



**THE READABILITY OF READING PASSAGES IN
PRESCRIBED ENGLISH TEXTBOOKS AND THAI
NATIONAL ENGLISH TESTS**

BY

MISS THANAPORN SRISUNAKRUA

**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF
PHILOSOPHY IN ENGLISH LANGUAGE TEACHING
LANGUAGE INSTITUTE
THAMMASAT UNIVERSITY
ACADEMIC YEAR 2018
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DISSERTATION

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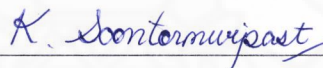
ENTITLED

THE READABILITY OF READING PASSAGES IN PRESCRIBED ENGLISH
TEXTBOOKS AND THAI NATIONAL ENGLISH TESTS

was approved as partial fulfillment of the requirements for
the degree of Doctor of Philosophy (English Language Teaching)

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Chairman



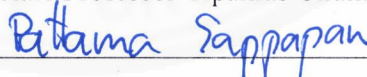
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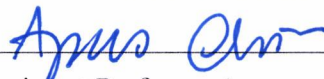
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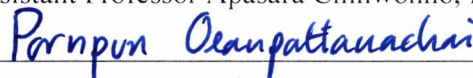
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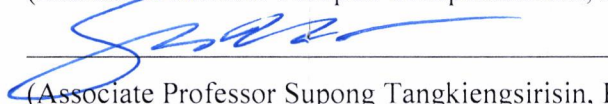
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ABSTRACT

Readability has long been regarded as a significant aspect in English language teaching as it provides the overall picture of a text's difficulty level, especially in the context of teaching and testing. Readability is a practical consideration when making decisions on materials to match a text with target readers' proficiency. A suitable difficulty level will ensure that students receive the most benefit from the materials. However, few studies have compared the readability levels of teaching and testing materials in terms of the difficulty of passages. The present study, therefore, aims to explore the readability of reading passages in English textbooks and Thai national English tests based on three aspects: readability level, linguistic characteristics, and topic areas.

Two sets of corpora—the prescribed English textbooks (CPET) and Thai national English tests (CONET)—were generated and analyzed in order to find out the overall readability level, the linguistic characteristics, and the topic areas in the reading passages. The results revealed an incongruity in the readability levels. The reading passages compiled in the tests are more difficult than those found in the prescribed English textbooks. Regarding the linguistic characteristics, the results

revealed that the reading passages compiled in the prescribed English textbooks consisted of linguistic characteristics that are normally found in the easier reading passages whereas the linguistic characteristics in the tests are rarely found in the less difficult reading passages. In terms of topic areas, it is found that there were more differences than similarities in the topic areas analyzed from the prescribed English textbooks and the tests.

It can be concluded that the students in the present study have been instructed with simpler reading passages with easier linguistic characteristics and have been assessed with more difficult reading passages in the tests. Furthermore, the topic areas mainly found in the textbooks were not included in the tests.

It is recommended that all stakeholders in both teaching and testing administration be aware of the different levels of readability between the reading passages used as teaching and testing materials since incongruity could affect the students' learning and testing performance.

Keywords: Coh-Metrix, English test, English textbooks, readability, reading passages

