design. In this kind of associational research, the relationships among two or more variables are analyzed without any attempt to influence these variables (Fraenkel, Wallen, & Hyun, 2012). Fraenkel, Wallen and Hyun also state that a correlational study is different from descriptive research since it describes the degree to which two or more quantitative variables are related by using a correlation coefficient. In this sense, the following instruments were applied to investigate the related research questions (Table 3).

Following these procedures, it was aimed to identify the relationship among text-based vocabulary size and reading comprehension. Since a relationship of sufficient magnitude was found between text-based vocabulary

size and reading comprehension, it was aimed to predict to what extent a university student can comprehend an expository text according to the vocabulary knowledge they have.

Table 3. Research questions, designs and instruments used in the study

Research Question	Design	Instrument
1. Will different percent of text-based vocabulary result in differences in reading comprehension?	Quantitative	Vocabulary Test and Reading Comprehension Test
2. Is there any threshold level in terms of text-based vocabulary size between adequate and inadequate comprehension of an academic text?	Quantitative	Vocabulary Test and Reading Comprehension Test

3.2.   Setting and Participants of the Study

The students who took part in this study were enrolled in an English Language Teaching (ELT) program at Pamukkale University, Turkey. Before starting the first academic year at the university, these students were subjected to an English Proficiency Exam in order to determine if their English level was adequate for undergraduate courses. Some of the students directly started undergraduate courses. Yet, some of them had one-year preparatory program to improve English. In this regard, English proficiency level of the study group was considered as higher intermediate to advanced level. In other words, the respondents could be considered as proficient users of English.

The number of the students who were majoring in ELT was 382 in spring term of 2012-2013 academic years. 267 of them were female, and 115 were male. The vocabulary checklist and the reading comprehension test were distributed to a total of 184 students, nearly half of the population. However, 6 of the students were excluded from the study since four of them marked more than three non-words, and two of them denied to answer more than half of the reading comprehension test battery. In this sense, the study group was comprised of 178 respondents, which was composed of 76 freshman, 60

sophomore, 40 junior, and 2 senior students. The number of the senior students was very low since they completed most of their fourth grade courses in their third year and they were busy with their Public Personnel Selection Examination (KPSS) preparations out of the campus in their last year. Considering their situation, an announcement was made to find volunteer respondents for the study, and just 2 students turned up to take the test.

As for the gender distribution of the respondents, 71.3% (n=127) were females and 28.7% (n=51) were males (Table 4). The gender distribution of the study group had strong positive linear relationship with the gender distribution of the population (r=1.00, n=178). Even if the simple random sampling process was followed, the population was included in the same proportions in terms of gender as in stratified random sampling. In this sense, these numbers increased the likelihood of representativeness (Fraenkel, Wallen, & Hyun, 2012).

Table 4. The gender and grade ratio of the study group

	Freshman	Sophomore	Junior	Senior	Total
Female	54	41	31	1	127
Male	22	19	9	1	51
Total	76	60	40	2	178

The majority of the students were from the age groups of 18-20, 21-23 and 23-30. Two respondents did not write their ages. The respondents between 18 and 23 comprised approximately %90 of the study group. The frequencies and percentages were given in Table 5.

Table 5. The age ratio of the study group

	Number	% of total
20 and younger	83	46.63%
21-23	79	44.38%
23 and elder	14	7.87%
Missing	2	1.10%
Total	178	100%

*The percentages were given by rounding up as there were fractions.

3.3.   Data Collection Instruments

In this study, a vocabulary checklist was used to measure text-based vocabulary knowledge of the students after filling in the informed consent form and demographic information part (see Appendix 1). Following this checklist, a reading comprehension test was given to students in order to measure their reading comprehension level (see Appendix 1). Learners were expected to fill in a vocabulary checklist and comprehension tests in about 60 minutes.

3.3.1. Vocabulary test

In the literature, many different ways of measuring total vocabulary size and text-based vocabulary size ranging from multiple-choice and the Vocabulary Levels Test (Schmitt, Schmitt, and Clapham, 2001) to checklist test formats (Meara and Buxton, 1987; Schmitt, 2011) could be found. The measures related to text-based vocabulary size were reviewed for this study. In this respect, in two different studies, Carver (1994) and Laufer (1989) were seen to ask the learners to underline the words they did not know. Hu and Nation (2000) inserted some vocabulary items which do not have any meaning, and the participants tried to distinguish unknown words from nonwords in the texts. This kind of tests looks practical at first. However, Schmitt, Jiang, and Grabe (2011) expressed their hesitation about how this changed the natural reading process even if Schmitt (2010) considered the use of nonwords in texts as an accepted practice. Regarding these ideas, Schmitt, Jiang, and Grabe (2011) opted for a separate extended vocabulary checklist test in order to analyze reading comprehension in unmodified and authentic readings. In a related vein, in this study also an extended vocabulary checklist was applied in order to protect the authenticity of the texts. Since checklist tests serve to measure a large number of words, 60.7% of the content words were measured in this study. Pellicer-Sánchez and Schmitt (2012) reported the advantages of the checklists, in other words the yes-no test as follows:

> Yes–No tests also have the advantages of test administration to a large number of people (Nation, 1990), limited task demands (e.g. Harrington & Carey, 2009), easy development of items, straightforward and

automatic scoring, and no apparent negative washback effects (Meara, 1990, p. 490)

In the vocabulary research, selecting the target lexical items is one of the basic and critical steps, and frequency is one of the most important aspects for selecting these lexical items (Schmitt, 2010). In this sense, the readings were submitted to BNC-20 v 3.2 British National Corpus lists version of VocabProfilers program (www.lextutor.ca) to determine the frequency levels of the vocabulary in the readings. Namely, the British National Corpus (BNC) is a 100 million word collection which has been designed to represent British English corpora, especially after the 20th century. It is possible to determine the first 20.000 frequent words in the BNC with the help of VocabProfilers program. Therefore, the readings used in the study were analyzed in the program, and the results were presented in Table 6.

According to the table, a large proportion of the readings were formed of K1 words which represented the first 1000 frequent words list in BNC. The percentage of K2, K3 and K4 words is 14.5%. Off-list words, which may include proper nouns, unusual words, specialist vocabulary, acronyms and abbreviations, contribute 2.39% to the total. When we look at the type-token ratio, which indicates the number of different words in the text (types) divided by the number of words on which they are based (tokens), the average was found as 0.44. In other words, the lexical variety was measured as 44%.

As a limitation of the checklist, the answers of the learners might not be reliable. To propose a solution for this problem, an automatic check was built in the test if the learners' self-assessments were reliable (Meara, 1992), and 22 plausible non-words from Meara and his friends' list were integrated into the sets of vocabulary items.

In sum, a vocabulary checklist which was comprised of 168 words was used to measure the number of the words students knew. This 168-word checklist gave an advantage to check 290 words practically in a short time.

Table 6. The frequency levels of the words in the reading texts

Frequency Level	Families	Types	Tokens	Coverage (tokens) %	Content Words
K1 Words	248	309	889	78.60	158
K2 Words	64	77	94	8.31	53
K3 Words	28	30	46	4.07	29
K4 Words	15	17	24	2.12	13
K5 Words	8	9	10	0.88	8
K6 Words	3	3	4	0.35	3
K7 Words	6	6	7	0.62	6
K8 Words	3	3	3	0.27	3
K9 Words	3	3	3	0.27	3
K10 Words	1	1	1	0.09	1
K11 Words	3	3	8	0.71	3
K12 Words	3	4	7	0.62	3
K13 Words	4	4	4	0.35	4
K14 Words	2	2	2	0.18	2
K15 Words	0	0	0	0.00	0
K16 Words	1	1	1	0.09	1
K17 Words	1	1	1	0.09	1
K18 Words	0	0	0	0.00	0
K19 Words	0	0	0	0.00	0
K20 Words	0	0	0	0.00	0
Off-List	?	20	27	2.39	0
Total	**393+?**	**493**	**1131**	**100%**	**290**

3.3.2. Reading comprehension test

To be able to measure the comprehension levels of the students, the need for a valid and reliable test emerged. In the field, there were different kinds of reading comprehension tests such as the Gates-MacGinitie Reading Comprehension Test, The Group Reading Assessment and

Diagnostic Evaluation, the Iowa Test of Basic Skills and the Stanford Diagnostic Reading Test (Morsy, Kieffer, & Snow, 2010). On the other hand, there were copyright problems to conduct and publish these kinds of tests for the study. Considering this drawback, a reading comprehension test was developed by the researcher in line with the aims of the study.