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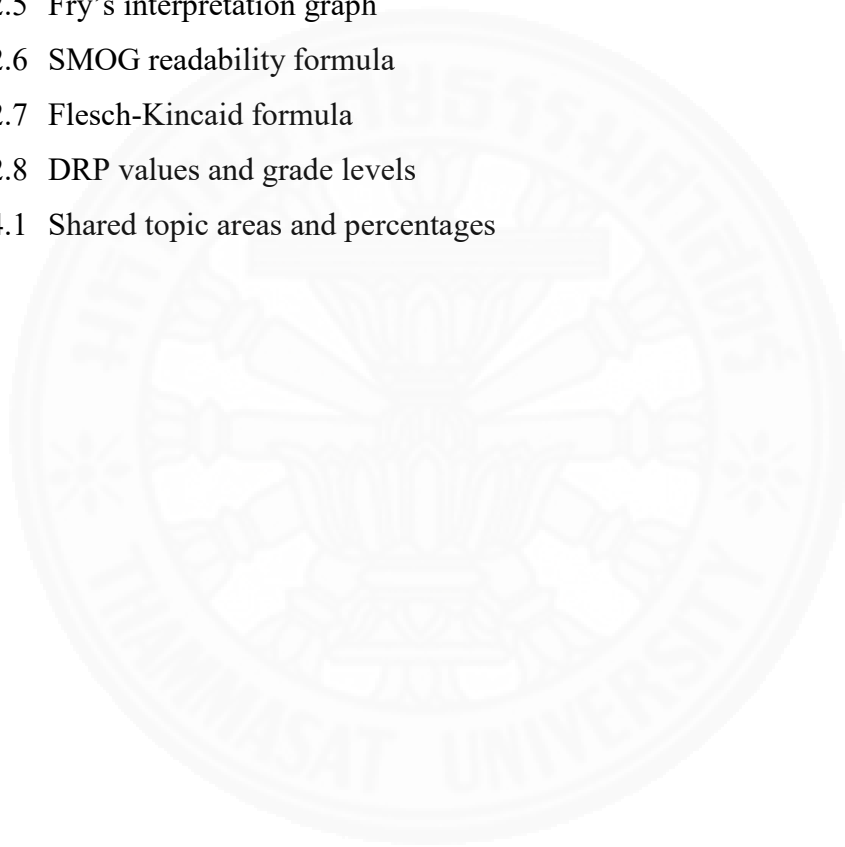
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LIST OF ABBREVIATIONS

Symbols/Abbreviations	Terms
CPET	Corpus of the reading passages in the prescribed English textbooks
CONET	Corpus of the reading passages in Thai national English tests



CHAPTER 1

INTRODUCTION

1.1 Thai educational system

The Thai Educational system is composed of three main branches: formal education, non-formal education, and informal education. The formal education consists of 12 years of free basic education. The basic education system is divided into two parts: elementary schooling, consisting of 6 years (Prathom 1 to Prathom 6) and secondary schooling, consisting of 6 more years (Mattayom 1 to Mattayom 6). Non-formal education is another branch of the educational system which aims at providing educational opportunities for the out-of-school population. The main focus of this branch is to promote lifelong learning. The last branch of the Thai Educational system is informal education, which aims at promoting the concept that learning can take place outside the traditional classroom. The conduct and support of this branch are reinforced in the form of district and provincial libraries and museums, as well as free educational television and radio programs. These latter two main branches are not the focus of this present study; therefore, they will not be discussed in detail.

The formal education in Thailand, as prescribed in the National Curriculum Act (2008), has listed eight core subjects to be taught in all grades of basic education: Thai language, mathematics, science, social studies, religion and culture, health and physical education, arts, careers and technology, and foreign languages. The learning standards in these core subjects are set by the Office of Basic Education Commission (OBEC), which is administered under the Ministry of Education. The OBEC is responsible for proposing educational policy, developing plans, setting up educational standards and core curricula in line with the national scheme for education, and providing equitable education opportunities in all areas of Thailand.

In order to assure the quality of Thai education, another public organization under the name of the National Institute of Educational Testing Service (NIETS) has been set up. The main mission of this organization is providing test services to assure that the common core standards for the Thai education system have been met with

equitable quality. The main mission of this organization is to provide services in the area of educational testing and evaluation and to be the center for the cooperation of national and international testing services. The NIETS is responsible for designing the national test in order to evaluate the quality of and to administer basic education. One of the tests provided is called the Ordinary National Educational Test (O-NET), which is designed to test the quality of formal education (elementary and secondary schooling). The O-NET covers eight core subjects prescribed by the OBEC. All students are required to take the O-NET after they finish their study at the elementary level (Pratom 6), lower secondary level (Mattayom 3), and upper secondary level (Mattayom 6). The O-NET scores at the upper secondary level are also used as part of university admission.