3.3.2.1. Selection of the reading texts

As the study group was comprised of the university students, two expository texts which could serve as an archetype for more thorough descriptions of a variety of scientific genres (Lewin, Fine, & Young, 2001) were chosen from the Science and Technology part of *The Economist*. The Research & Development in America- Bad Medicine was printed on March 2nd, 2013, and the Exercise and Elderly- Circuit Training appeared on September 22nd, 2005. The text titled "Bad Medicine" was concerned with the aims and current situation in research and development in the USA. The length of this text was 545 words. The difficulty analysis was carried out based on the Flesch-Kincaid Grade Level for this study. The Flesch-Kincaid Grade Level was 8.7 which meant that an average U.S. student in 9th grade can read and understand the text. Also, the text titled "Circuit Training" was a scientific study analyzing the relationship between exercise and mental acuity. The text was comprised of 578 words. The Flesch-Kincaid Grade Level was computed as 9.3 which was very similar to the first text in difficulty, and it was comprehensible enough for an average U.S. student in 9th grade, as well.

The lengths and readability level of the texts were similar. The texts could be considered academic in nature as they were related to scientific subjects and studies, and they were not modified not to damage authenticity. In this sense, these two reading texts were selected for the comprehension test, and the permissions were granted to use and publish these texts for academic purposes in the study by *The Economist*.

3.3.2.2. Development of the reading comprehension test

To eschew limitations of the study, the multiple methods and techniques were used to measure the comprehension level of the students (Alderson, 2000; Alderson, Clapham, & Wall, 1995). 10 multiple-choice (MC) questions and 10 graphic organizer (GO) questions were incorporated for each text. As put forward by Haladyna (2004), MC questions are efficient and provide a useful summary of student learning of knowledge and cognitive skills, especially for large-scale testing program. As the second part, GOs were used as a frequently used information transfer task. The respondents were expected to transfer the information from the text to the graphic organizer. Alderson, Clapham and Wall (1995) emphasize GOs as information transfer tasks which resemble real-life activities. In this study, they were used in the test battery to include authentic tasks. The drawback for the GOs is the objectivity of marking. To overcome this drawback, two scorers marked the GOs of the first 30 respondents in line with the answer sheet. The marks that two scorers yielded were consistent; however, an analytical scoring instrument was prepared to increase inter-rater and intra-rater reliability of the results (Brown, 2003). The rest of the papers were scored by the researcher.

According to Bloom's taxonomy (1956), the question formats in both tests were based on knowledge and comprehension. In Bloom's taxonomy, knowledge includes those behaviors and test situations which focus on the remembering of ideas, material, or phenomena either by recognition or recall. The comprehension term, which was the core of this study, include the objectives, behaviors, or responses which represent an understanding of the literal message contained in a communication. Namely, the question formats were in line with the aim of the study, comprehension.

As the novelty of the study, the comprehension questions were written in Turkish, the first language (L1) of the respondents. In the literature, in Turkey, a study using L1 as the medium of the questions could not be found. Many authors such as Figueroa and Hernandez (2000) stress the potential harm embedded in constructing viable assessment. Therefore, native language

assessment forms are seen as the most effective type by some researchers (Lara & August, 1996). Nation (2009) states his views on this issue as follows:

> When the learners have to read second language questions and write their answers in the second language, comprehension of questions and second language writing skill are playing a part in measuring comprehension. Do the learners make poor answers because of poor reading comprehension of the text, poor comprehension of the questions, poor skill in writing answers in the second language, or any combination of these? If the learners feel comfortable with the first language questions, they could be worth using. (p. 92)

Based on the views of Nation and some other researchers, measuring L2 reading comprehension in L1 was not a new idea and it was frequently emphasized as a viable route to follow. Just to clarify, in some other countries, the use of L1 in the assessment is a topical issue, and there are some studies emphasizing the benefits of L1 use in assessments. In a study, Solano-Flores and Trumbull (2008) first defined English language learner (ELL) as "an individual who may exhibit any of an almost indefinite number of patterns of proficiency in L1 and English" (p. 171). The language proficiencies were given for eight hypothetical people, and the researchers analyzed these eight hypothetical people to determine the advantages and disadvantages of using L1 in assessment. Even if a person was bilingual, their proficiency level for reading was same. The ELLs ranged from E, the least proficient ones, to H, the most proficient ones excluding bilinguals and native ones. According to these hypothetical people, using L1 was more advantageous than using L2 for ELLs. Using L1 and L2 did not make sense for bilinguals in terms of reading. Therefore, testing in English is not likely to reveal what ELL students know (Solano-Flores & Trumbull, 2008), and focusing on English alone might lead to wrong decisions concerning the language of testing or wrong inferences about their ability (Figueroa & Hernandez, 2000). In the light of these, a set of Turkish comprehension questions were given to the respondents with an attempt to fill in the gap in the field. The details of the piloting study were given in the following section.

3.3.2.3. Piloting study

Language testers are reminded that the qualities of reliability and validity are essentially in conflict, and it is not easy to design test tasks that are authentic and at the same time reliable (Bachman and Palmer, 1996). Nevertheless, it does not mean that one of these can be ignored in test designing process. For the test battery, 10 MC questions and 10 GOs were written for the text entitled "Bad Medicine". The other question set of "Circuit Training" was adapted from Schmitt, Jiang and Grabe's study (2011) with their permission.

The pilot study was conducted at an ELT program of Gazi University, Turkey. The piloting population was 136, and the numbers of the female and male respondents were 116 and 19 respectively. One student did not state his or her gender. The ratio of gender and grade was presented in Table 7 excluding this one respondent.

Table 7. The gender and grade ratio of the piloting group

	Freshman	Sophomore	Junior	Senior	Total
Female	48	32	36	0	19
Male	5	10	2	2	116
Total	53	42	38	2	135

The most frequent method employed for internal consistency of the test items is Kuder-Richardson approach, particularly formulas KR20 and KR21 (Fraenkel, Wallen, & Hyun, 2012). As the formula KR20 does not require the assumption that all the items are of equal difficulty, it was applied to measure the internal consistency of the reading comprehension tests.

The KR20 reliability estimates for the reading tests were as follows: 0.72 for the entire reading test, 0.70 for "Bad Medicine" and 0.60 for "Circuit Training". The value of 0.70 is a desirable level for the reliability, and the reliability level can be considered as moderate. To have a detailed look, the complete test battery was given to two language experts in Turkish language

who did not observe any flaws linguistically. Consequently, the same version of the reading test was decided to be used in the study.

3.4. Data Collection Process

After the piloting stage, the data for the study were collected in the spring term of 2012-2013 academic years at Pamukkale University, Turkey. The complete test battery which included a consent form, a demographic information part, vocabulary checklist and reading comprehension questions (see Appendix 1) were given to a group of ELT students. It was expected that students would finish all the test battery in 70 minutes. On the other hand, the respondents were not limited within this time length.

Before the analysis, the respondents who checked over 3 nonwords were deleted from the data set to make sure that they did not overestimate their vocabulary knowledge. Secondly, the students who left more than half of the questions unanswered were excluded from the study. To get more accurate results, the responses of respondents who left 5 (12.5%) questions unanswered might have been excluded. However, some students stated in the test battery that they could not understand either the first or second text. In line with the observation in the test process, the views of the students were not underestimated, and the responses of respondents who left less than 10 questions unanswered in a text were accepted.

3.5. Data Analysis

For this study, a set of statistical procedures were employed to analyze the data and to draw conclusions therefrom (Kothari, 2009). In addition to descriptive statistics, Pearson's correlation value and regression analysis were employed to shed a light to the data. Descriptive statistics are a good way to get a snapshot of the distribution of the data. To analyze the relationship between the text-based vocabulary size and reading comprehension, Pearson's product-moment correlation coefficient was used as an example of the bivariate correlation. Following correlation analysis, a simple regression analysis was

used to predict an outcome variable from one predictor variable (Field, 2009). Hereby, the predictor variable was the text-based vocabulary size of the respondents, and the outcome variable was the achievement of the respondents in the reading comprehension tests.

CHAPTER 4
RESULTS AND DISCUSSION

This chapter provides statistics for the study. In addition to the results of descriptive statistics, the results regarding Pearson's correlation coefficient and regression analysis were analyzed using SPSS 20 package program. Also, discussions based on these analyses were done by referring to some earlier studies.

4.1.   The Descriptive Statistics about the Study

4.1.1. The results about the text-based vocabulary size

As given in the method part of the study, there were 168 words in the vocabulary checklist. However, the first 35 words from the K1 list represented 158 vocabulary items. Therefore, the number of the known words was multiplied by 158 and divided by 35 to find the approximate number of the known words in the total of 158 words in K1 list. Thus, the number of the words measured in the checklist was 290, and all statistical procedures were carried out based on this number of words.

Based on the 290 words, the mean value for the whole checklist was computed as 238.3 (82.17%) with a standard deviation of 18.83. The values ranged from 179 to 279, and the variance was found as 354.63 for the checklist. In Table 8, the number of the vocabulary items in the checklist, mean, standard deviation, variance, minimum and maximum values were presented. The mean for the K1 list was about 145 and 11 students (6.2%) knew all the 158 words in K1 list. The number of the students who knew 142 (~90%) or more words in K1 list was 135 (75.9%). The mean value of the K2 list (m=49.90) was also high, and 39 students (21.9%) knew all words in K2 list. The number of the students

who missed just one word was 38 (21.35%). The number of the students who knew 48 (90%) or more words was 145 (81.46%).

In the first 5000 list, the students knew at least one word. However, there were some students (74 students for K6 list, 10 students for the K7 list and 22 students for the K8 list) who did not have an idea with the words in K6, K7 and K8 lists. Furthermore, it was observed that students had difficulty in K10, K12, K14 and K16 levels, and, respectively, 166, 155, 159 and 163 students did not know even one word in these lists.

Table 8. The detailed analysis of text-based vocabulary size

	Student Numbers	Mean	Std dev.	Variance	Min.	Max.
K1	158	144.93	8.05	64.73	104	158
K2	53	49.92	3.43	11.75	36	53
K3	29	21.34	3.81	14.54	9	29
K4	13	9.65	1.94	3.77	3	13
K5	8	4.29	1.71	2.92	1	8
K6	3	.84	.87	.76	0	3
K7	6	2.99	1.56	2.44	0	6
K8	3	.99	.49	.24	0	2
K9	3	.90	.86	.74	0	3
K10	1	.07	.25	.06	0	1
K11	3	.75	.63	.40	0	2
K12	3	.17	.48	.24	0	2
K13	4	.72	.81	.65	0	4
K14	2	.11	.31	.10	0	1
K16	1	.08	.28	.08	0	1
K17	1	.54	.50	.25	0	1

According to the mean values of the first 8000 words, the students knew about 235 (86.08%) out of 273 words in the checklist. Nation (2006) concludes that the ELLs should know the first 8000 words to reach a level of 98% coverage for reading newspapers. Regarding the assumption of Nation, the text-based vocabulary size and comprehension level of the students could be analyzed in terms of correlation of the first 8000 words, too.

4.1.2. The Results about the Reading Comprehension Test

The mean value for the entire reading test was 22.36 (55.9%) which can be interpreted as a little higher than 20, the half of the questions. The number of the right answers ranged from 7 (17.5%) to 35 (87.5%). According to these results, none of the participating students answered all the questions in the test battery right. The number of the right answers accounted for 87.5% of the entire test for the best student who answered 35 questions truly.

There was not an exact threshold for the achievement in comprehension. In this sense, some researchers defined different percentages as required comprehension of texts. This required comprehension ranges from 55 to 70 in different studies (Schmitt, Jiang, & Grabe, 2011; Laufer & Sim, 1985; Laufer, 1989). When 70% of the questions are answered correctly, it accounts for 28 questions in this test battery. The number of the students who answered 28 and more was 35 (19.7%). The number of the students who gave the right answers for 24 or more questions was 71 (39.9%). If the required comprehension is accepted as 60% percent of the questions, 24 right answers can be regarded as the comprehension of the texts.

Considering the right answers of the different test types, the mean value of the right answered multiple-choice questions was 10.76, and the mean value of the right answered graphic organizer questions was 11.60. The standard deviations of MC and GO questions were 2.63 and 4.14 respectively. For the entire test, the standard deviation was 5.79.

4.2. The Relationship between the Text-based Vocabulary Size and the Reading Comprehension

4.2.1. The Descriptive Statistics about the Relationship

Based on the first research question of the study, a threshold was sought; however, it could not be found according to the results in Table 9 and Table 10. At the level of 88% coverage, an increase was seen with the mean

score of 26.50. After this percentage, the vocabulary coverage and text comprehension started to increase gradually. On the other hand, this increase mitigated at the levels of 90%, 92% and 96% coverage. Due to the flaws at these levels, there was not an obvious point at which comprehension would accelerate dramatically. The reason for this decrease might be the limited number of respondents who knew 96% and %92 of the content words in the text. Therefore, the first hypothesis of the study was eliminated since there were some flaws at some vocabulary coverage levels. The results of this study corroborates with Schmitt, Jiang, and Grabe's study (2011) as they could not find a threshold at which comprehension increases sharply, either.

Table 9. The vocabulary coverage & reading comprehension -1-

	96%[a]	94%	93%	92%	91%	90%	89%	88%
Student Numbers	1	3	3	1	3	6	11	4
Mean[b]	22.00	29.00	28.00	24.00	27.67	24.50	26.82	26.50
Median	22.00	29.00	30.00	24.00	25.00	24.00	28.00	25.00
SD	-	2.00	6.25	-	4.62	3.51	5.74	6.19
Min.	22.00	27.00	21.00	24.00	25.00	20.00	15.00	21.00
Max.	22.00	31.00	33.00	24.00	33.00	29.00	34.00	35.00

Note.
[a]Vocabulary coverage
[b]The mean scores of the 40-question comprehension test

Table 10. The vocabulary coverage & reading comprehension -2-

	87%[a]	86%	85%	84%	83%	82%	81%	80%
Student Numbers	12	17	11	11	18	12	5	6
Mean[b]	24.33	23.94	20.55	24.09	21.67	22.08	21.40	20.50
Median	25.50	22.00	20.00	25.00	20.00	23.00	24.00	20.00
SD	5.19	6.32	4.93	5.68	4.43	6.32	6.43	5.58
Min.	12.00	11.00	9.00	15.00	15.00	9.00	14.00	14.00
Max.	30.00	34.00	27.00	32.00	29.00	31.00	27.00	30.00

Note.
[a]Vocabulary coverage
[b]The mean scores of the 40-question comprehension test

The mean scores of the comprehension test gave an idea about what percentage of vocabulary is needed to understand a similar text. This level depends on the degree of required comprehension. This required degree of comprehension ranges from 55 to 70 in different studies (Schmitt, Jiang, & Grabe, 2011; Laufer & Sim, 1985; Laufer, 1989). If this level is taken as 70, 93% and 94% vocabulary coverages make texts comprehendible. However, it should not be ignored that the vocabulary coverage over 96% percent could not be represented in the study since there was no respondent over 96% vocabulary coverage. Therefore, the regression models made up for the lost data in this range, and gave the predictive results regarding the percentages over 96% in the following sections.

4.2.2. The Results about the Correlations between the Variables

To shed light on the second research question of this study, Pearson's correlation coefficient was employed. Before running the analysis, the normality assumption was tested. In a large set of observed variables, assumptions regarding the distribution of variables were not required (Tabachnick & Fidell, 2007). Nonetheless, only the probability plot and histogram charts were analyzed to determine if the data had a normal distribution (Figure 1). As can be seen in Figure 1, the normality assumption can be accepted since the histogram indicated a curve with a few outliers, and the points were arranged on the line in the probability plot.
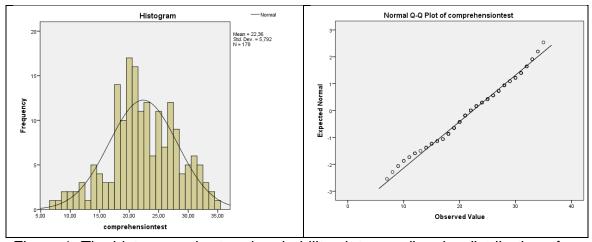

Figure 1. The histogram chart and probability plot regarding the distribution of the data