1.2 Rationale of the study

This present study aims at exploring and comparing the difficulty level between the reading passages used in the prescribed English teaching materials for upper secondary students in Thailand and the reading passages employed in Thai national English tests for upper secondary students—and determining whether they are at a balanced level of difficulty. One reason why this area is worth exploring is partly because of the reactions to the O-NET. Every year, there is social controversy after the O-NET administration. Students, as well as their parents and teachers, keep complaining about the quality of the O-NET, especially in the aspect of its difficulty level. The major complaint is about the students' O-NET scores. For many years, the average scores for every subject being tested were less than 60%, and the lowest mean score was found in the English subject. As can be seen in Table 1, the average scores on Thai national English tests from academic years 2008 to 2017 were less than 31% (<http://www.niets.or.th/th/>).

Table 1.1*Average scores for English subject*

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mean	30.68	23.98	19.22	21.80	22.13	25.35	23.44	24.98	27.76	28.31

These low scores on Thai national English tests require further exploration. When the test results show low scores, it might be evidence that something is possibly wrong, either about the tests or the testees. Do Thai Mattayom 6 students actually have low English proficiency? Do Thai national English tests meet the standards of core curriculum? Is there a balance in the difficulty level between the teaching and testing materials? In order to find out the answers to these questions, it is necessary to do more research in this area. The expected outcomes might reveal that there might not be a balance in the difficulty level between the teaching and testing materials. The gained findings could support for test developers and help raise awareness for selecting testing materials that can be used in high stakes tests such as Thai national English tests. If there is a match between the difficulty level of the teaching and testing materials, the students' national English test scores might be higher.

Since Thai national English tests are designed to be used as an achievement test to measure the overall English ability of students after they have finished their study in elementary (Pratom 6), lower secondary (Mattayom 3), and upper secondary (Mattayom 6) levels, what is tested should definitely reflect what has been taught in the educational program and the common core standard set by the OBEC. Brown (2004) has stated that an achievement test should be designed to match the specific course or program. It should be based on the teaching materials so that it can be used to determine the test-takers' achievement after participating in those particular courses. In the Thai context of testing, this aspect of Thai national English tests has not been researched. That is to say it is difficult to find research studies presenting information about the difficulty level of the testing materials, especially studies comparing the teaching and testing materials. Although the NIETS has attempted to assure the validity and standard of Thai national English tests by funding research studies, the results are not really applicable in the area of foreign languages, especially the subject of English.

According to the list of research titles funded by the NIETS from 2009 to 2015, no study has focused on the area of foreign languages or English. Most of the funded research studies are in the areas of how to develop assessment tools for the national test, how to make use of the test results in order to develop learning quality, finding out the school effectiveness in terms of the students' development and the factors associated with learning through the national test scores, and exploring the possible factors affecting the scores obtained from the national test. Although there is one study that seems to provide insight related to the factors affecting low scores on the O-NET, the focus of the study excluded the area of English. Thus, it can be concluded that there is still a huge gap in this area; there is no research conducted in the Thai context to explore the balance of the difficulty level between what has been set as the standard for learning and teaching and what has been used in the tests. Therefore, more research is needed in this area in order to explore the readability between the teaching and testing materials.

Apart from the gap of research level in the Thai context, the review of the literature in the field of readability also demonstrates a big gap. Most studies in the field of readability do not compare teaching and testing reading materials. According to the review, it was found that there are two main branches of studies in the field of readability research. First, studies have been conducted in order to assess the readability level of reading materials and these have been compared to the obtained results of the reading performance of the target readers (Begeny & Greene, 2014; Burton, 2014; Fuller, Horlen, Cisneros, & Merz, 2007; Heydari, 2012; Hippensteel, 2015; Izgi & Seker, 2012; Kouamé, 2010; Mahmood & Mahmood, 2011). The results indicated that readability formulas are one of the effective tools for measuring and evaluating the difficulty level of the documents, either in the form of texts, textbooks, reports, survey questionnaire, etc. The gained results of readability analysis also confirm the practicality of using readability formulas to analyze reading materials to suit the target readers.