As a preliminary analysis before performing the correlation analysis, a scatterplot (Figure 2) was generated to have a better idea of the nature of the relationship between the variables (Pallant, 2011). Some outliers can be seen in the scatterplot; yet, the data points did not spread all over the place. The points were not neatly arranged around the line. According to the data points, a moderate correlation was observed. The upward line also indicates a positive relationship; high number of the known words associated with high scores on the comprehension test.
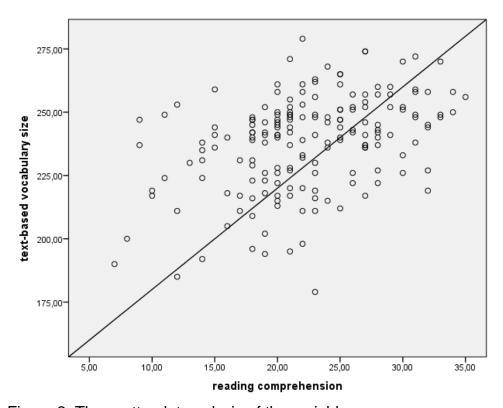

Figure 2. The scatterplot analysis of the variables

According to the correlation analysis given in Table 11, there was no missing datum in the data set. The value of the Pearson's correlation coefficient was calculated to determine the direction of the relationship between variables, and it indicated a positive correlation between the text-based vocabulary size and the reading comprehension level of the students. In other words, the more vocabulary items the students knew, the more they understood the texts. In this sense, the second hypothesis was confirmed.

The correlation coefficient ranges from -1.00 to 1.00. A correlation of 1 indicates a perfect positive relationship, a value of -1.00 indicates a perfect negative correlation, and a value of 0 indicates no relationship at all (Pallant, 2011). In this study, the Pearson's correlation coefficient was r= .41, n= 178, p<0.01. Different authors have different interpretations for coefficients. According to Cohen (1988), the values between .30 and .49 can be regarded as moderate correlation. To calculate the coefficient of determination, r value (.41) can be squared, and multiplied by 100. In this study, vocabulary size accounted for 17 percent of their variance. To interpret this value, the text-based vocabulary size could be said to explain about 17 percent of the variance in students' scores on the reading comprehension test. To determine how much reliable the data were, the significance level was considered. The 2-tailed significance level was .00.

Table 11. Pearson product-moment correlations between the variables

	Vocabulary Size		**Comprehension Test**	
Vocabulary Size	Pearson Correlation	1.00	Pearson Correlation	.41**
	Sig. (2-tailed)		Sig. (2-tailed)	.00
Comprehension Test	Pearson Correlation	.41**	Pearson Correlation	1.00
	Sig. (2-tailed)	.00	Sig. (2-tailed)	
N	178		178	

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the Nation's hypothesis aforementioned in the results section about the text-based vocabulary size, the correlation was sought between the text-based vocabulary size for the first 8000 words and the reading comprehension level of the students. The reason for looking at for the first 8000 words in these expository texts was prompted by Nation's claim that it is the adequate quantity to read a newspaper. Hence, the source of the texts used in this study was also a well-known newspaper, *the Economist*.

According to Table 12, the Pearson's correlation coefficient value was r= .44 and it means that there is a linear positive correlation between the text-based vocabulary size for the first 8000 words and the reading comprehension level. The Pearson's correlation values of both analyses were also similar (r_1=

.41 and r_2= .44). Corroborating with the assumption of Nation (2006), vocabulary size accounted for 20 percent of variance in this study, as well. To interpret this value, the knowledge of the first 8000 words helps to explain about 20 percent of the variance in students' scores on the reading comprehension test. The 2-tailed significance was computed as .000 in this correlation.

Table 12. Pearson product-moment correlations between the variables

	Vocabulary Size (8000)		Comprehension Test	
Vocabulary Size	Pearson Correlation	1.00	Pearson Correlation	.44**
	Sig. (2-tailed)		Sig. (2-tailed)	.00
Comprehension Test	Pearson Correlation	.44**	Pearson Correlation	1.00
	Sig. (2-tailed)	.00	Sig. (2-tailed)	
N	178		178	

**. Correlation is significant at the 0.01 level (2-tailed).

In the literature, there is an agreement that vocabulary might not be the best but a good predictor of reading (Laufer & Ravenhorst-Kalovski, 2010; Laufer, 1992; Nation, 2001). There are some studies analyzing the relationship between vocabulary knowledge and reading comprehension. In one of these, Schmitt (2011) found a moderate correlation (r=.41, n=661, p<.001) between the text-based vocabulary size and reading comprehension, and this value is exactly the same as the result of this study (r=.41, n=178, p<.001). In this study, the correlation was computed directly. On the other hand, there are different kinds of studies analyzing the relationship with different tests such as Depth-of-Vocabulary-Knowledge (DVK) Measure and TOEFL Vocabulary Item Measure (TOEFL-VIM). Using these tests, Qian (2002) found DVK and TOEFL-VIM highly correlated (r=.77 and r=.73 respectively, n=217, p<.01) with TOEFL-Reading for Basic Comprehension Measure. A significant high correlation was found between TOEFL version 2004 and Nation's vocabulary size test (r=.84, n=80, p=.001) in Baleghizadeh and Golbin's study (2010), as well. However, the correlation coefficients are not similar since the nature of the studies is highly different from the current one.

In sum, the aforementioned studies point out that there are moderate and high correlations between vocabulary knowledge and reading comprehension no matter what the test types are. These results motivate the studies on this relationship, and lead researchers to delve into the variables from different viewpoints.

4.2.3. The Results of the Regression Analysis

Following the correlation analysis, a simple regression analysis was carried out to make some predictions regarding the vocabulary size and the reading comprehension level. Before conducting regression analysis, some assumptions were checked. The first assumption is normality of the errors which means the residuals in the model are randomly distributed (Field, 2009). To check the assumption of normality of errors, histogram of standardized residuals and normal probability plot of the residuals were analyzed.

The graphics in Figure 3 can be interpreted that the shape of histogram approximately followed the shape of normal curve, and the histogram produced for this data set showed that normality was not violated. Furthermore, the probability plot of the residuals followed the 45-degree line which means the normality assumption appeared acceptable.
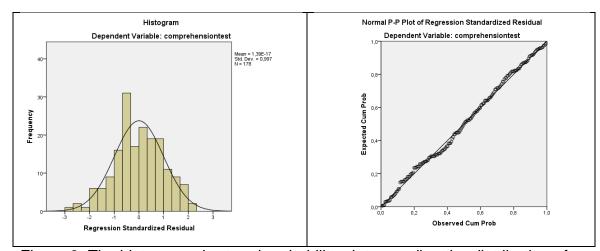

Figure 3. The histogram chart and probability plot regarding the distribution of the data

Another assumption is homoscedasticity. The term refers to constant distributing of residuals across each predictor; that is to say, there should be no apparent pattern in the scatterplot of predicted value and residual. As seen in Figure 4, it seems that there is not a certain pattern in the scatterplot below.
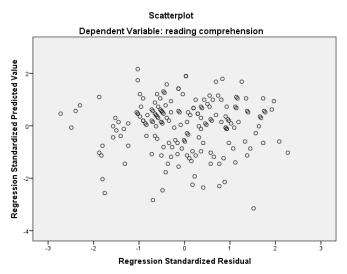

Figure 4. The scatterplot of the predicted value and the residuals

In the regression analysis, the third assumption is the independence of errors. In other words, the errors should be independent of each other. This issue can be checked by using statistical procedure named *Durbin-Watson* (Tabachnick & Fidell, 2007). The value of Durbin-Watson test should range from 1.5 and 2.5. The Durbin-Watson value was 1.77 in this study, which indicated independence of errors. In other words, the independence of errors assumption was met.

After checking all the assumptions, the regression analysis was carried out. As there was only one predictor, the value of .41 represented the simple correlation between the text-based vocabulary size and the reading comprehension level. The value of R^2 was .17, which meant that the text-based vocabulary size accounted for 17% of the variation in the reading comprehension level (Table 13). In other words, this means that 83% of the variation could not be explained by the text-based vocabulary size alone. These results exactly corroborate with Schmitt, Jiang and Grabe's study (r=.41, R^2=.17).

Table 13. The model summary of the regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.41[a]	.17	.20	5.31

    a. Predictors: (Constant), the text-based vocabulary size

Table 14 shows the various sums of squares and the degrees of freedom associated with each. The most important part of the table is the *F*-ratio (Field, 2009). For this data set, F-ratio was 44.94, which was significant at p < .001. Therefore, it can be concluded that this regression model resulted in significantly better prediction of the reading comprehension level than if the mean value of the reading comprehension level was used. In short, the regression model predicted the reading comprehension level significantly well.

Table 14. The analysis of variance (ANOVA) results

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1207.59	1	1207.59	44.94	.00[b]
	Residual	4729.40	176	26.87		
	Total	5936.99	177			

a. Dependent Variable: comprehensiontest

b. Predictors: (Constant), totalwordnumber

In Table 15, the value of b_1 is .13 and this value represented the gradient of the regression line. However, it is helpful to think of this value as representing the change in the reading comprehension level associated with a unit change in the text-based vocabulary size. In other words, the model predicts that reading comprehension score increase about .13 for the one-word increase in the text-based vocabulary knowledge. For instance, the model predicts that a 10-word increase in the vocabulary size will enable to answer 1.25 questions more (0.125 x 10 = 1.25). Considering the value of significance level, .00, it can be concluded that the text-based vocabulary size made a significant contribution (p < .001) to predicting the reading comprehension level of the students.

Table 15. The model parameters and significance of these values

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-7.47	5.06		-1.48	.14
	Text-based vocabulary size	,125	.02	.41	5.91	.00

a. Dependent Variable: the reading comprehension level

So far, it has been discovered that the model in the regression analysis is a useful model, and this model significantly improves the ability to predict the reading comprehension levels. Therefore, the model is defined by replacing the b-values in the regression equation (Figure 5):

$$outcome_i = (model) + error_i$$

the comprehension level = -7.47 + (0.13 x the vocabulary size)

Figure 5. The model predicting the equation between text-based vocabulary size and reading comprehension

For the detailed analysis, it needs to set a reasonable comprehension as a score of understanding. For instance, Schmitt, Jiang, and Grabe (2011) define 60% comprehension as adequate, and this percentage accounts for 24 out of 40 questions. To be able to answer 24 questions, readers are expected to know 242 (83.45%) out of 290 words in these texts. On the other hand, Laufer and Sim (1985), and Laufer (1989) determine 65-70% and 55% respectively as the minimum comprehension scores, and these percentages, for this study, correspond to 26, 28 and 22 right answers respectively. If the values of 26, 28 and 22 are calculated with the regression equation above, the students should know 268, 284 and 236 words out of 290 content words respectively. 268 words account for 92.41%, 284 words account for 97.93%, and 236 words account for 81.38% of the content words in the texts.

Based on the 70% comprehension level, Hu and Nation (2002) claim that 98% coverage is needed for adequate comprehension, and approximately the same percentages (98%-99% coverage) are mentioned in Schmitt, Jiang and Grabe's (2011) study to comprehend a text. Furthermore, Nation (2006) suggests that 98% comprehension is necessary to comprehend newspapers. The results of the present study (97.93%) corroborates with these three studies in terms of vocabulary coverage, and it means that the model predicting the equation between the text-based vocabulary size and reading comprehension can be applied to predict the vocabulary size necessary to understand the text. By using the model, it can be concluded that Turkish EFL learners at the tertiary level need to know 98% of the content words to be able to understand at least 70% of an expository text.

CHAPTER 5
CONCLUSIONS AND IMPLICATIONS

This chapter presents a brief summary of the study with its aims and findings. Then, the pedagogical implications of the study are discussed, and a set of suggestions are presented for further research.

5.1.   Overview of the Study

This study aimed to identify and describe the relationship between text-based vocabulary size and reading comprehension level of Turkish EFL learners at the tertiary level. This relationship was investigated based on both explanatory and predictive correlations between variables, and the data were obtained from 178 participants at an ELT program of a state university. To analyze the relationship, the results of two reading comprehension tests and a vocabulary checklist were employed. It was found that there was a moderate correlation between the text-based vocabulary size and reading comprehension. Based on the correlation found in the study, some regression analyses were carried out to predict what percentage of words university students should know to comprehend expository, in other words, academic texts.

Academic achievement is considered to be closely related to reading performance (Adamson, 1993; Collier, 1989; Daneman, 1991; Duke & Carlisle, 2011; Van Steensel, 2006), and the breadth of vocabulary is recognized as a good predictor of reading comprehension ability (Thorndike, 1973; Hu & Nation, 2000; Schmitt, 2000; Stahl, 2003). Even many readers are not aware of whether they adequately comprehend a text or not (Graesser, 2007). Therefore, estimating necessary vocabulary size for the comprehension of a text has become a perennial concern in the educational research. The incentive point of

the study was the dearth of studies giving a guideline for Turkish learners regarding the necessary vocabulary knowledge to comprehend an expository text. This study also aims to help instructors and lecturers about the lexical needs of EFL learners so that they can easily guide students in terms of the vocabulary size which university students need to have.

The study group was comprised of 178 EFL students enrolled at an ELT program, Faculty of Education at Pamukkale University. The study was based on the right answers on the comprehension tests and the number of the words known in the checklist. The whole test battery was given to the participants including a vocabulary checklist and 40 comprehension questions. The participants completed the test battery in a time length ranging from 50 minutes to 90 minutes. The number of the right questions and the vocabulary items known in the checklist were determined for the analysis.

According to the descriptive statistics, it was found that, on average, participants knew 238.3 (82.17%) of the content words in the checklist with a standard deviation of 18.83. The mean value of the right answers given by the participants was 22.36 (55.9%), and the number of the right answers ranged from 7 (17.5%) to 35 (87.5%). As for the first research question, Pearson's correlation coefficient was tested, and a moderate correlation ($r=.41$, $n=178$, $p<.001$) was found between the text-based vocabulary size and the reading comprehension level of the participants. As for the second research question, a threshold level was traced; however, no threshold level was found due to the lack of the data at 92% and 96% coverage levels. Therefore, a regression analysis was carried out to find a regression model predicting the equation between the text-based vocabulary size and reading comprehension levels. It was found that Turkish EFL learners at tertiary level should know 98% of the content words in an expository text to comprehend at least 70% of the text.

5.2. Implications of the Study

Research on L2 reading has indicated that vocabulary knowledge is correlated with L2 reading comprehension (Eskey, 2005; Droop & Verhoeven, 2003; Hu & Nation, 2000; Pike, 1979; Qian, 2002; Schmitt, 2000; Schoonen, Hulstijn, & Bossers, 1998; Stahl, 2003). However, the current study attempts to expand the scope of the research in terms of direct comparison of vocabulary coverage and reading comprehension. Therefore, the results are expected to offer a comprehensive description of the text-based vocabulary size and reading comprehension of tertiary level Turkish EFL learners.

According to the results of the study regarding the relationship between variables, a threshold at which comprehension increases or decreases dramatically at a certain percentage of the text-based vocabulary size does not appear. Instead, the correlation value indicates a positive moderate relationship; high numbers of the known words associated with high scores on the comprehension test. Therefore, it can be said that there is a fairly straightforward linear relationship between the text-based vocabulary size and reading comprehension of the participants. The reason for the moderate correlation might be that reading comprehension involves much more than vocabulary knowledge (Nation, 2000). To reach a deep level of comprehension, readers are required to have some skills such as inferencing, making coherent connections between ideas, scrutinizing the ideas with a critical stance, understanding the rationale of authors (Graesser, 2007), activating their background knowledge (Rumelhart, 1980) and paying attention to the social context in which texts are produced (Lantolf & Thorne, 2007). Furthermore, readers should actively engage with a text or task to adopt a standard of coherence (Nation & Angell, 2006; Perfetti, Landi, & Oakhill, 2005; Schmitt, Jiang, & Grabe, 2011). In other words, they should monitor their comprehension and make inferences from texts as good readers do.

Considering the results related to adequate level of comprehension (which is considered to be 70%o of the text in this study), Turkish EFL readers at tertiary level need to know at least 98% of the content words in a text. Even if

they know 98%, they cannot comprehend the text at 100% comprehension. These two statements are in line with the findings of Hu and Nation (2000) and Schmitt, Jiang and Grabe (2011). In this vein, it can be suggested that vocabulary knowledge is a prerequisite for comprehension. However, as Laufer (1989) pointed out, below 95% coverage does not mean that a person cannot understand a text since some other factors are involved in the comprehension process. Even with a limited lexical knowledge, some readers might enhance their comprehension by benefiting from grammatical clues, and some readers make use of their background knowledge and the familiarity to the text types to facilitate their comprehension. On the other hand, comprehending expository texts might become a challenge for even skilled readers. The reasons behind these difficulties might be lack of knowledge in key concepts and terms, arrangement of the text, and prior knowledge (Graesser, 2007).