Secondly, the review of the literature shows that some studies aimed to improve the effectiveness of the readability formulas. These scholars attempted to add more features to help analyze the readability level of the target reading materials. For example, there have been attempts to integrate more aspects related to the reading

passages, such as the amount of cohesive markers, lexical and syntactic features, and the amount and difficulty level of textbook-based vocabulary and idioms. Additionally, other features related to readers, such as their background knowledge, topic familiarity, and the reader's feeling in terms of difficulty level, are sometimes added when doing readability analysis (Mikk & Elts, 1999; Ozasa, Weir, & Fukui, 2007; Rezaee & Norouzi, 2011; Tabatabaei & Bagheri, 2013; Thienpermpool & Ward, 2011; Vajjala & Meurers, 2012). From these studies, the results showed that they could be used as valid predictors of difficulty level. Therefore, there have been studies aimed at combining these features into a tool that could be used as a powerful predictor of readability level.

To improve the validity of the readability formula, Coh-Metrix is being developed and studied to be a tool for analyzing the linguistic features related to the comprehension process from the word level to the situation model of comprehension (Graesser, McNamara, Louwerse, & Cai, 2004). Many studies have been conducted to validate this tool, and researchers have found that the results gained from Coh-Metrix are valid and correlate with the results obtained from the traditional formulas (Crossley, Greenfield, & McNamara, 2008; Crossley, McCarthy, Dufty, & McNamara, 2007; Gupta, 2013). When comparing the Coh-Metrix results with other factors, such as the reader's reading times and content recalls, Coh-Metrix also shows positive correlations (Duran, Bellissens, Taylor, & McNamara, 2007).

Considering the above review, it is clear that readability formulas are practical tools for determining the difficulty level of reading passages; however, the area of research conducted in this field specifically focuses on measuring difficulty level and uses the results to match reading texts to appropriate readers, and exploring ways to improve the formulas to be able to provide more valid and effective results. Referring to the Thai context, few studies in the area of readability have been conducted. So far, only one study has developed a new readability formula using a vocabulary-based index for Thai university students (Thienpermpool & Ward, 2011). However, the focus of this study is to develop and validate a new tool in order to determine the difficulty level of reading passages used in the subject of English.

Up to the present, there has been no study aiming at exploring the balance in the difficulty level between the prescribed teaching and testing reading materials,

especially in high stakes tests such as Thai national English tests, which are used to test students all over Thailand.

To sum up, readability research can be academically valuable in the Thai context, especially in the area of exploring a balance in the difficulty level between the passages used in English teaching and testing materials. The obtained findings can illustrate the actual level of readability, the linguistic characteristics, and the topic area of the reading materials used in the teaching and testing contexts. Moreover, the investigation of how text difficulty is analyzed can also be used as one criterion for teachers, test designers, material developers, and administrators when considering the materials to be used in teaching, learning, and testing situations.

1.3 Research purpose

This research intends to explore and compare the difficulty level of passages found in prescribed English textbooks by the OBEC and those used in Thai national English tests in order to gain greater understanding about the readability level, linguistic characteristics, and topic area of both sources. The main objective of this research is to ascertain whether there is a balance in terms of the text difficulty level of passages used for teaching and testing. In doing this, the expected outcomes can provide a clearer picture of the texts' difficulty used for teaching and testing and to see whether they are at the appropriate balance of readability level, linguistic characteristics, and topic area. The results of this study, therefore, can provide policymakers, teachers, and material designers with greater understanding of text readability and guidelines for text selection for teaching activities and testing materials.

1.4 Research questions

1) What are the readability levels of the reading passages used in the English textbooks prescribed by the OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different?

2) What are the linguistic characteristics of the reading passages used in the English textbooks prescribed by the OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different?