As for the implications of the results to the curricular developers, EFL instructors and university students, 98% coverage for academic texts and newspapers refers to approximately 8000 words based on the studies of Nation's (2006) and Laufer and Ravenhorst-Kalovski (2010). Therefore, Turkish EFL learners at tertiary level need to know about 8000 words to be able to read academic texts without having any problems in terms of vocabulary. In Turkey, book authors and curriculum designers should consider the target vocabulary size, and they need to prolong vocabulary instruction from the beginning of English instruction at schools to the university level studies. Thus, the vocabulary knowledge of students can be increased, and, in turn, achieving adequate vocabulary level leads to a desired level of reading comprehension.

5.3. Suggestions for Further Studies

As Grabe (2009b) suggests, ideally, each implication of a study should be dwelled upon so that these implications might turn into effective applications in the classroom. To integrate the results of the study with real life applications and didactics, the current study can be embedded with instructional training studies. To understand antecedents, consequences and difficulties of reading comprehension, it is obvious that longitudinal studies be carried out (Nation,

2005). Through longitudinal studies, multiplicity of variables and conceptualizations which play a significant role in second/foreign language reading can be explored in order to gain a credible insight related to reading (Bernhardt, 2011).

In sum, several other studies can be conducted with a similar scope. For instance, in a follow-up study, different types of texts other than the one used in this study can be used to determine the necessary vocabulary size to be able to read them. In line with the aim of the current study, vocabulary size for each level of Common European Framework (CEFR) can be studied, and new insights could be presented to the field.

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APPENDIX-1. Test Battery

PAMUKKALE ÜNİVERSİTESİ
EĞİTİM BİLİMLERİ ENSTİTÜSÜ
2009

Text-based vocabulary size and reading comprehension of Turkish EFL learners

Hazırlayan

Fatih GÜNGÖR

Danışman

Doç. Dr. Demet YAYLI

DENİZLİ

2013

Text-based vocabulary size and reading comprehension of Turkish EFL learners

BİLGİLENDİRİLMİŞ ONAY FORMU

Yabancı dil olarak İngilizce öğrenen Türk öğrencilerin metin içerisindeki kelime bilgileri ve okuduklarını anlamaları konusunda bir araştırmaya katılmaya davet ediliyorsunuz. Bu araştırmaya orta seviyenin üstü veya ileri seviyede İngilizce bilgisine sahip olduğunuz düşünülerek seçildiniz.

Bu araştırmanın amacı metin içerisinde bildiğiniz kelime sayısı ile okuduğunu anlama seviyeniz arasındaki ilişkiyi ölçmek ve bu bağlamda Türk öğrenciler için bir yordama da bulunmaktır. Araştırmaya katılmanız durumunda kelime listesini ve okuduğunu anlama ile ilgili soruları çözmeniz yaklaşık 70 dakikanızı alacaktır.

Araştırmaya katılan katılımcıların bilgileri ve testlere verdiği cevaplar araştırma kapsamı dışında ikinci kişilerle asla paylaşılmayacaktır. Bu anlamda sorulara samimiyetle cevap vermeniz araştırma sonrasında ortaya çıkacak sonuçlar açısından önem arz etmektedir. Araştırma sonucunda elde edilecek veriler bir süre kilitli bir dolapta muhafaza edildikten sonra imha edilecektir. Araştırma sonuçları Haziran ayının sonunda kişisel web sitemden duyurulacaktır. Araştırma ile ilgili her hangi bir sorunuz olursa bana iş telefonu, e-posta ve yazışma adresimden ulaşabilirsiniz.

☐ Evet, araştırmaya gönüllü olarak katılmak istiyorum.
☐ Hayır, araştırmaya katılmayı reddediyorum.

Üniversite	: _____	Cinsiyet : ☐ Kadın ☐ Erkek
Sınıfınız	: _____	Yaş : _____
Exam Score	: _____	

UYGULAMA YÖNERGESİ

Araştırma 2 bölümden oluşmaktadır:

Bölüm 1: Bu bölümde 200 adet kelime bulunmaktadır. Eğer bir kelimeyi bildiğinizden eminseniz bildiğiniz kelimelerin yanına tik (√) işareti koyunuz. Eğer bir kelimeyi Türkçe ile benzerliğinden dolayı bildiğinizi düşünüyorsanız (T) işareti koyunuz. Bilmediğinizi düşünüyorsanız ya da emin değilseniz boş bırakınız, çünkü testin içerisinde hiç bir anlama sahip olmayan kelimeler de mevcuttur. Bu kelimelere tik atmanız durumunda bu puanlar toplam puanınızdan düşülecektir.

Bölüm 2: Bu bölümdeki 2 metni dikkatli bir şekilde okuyunuz. Her bir metin için 10 adet çoktan seçmeli soru ve 10 adet boşlukları doldurma sorusu cevaplayacaksınız. Cevaplamadığınız sorular yanlış olarak kabul edilecektir. Bu sebeple testin içerisindeki her soruya en yakın cevabı vermeniz gerekmektedir.

Sağladığınız katkılardan ötürü siz geleceğin İngilizce Öğretmenlerine teşekkür ederim.

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Yabancı Diller Eğitimi
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BÖLÜM 1 – KELİME KONTROL LİSTESİ								
develop			understand			limidate	
receive			share			indeed	
suddery			exist			rise	
include			total			affect	
mean			drop			investment	
particular			berrow			economy	
national			associated			research	
spend			properly			assumption	
suggestion			grow			period	
difference			opportunity			eluctant	
project			generate			proportion	
beneficiary			nonagrate			oxylate	
evidence			domestic			physical	
team			adult			mental	
funder			demonstrate			capacity	
galpin			medical			adjust	
area			publish			deny	
grant			implication			institute	
link			complex			pernicate	
benefit			significantly			remain	
wheel			brain			declare	
opposite			award			contain	
perform			examine			contortal	
speech			cash			swim	
advancement			golden			risky	
elderly			knowledge			split	
firm			reach			medicine	
cell			horobin			hidden	
glandle			discovery			sad	
disease			rare			swim	
direction			accelerate			fade	
human			whereabouts			subsidy	
map			vital			flu	
relative			border			straightforward	
hapgood			visual			gut	
prove			cancer			squeeze	
drug			era			height	
race			trigger			spill	
seconds			therapy			iustal	
promise			abrogative			rescue	

rank	
degate	
laboratory	
predict	
lazy	
praise	
mice	
portion	
military	
platform	

pace	
mundy	
billion	
universal	
decade	
federal	
decline	
trim	
brutally	
elaborate	

pring	
shrink	
inflation	
rusty	
rapid	
microscope	
tub	
congress	
innovation	
journal	

thigh	
refuge	
deficit	
stimulate	
wray	
cumulative	
underpin	
cue	
erosion	
vaccine	

salvaging	
excel	
regenerative	
counterpart	
woolnough	
plop	
ravage	
underwater	
antibody	
ascent	

outlay	
haunch	
twose	
astute	
supremacy	
neuron	
biomedical	
sequester	
sloth	
dysfunction	

surpass	
sedentary	
charlett	
jowl	
GDP	
haque	
monoclonal	
escrotal	
brawl	
neuroscience	

BÖLÜM 2 – OKUDUĞUNU ANLAMA
Research & Development in America
Bad Medicine
Mar 2nd 2013 | NEW YORK | The Economist

BARACK OBAMA, in his state-of-the-union speech on February 12th, called for a new era of scientific discovery. "Now is the time to reach a level of research and development not seen since the height of the space race," he declared. He praised projects to map the human brain and accelerate regenerative medicine. This would mean spending more on research. As *The Economist* went to press, America's government was about to do the opposite.

Federal spending is due to be cut on March 1st, the result of a long brawl over the deficit. Complex politics triggered this "sequester" (Congress excels at nothing if not elaborate dysfunction) but the sequester itself is brutally simple. America will cut $85 billion from this year's budget (about 2.5% of spending), split between military and non-military programmes. Among the areas to be squeezed is R&D, and medical research in particular.

For years America has enjoyed pre-eminence in research, but this is fading. Chinese investment (including both public and private money) more than quintupled from 2000 to 2010, to $160 billion, in 2005 prices. America's R&D spending rose by just 22% over that period, according to the OECD. Research also makes up a smaller portion of America's economy than some other countries'. In a ranking of R&D spending as a share of GDP, America came tenth in 2011. A decade earlier it was sixth.

Nevertheless, America remains the world's biggest engine for innovation. It spent $366 billion on research in 2011, compared with $275 billion by all 27 countries of the European Union. Despite China's rapid ascent, America still spends more than twice as much on R&D. Subsidies help. America's government pays for about one-third of all domestic research and for most basic science.

Medicine is one of the main beneficiaries. America's National Institutes of Health (NIH) is the world's biggest funder of biomedical research. It pays for risky basic science; companies pay for later stages of development. For example, the NIH supported early research into monoclonal antibodies. By 2010 such research underpinned five of America's 20 bestselling drugs. As drug firms trim their budgets, the NIH's work is becoming even more vital. But since 2003, inflation-adjusted spending on medical research has declined.

With the sequester, public investment will shrink further. America's total outlay on R&D will drop by $8.7 billion this year, according to the American Association for the Advancement of Science. Francis Collins, the NIH's director, says that his organization will spend $1.6 billion less in 2013—a cut of 5.1%—and $16 billion less over the next decade. Hundreds of grants will not be awarded. Existing grantees will receive only 90% of the cash promised to them.

These cuts will speed the erosion of American supremacy in research. In December Battelle, a research group, predicted that China would surpass America's spending by 2023. Thanks to the sequester, that date may come earlier.

But the real problem is absolute, not relative, and affects the whole world, not just America. R&D is a rare type of public spending that stimulates growth. Knowledge is cumulative, easy to share and generates benefits that spill rapidly across borders. Dr Collins says that cuts to the NIH will slow work on Alzheimer's disease, a universal flu vaccine and cancer therapies, to name just a few.

SORU SETİ 1: Okuduğunuz metinden yola çıkarak her bir soru için **en doğru** cevabı işaretleyiniz.

1. Metnin ana fikri aşağıdakilerden hangisidir?
   A. Bilim adamları ilaç sektöründe Amerika'nın daha belirgin bir rol oynaması gerektiğini ifade ediyor.
   B. Amerika dünyadaki teknoloji geliştirme konusundaki üstünlüğünü kaybetmiştir.
   C. Amerika kazancını büyük ölçüde ilaç sektöründen sağlamaktadır.
   D. İlaç sektöründeki kesintiler dünya üzerindeki tüm ülkeleri olumsuz etkileyecektir.

2. Metne göre, Amerika _____.
   A. Avrupa Birliği'nde bulunan 27 ülkenin yaptığı yatırımdan daha fazla yatırım yapmaktadır.
   B. araştırma&geliştirme çalışmalarına Çin'in iki katından daha az yatırım yapmaktadır.
   C. araştırma&geliştirme çalışmalarına ayırdığı tutar ülkenin gayrisafi yurtiçi hasılasıyla karşılaştırıldığında 2011'de 6. Sırada bulunmaktadır.
   D. her geçen gün ilaç endüstrisi ve araştırma&geliştirme yatırımlarını artırarak sürdürmektedir.

3. Metne göre aşağıdaki ifadelerden hangisi yanlıştır?
   A. Obama insan beyninin haritasını çıkarma ve yenileyici tıp ürünlerini hızlandırma çalışmalarını takdir etmektedir.
   B. Amerika bütçe açığı sebebiyle özelikle ar-ge ve tıbbi araştırmalarda kısıtlamalar getirmektedir.
   C. Amerika'nın ar-ge konusunda yıllardır sahip olduğu üstünlüğü günden güne zayıflamaktadır.
   D. Çin'in 2000-2010 yılları arasındaki yatırımı Amerika'dan 5 kat daha fazladır.

4. Amerika'da ar-ge çalışmalarına ayrılan tutar, _____.
   A. Gayri safi milli hâsılanın 22%'sine tekabül etmektedir.
   B. Gayri safi milli hâsılalara göre karşılaştırıldığında 2001'de 6. sıradadır.
   C. Diğer çalışmalara ayrılan tutardan çok daha azdır.
   D. OECD tarafından net olarak ifade edilmemiştir.

5. Aşağıdakilerden hangisi metinden çıkarılabilir?
   A. Amerika ar-ge çalışmalarını gelişen ülkelere pazarlayarak kazanç elde etmektedir.
   B. Amerika Alzheimer ve kanser hastalarını önemsememektedir.
   C. Ar-ge çalışmaları ülkelerin büyüme ve gelişmesinde önemli bir faktördür.
   D. Kesintilere rağmen Amerika Ulusal Sağlık Enstitüsü çalışmalarına hız kesmeden devam etmektedir.

6. Metne göre Amerika Ulusal Sağlık Enstitüsü'nün kesintileri aşağıdakilerden hangi grup için sorun teşkil etmemektedir?
   A. Alzheimer hastaları
   B. Grip aşısı kullananlar
   C. Kan ihtiyacı olan hastalar
   D. Kanser hastaları

7. 2. ve 3. Paragraflar temel olarak aşağıdakilerden hangisinden bahsetmektedir?
   A. Muhtemel etkileri tartışma
   B. Diğer ülkelerle bir kıyaslama
   C. Olası sonuçları açıklama
   D. Çin'in ar-ge çalışmalarına verdiği önem

8. Amerika Ulusal Sağlık Enstitüsü hakkında verilen bilgilerden hangisi yanlıştır?

   A. Amerika'da en çok satan 20 ilacın 5'inin araştırmalarına zemin hazırlamıştır.
   B. Biyomedikal araştırmaya en çok fon sağlayan kuruluştur.
   C. 2003'ten bu yana ilaç firmalarının araştırma kesintilerini tolere etmektedir.
   D. Yararlanıcılara toplam maliyetin 90%'ını ödemeyi taahhüt eder.

9. Çin'in ar-ge yatırımları hakkında aşağıdakilerden hangisi yanlıştır?

   A. 2000-2010 yılları arasında Çin, yatırımlarını 5 kat artırmıştır.
   B. Son yıllarda Çin araştırma yatırımlarını bir hayli artırmıştır.
   C. Çin'de ar-ge yatırımları büyük ölçüde devlet tarafından sübvanse edilmektedir.
   D. Çin 10 yıllık bir süre içerisinde ar-ge konusunda Amerika'nın üstünlüğünü ele geçirecektir.

10. Yazar neden aşağıdaki cümleye metinde yer vermiştir?

    "It pays for risky basic science; companies pay for later stages of development."
    A. Amerika'daki firmaların taşı elin altına koymamasından şikâyet etmektedir.
    B. Amerika Ulusal Sağlık Örgütü'nün üstüne düşen sorumluluğun arttığını ifade etmektedir.
    C. Özel şirketlerin sağlıktaki gereksiz yatırımlarından şikâyet etmektedir.
    D. Özel şirketlerin kanser, Alzheimer ve grip aşıları üzerine araştırma yapmasını istemektedir.

SORU SETİ 2: Metindeki bilgiler aşağıdaki grafiklerde düzenlenmiştir. Grafikleri 10 boşluğu doldurarak tamamlayınız. Gerekli olduğu takdirde okuma metnine dönebilirsiniz. Cevaplandırırken kendi kelimelerinizi veya metindeki kelimelerin, öbeklerin ve cümlelerin Türkçelerini kullanabilirsiniz.

Amerika'daki ar-ge çalışmaları (Paragraf 1)

Obama'nın hedefi	Şu anki durum
1.	2.

Amerika'nın yatırımlarının diğer ülkelerle kıyaslaması (Paragraf 3)

Amerika	Çin	27 AB Ülkesi
3.	4.	$275 billion

Amerikan Ulusal Sağlık Enstitüsü (NHI) (Paragraf 4)

Enstitünün Uzmanlık Alanı	Enstitü Araştırmasının Kazandırdıkları
5.	6.

Ar-ge kesintileri ve sonuçları (Paragraf 5, 6 ve 7)

Ar-ge Kesintileri	Ar-ge Kesintilerinin Sonuçları
7. Amerika:	8. Amerika için:
9. Ulusal Sağlık Enstitüsü:	10. Dünya için:

Exercise and the elderly
Circuit Training

Sep 22nd 2005 | NEW YORK | The Economist

IT IS never too late for the lazy and the old to get off their haunches and exercise. This week, a study found that physical activity beginning in old age, even after a whole life lost to sloth, can help rescue the brain from mental decline—at least in mice.