3) What are the topic areas of the reading passages used in the English textbooks prescribed by the OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different?

1.5 Research scope

This study aims at determining and comparing the difficulty level of the reading passages used as the teaching and testing materials in the Thai upper-secondary school context. For the teaching materials, all reading passages in the English textbooks prescribed by the OBEC were used as the main teaching materials for the upper-secondary level (M.6). They were compiled as the corpus of reading passages in the prescribed English textbooks by the OBEC (CPET). The total number of English textbooks is 13. For the testing materials, only reading passages in Thai national English tests—reading sections administered from 2005 to 2011 (seven academic years)—were compiled as the corpus of the reading passages used in Thai national English tests (CONET). Other sections of Thai national English tests were not included in this study. More recent tests after the academic year 2011 could not be added to the corpus because they were not publicly accessible.

1.6 Significance of the study

The results of this study can provide a clearer picture regarding whether there is a balance of readability levels, linguistic characteristics, and topic area between the passages used in the teaching and testing materials in Thailand. The results can also be used as a guideline for test designers, teachers, and material designers. Test developers can make use of the results to choose passages that more appropriately match the target testing context and the level of the testees. The teachers and material designers can use the results to support the selection of reading materials or even

analyze the prescribed passages in terms of readability level, linguistic characteristics, as well as topic familiarity for their teaching contexts and target students.

1.7 Definitions and operationalization of key terms

Difficulty level

In this study, the term difficulty level is defined as the difficulty level in reading comprehension which might be the result from the readability levels, linguistic characteristics, and topic areas of the target reading passages.

Readability

This term is defined as the difficulty level or the ease with which a reading passage can be read and understood. It is often used interchangeably with “level of text difficulty” or “text accessibility.” In this study, the readability is the results gained, analyzed, and interpreted from three readability formulas: Flesch Reading Ease, Flesch Kincaid Grade Level, and Coh-Metrix L2 Readability; the linguistic characteristics analyzed from Coh-Metrix program; and the topic areas.

Linguistic characteristics

This term is defined as the linguistic characteristics analyzed by the Coh-Metrix program (categories 1 to 10: indices 1-103), such as descriptive information about the target text, lexical diversity, word information, syntactic complexity, and so on (see Appendix A).

Topic areas

This term refers to the subjects or the themes of the reading passages gained from two sources: prescribed English textbooks by the Office of Basic Education Commission (OBEC) and Thai national English tests (O-NET).

Reading passages

This term refers to the reading passages gained from two sources. The first source is the reading passages that are used in the English textbooks prescribed by the Office of Basic Education Commission (OBEC) as the sources of certified textbooks to

be used in all Thai secondary public schools. The second source is the reading passages employed in Thai national English tests (O-NET).

CPET

This term refers to the corpus of reading passages in the prescribed English textbooks by the Office of Basic Education Commission (OBEC). All accompanied illustrations, such as pictures, tables, graphs, etc., will be excluded.

Prescribed English textbooks

This refers to the list of English textbooks provided by Office of the Basic Education Commission (OBEC) as the certified textbooks for use as the teaching resources for grade 12 (Mattayom 6), which total 13. Public schools all over Thailand are required to select the English textbooks from this list to be used as the main teaching materials. Each textbook has approximately 8-16 units. In each unit, there is at least one reading passage.

CONET

This term refers to the corpus of reading passages used in the reading section of Thai national English tests (O-NET) for grade 12 (Mattayom 6) students administered from years 2005 to 2010. All accompanied illustrations, such as pictures, tables, graphs, etc., will be excluded.

The ordinary national education test (O-NET)

This term refers to the English test that is used as the ordinary national education assessment for all Thai grade 12 (Mattayom 6) students. It is designed and validated by the National Institute of Educational Testing Service (NIETS). The objective of this test is to assess the overall English achievement, which is one of the eight core subjects, of the students after they have finished their secondary school education. The scores obtained are also used as part of the university admission.

1.8 Organization of chapters

There are five chapters in this present study. Each chapter shows necessary components in each stage of the research. The detailed explanation is hoped to give a brief and clear summary of each chapter.

Chapter 1 includes an introduction to the background of the study. The brief explanation on the Thai educational system is clarified. The rationales of the study are stated to show significant problems and the need of more research in the area of readability in the Thai context. Other components of research are also illustrated: the research purposes, the research questions, the research scope, the significance of the study, the definitions of key terms, and the organization of the study.

Chapter 2 includes review of literature related to the definitions and processes of reading comprehension, texts and the factors affecting textual difficulty, text selection, readability and readability formulas, and the review on Coh-Metrix.

Chapter 3 clarifies the research methodology. It explains the process of collecting and building the corpora and how the data were analyzed and interpreted. Each of the steps involved in conducting the study is described and justified.

Chapter 4 presents the results of the study according to the research questions.

Chapter 5 includes a brief summary and the discussions of the significant findings gained from the data analysis. The recommendations regarding the teachers, the test preparation, and the list of prescribed English textbooks are also illustrated. This chapter ends with the conclusion.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Reading comprehension: Definitions and processes

Reading seems to be one of the simple terminologies that is easily understood by people in general. However, the term has been used differently by different people during different periods of time (Nuttall, 2005). When referring to reading, it is necessary to learn from its definition as well as its underlined process. Exploring these aspects could also represent the developments, trends, and focuses on how reading is viewed, taught, and studied in different periods of time. Following is a discussion of the on-going views of reading definitions and how reading is processed.

During the first era, reading was influenced by the view of behaviorism. During this period of time, learning was believed to occur based on habit formation. With an appropriate stimulus and a response, humans can acquire learning through automatic conditioning processes (Omaggio, 1993), according to this view. In reading, habit formation can be accomplished in the form of recognition. When readers recognize words and their sound and meaning or keep using cognitive strategies, they can combine these in order to form a comprehension process. Reading can be considered as the result of recognition. It is the ability to create a link between the graphemes and phonemes of the target printed text. Gough (1972) referred to reading as the linear process of constructing meaning from letters, words, phrases, and sentences. The target text here is viewed as a code and the reader's responsibility is to decode the text. Widdowson (1979) also viewed reading as a decoding process and defined reading as "the process of getting linguistic information via print." The linguistic information based on Widdowson's definition can be restricted to syntax, morphology, and lexis, which are encoded in the printed materials (Liu, 2010). Nuttall (1982) and Perfetti (1985) added the role of sounding out the recognized words to the decoding process. They defined reading as the transforming of printed words into spoken words and extracting the meaning out of them. Based on these definitions, the

vital role of reading can be seen to rely on the process of decoding. It is a one-directional process from the written text to the reader.

Snow, Burns, and Griffin (1998) and Urquhart and Weir (1998) also added the role of interpretation in order to expand the definition of reading. They defined reading as the process of getting the meaning in the written language by using knowledge of the written alphabet and sound structure to interpret the encoded information. Though they use the term “interpretation,” the sources of information used in the interpretation process rely on the text. Therefore, it can be summarized here that decoding from the smallest unit of the target text in order to obtain information is the key action that readers use in the reading process.

From these various definitions, it can be seen that the reading comprehension process, during the earlier phase of its interpretation, was referred to as a decoding process. Readers employed cognitive actions in order to decode and understand the text from the lowest level—the word. Many reading scholars concluded that it is necessary to understand how these cognitive processes work together to create reading comprehension (Koda, 2005; Perfetti, 1999; Pressley, 2006).

Lower-level processing represents the more automatic linguistic processes conducted by the reader while accessing the text. Grabe (2002) clarified that lower-level processing involves three basic cognitive activities: lexical access, syntactic parsing, and semantic proposition formation. All three processes are conducted as part of working memory activation and they are likely to be carried out automatically while interacting with the text. For many times, they are referred to as the skills oriented because the whole process is mostly done unconsciously.