The link between taking exercise and remaining mentally astute into the golden years is well known but not well understood. Exercise seems to stimulate the growth of new neurons in certain parts of the brain. Physically active animals (including humans) perform better on tests of cognition than their inactive counterparts. But the assumption was that, at some point, people might be past salvaging.

Perhaps not. Fred ("Rusty") Gage and his team at the Salk Institute in La Jolla, California, studied young and old adult mice. Half the mice were given running wheels, on which they happily ran five or six kilometers a day. The other half were denied the opportunity to exercise.

Some 35 days later, each mouse was plopped into a tub of milky water. This water also contained a refuge, in the form of a hidden platform that was underwater but which the mice could stand on. Mice hate swimming, so they quickly learn to use visual cues to remember where the platform is (even when the scientists move the platforms and the cues around a few times). The test is about how quickly the mice can learn and remember the whereabouts of the platform.

It turns out that how quickly they learn and remember in old age is strongly associated with how much they had been exercising. Both groups of elderly mice swam at about the same pace, so the time it took to find refuge was not about improved swim speed. Yet whereas the physically fit old-timers found the platform in about 15 seconds, the old sedentary ones took 30 seconds—twice as long. (As for the young mice, it is a sad reality that youth gets away with a lot. Even the young sloths could remember where the platform was in less than 15 seconds.)

The difference in performance may come down to what was going on in the mice's brains. About a week after the water test, the mice were killed and the researchers examined their brains, counting the numbers of new neurons. In the elderly exercisers, about 26% of new brain cells were developing into neurons—not as large a proportion as in the younger mice, to be sure, but significantly more than the 9.5% in their non-running counterparts.

The team also found that, under the microscope, the neurons looked just like those developing in younger brains, suggesting they were working properly. There had been some suggestion that perhaps older brains simply lost their capacity for neurogenesis, but Dr Gage (who exercises daily) says this study demonstrates otherwise. And, although it is not clear that the new neurons are responsible for the improved performance, the evidence certainly points in that direction. The team published their work earlier this week in the *Journal of Neuroscience*.

Although this work was carried out using mice, it has been shown that humans, like many other animals, can grow new neurons even as adults. (Indeed, this was first demonstrated in Dr Gage's laboratory.) The implications for people, therefore, may prove to be rather straightforward: exercise may fight the ravages of age not just on your jowls and thighs and gut, but in your mind as well.

SORU SETİ 1: Okuduğunuz metinden yola çıkarak her bir soru için **en doğru** cevabı işaretleyiniz.

1. Metnin ana fikri aşağıdakilerden hangisidir?
   A. Eğer insanlar fiziksel açıdan sağlıklıysa zihinsel aktivitelerini sürdürebilirler.
   B. Egzersiz yapmak gençlerde bir fark yaratmayabilir fakat yaşlılarda belirgin bir fark yaratır.
   C. Metindeki deney egzersizin yaşlı insan ve farelerde nöron büyümesini tetiklediğini göstermektedir.
   D. İleri yaşlarda başlanılsa bile fiziksel egzersiz zihinsel aktivitenin sürdürülmesine yardımcı olabilir.

2. Metne göre aşağıdaki ifadelerden hangisi yanlıştır?
   A. Egzersizin neden yaşlı insanların zihinsel olarak zinde kalmalarına yardımcı olduğu tam olarak anlaşılmamıştır.
   B. Zihinsel performans üzerinde fiziksel egzersizin etkisi ileri yaşlarda yok olur.
   C. Fiziksel egzersiz tüm hayatları boyunca hiç egzersiz yapmayan kişilerin zekâsını geliştirebilir.
   D. Fiziksel olarak aktif olan insanlar aktif olmayanlara göre bilişsel testlerde daha iyi performans gösterir.

3. Metne göre deneyle ilgili gerçekleri yansıtmayan ifade aşağıdakilerden hangisidir?
   A. Deney hem genç hem de yaşlı fareleri kapsadı ve bunların yarısı çemberde koştu.
   B. Bir fare gizli platformu ne kadar hızlı bulursa zihinsel olarak o kadar aktif demektir.
   C. Yaşlı egzersiz fareleri platformu genç egzersiz farelerinden daha hızlı bulmuştur.
   D. Farelerin platformu bulma hızındaki farklılık onların akıllarıyla ilgilidir.

4. Aşağıdakilerden hangisi metinden çıkarılabilir?
   A. Su testinde daha iyi performans gösteren yaşlı fareler diğer yaşıtlarından fiziksel olarak daha sağlıklıdır.
   B. Yaşlı fareler için platformu bulma hızları yaptıkları egzersizin miktarıyla ilgilidir.
   C. Egzersiz genç fareler için bir fark yaratmaz çünkü genç fareler eşit şekilde hızlıdır.
   D. Performanslarındaki farklılık beyin hücrelerinin farklı sayıda olmalarıyla ilgilidir.

5. Aşağıdaki ifadelerden hangisi deneydeki araştırmacıların düşüncesidir?
   A. Egzersiz yapan yaşlı fareler, yaşlı egzersiz yapmayan farelerden daha fazla yeni beyin hücresi geliştirdi.
   B. Egzersiz yapan grupta yeni beyin hücrelerinin büyük bir bölümü nöronlara dönüşmüştür.
   C. Yaşlı farelerde gelişen nöronlar hücre doğumu (neurogenesis) için yeterli kapasiteye sahip değildir.
   D. Egzersiz yapan yaşlı fareler bile deneydeki genç farelerden daha iyi performans gösterdi.

6. 7'inci paragraf temel olarak aşağıdakilerden hangisinden bahsetmektedir?
   A. deneyin amacını ifade etmek
   B. olayları oluş sırasına göre sunma
   C. muhtemel çözüm önerilerini sunma
   D. iki farklı görüşü karşılaştırma

7. Farelerin suya atılmasının sebebi aşağıdakilerden hangisidir?
   A. Onlara egzersiz yapmak için bir fırsat vermek
   B. Yüzme hızlarını test etmek
   C. Görsel yeteneklerini test etmek
   D. Zihinsel yeteneklerini test etmek

8. Yaşlı koşmayan farelerde yeni nöronlara dönüşen yeni beyin hücrelerinin yüzdesi aşağıdakilerden hangisidir?
   A. 26%
   B. 9.5%
   C. 35.5%
   D. 16.5%

9. Aşağıdakilerden hangisi metinden çıkarılabilir?

A. Gençlerin beynindeki nöronlar yaşlıların beynindeki nöronlardan daha iyi çalışır.

B. Nöronlar zihinsel aktivite ile yakından ilişkilidir.

C. Nöronlar ne kadar çok olursa beyin o kadar genç demektir.

D. Hücre doğumu (neurogenesis) genç beyinlerde daha hızlı gerçekleşir.

10. Metinde ifade edilmiş araştırma sonuçlarına göre, insanlar _____.

A. hayat boyu faydasını görmek için gençken egzersiz yapmaya başlamalıdır.

B. yaşlandıklarında bile egzersiz yapmak için her fırsatı değerlendirmelidir.

C. yaşlandıklarında egzersiz miktarlarını azaltmalıdır.

D. hem bilişsel hem de fiziksel açıdan kendilerine meydan okumalıdır.

_____

SORU SETİ 2: Metindeki bilgiler aşağıdaki grafiklerde düzenlenmiştir. Grafikleri 10 boşluğu doldurarak tamamlayınız. Gerekli olduğu takdirde okuma metnine dönebilirsiniz. Cevaplandırırken kendi kelimelerinizi veya metindeki kelimelerin, öbeklerin ve cümlelerin Türkçelerini kullanabilirsiniz.

Egzersizin etkileri (Paragraf 1 ve 2)

• Zihinsel gerilemeyi engeller.	1.	2.

Deney süreci (Paragraf 3 ve 4)

Deney Grupları	2 Farklı Uygulama	35 gün sonra fareler içerisinde süt bulunan bir kabın içerisine bırakılır.	Farelerden beklenen davranış
3.	4.		5.

Deneyin sonuçları (Paragraf 5 ve 6)

	Egzersiz yapan grup	Egzersiz yapmayan grup
Yaşlı Grup	6. 7.	8. 9.
Genç Grup	• Genç fareler platformu yaşlı farelerden daha hızlı buldular. 10.	

Teşekkürler...

CV

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<tr><td colspan="2" align="center">PERSONAL INFORMATION</td></tr>
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