Lexical access, in other words, word recognition, is generally accepted as one of the most essential components in the reading comprehension process. It can be asserted that the goal of reading comprehension cannot be successful if readers cannot make any sense of the words included in the text. This concept is similar to what Grabe (2002) and Stanovich and Stanovich (1995) stated that fluent reading comprehension is not possible without rapid, automatic, and effective word recognition of vocabulary. If readers cannot recognize or recall their knowledge of the word, it means that no sense of the texts will be extracted or gained. In order to recognize a word, readers are required to be able to activate the connection between the orthographical and

phonological form of the word, and create a meaningful connection between the syntactic and semantic information of that particular word. All of these activations are the ways in which readers make rapid access to their mental lexicon. Perfetti (2007) also described these as the interactions of activated orthography, phonological, syntactic, and semantic processes. This activated process is generally carried out very rapidly and automatically because it is very likely that readers will not be able to reflect on how they make use of this process consciously. For readers, at the moment that they are exposed to the orthographical form of the word, they cannot stop themselves from accessing the meaning of that word. Good readers can recognize the word in less than a tenth of a second and about 98-100 percent of all the words in a text at some basic meaning level (Grabe, 2002). Moreover, Nation (1997) also claimed that successful reading comprehension of the text will be reached if readers have about 95-98% vocabulary coverage, i.e. readers can recognize about 95-98% of the words contained in the reading text. Therefore, word recognition is one of the basic components of lower-level processing that readers should master.

In addition to word recognition, syntactic parsing is another key component of lower-level processing. Readers are required to put words together to form basic grammatical information to support clause-level meaning. That is to say, readers need to be able to extract the syntactic information of the words—syntactic parsing—and put them together for creating the clause-level meaning of the text. It is generally accepted that syntactic parsing is as essential as word recognition and it shares a major contribution to reading comprehension (Fender, 2001; Grabe, 2005; Perfetti, 1999; Perfetti, Landi & Oakhil, 2005). It can be shown that syntactic knowledge, which covers the knowledge of determiners, word ordering, types of clauses, tenses, modality, and other grammatical information of words, could help in constructing the comprehension of the text. Apart from this, research studies have also mentioned that syntactic knowledge has effects on the comprehension processing time (Carpenter, Miyake, & Just, 1994; Gernsbacher, 1990 as cited in Grabe, 2009b). Additionally, syntactic knowledge is also a key support for forming a semantic-proposition unit. It is argued that meaningful units cannot be extracted without the syntactic parsing of clauses and sentences (Grabe, 2009b)

Semantic proposition formation is also an essential key in the comprehension process. It can be claimed as the last stage of lower-level processing. Generally, after readers recognize words, using their syntactic knowledge to put the words together at the phrase, clause, and sentence level, they will extract the meaning from this in order to create semantic meaning units so as to store units of comprehension for the overall text comprehension (Perfetti & Britt, 1995, as cited in Grabe, 2009a). Normally, semantic proposition formation is described for text analysis, which aims at analyzing the functional meaning of the clause structure. In order to form a semantic unit, readers will create a semantic proposition by focusing on the predicate or a verb of the clause and find the nodes that mostly are subject who does the action of the predicate and the object of that predicate. With these links between predicates and their nodes, meaningful units of information from the text are created and linked together to provide a higher level of meaning from the text. Many studies have concluded that the numbers of proposition units in sentences are a part of text processing and they have an effect on the comprehension processing time. In other words, it is likely to take more time for comprehension processing if the sentences or texts contain many complex semantic proposition units (Kintsch, 1998; Rapp et al., 2007; Singer & Leon, 2007, as cited in Grabe, 2009b). Generally, the process of forming a semantic unit is rather automatic. It is not easy to have conscious control over the process of forming meaningful unit propositions unless there are some complications or if difficulties occur. In this case, readers may have to stop and step back in order to reconstruct the proposition unit consciously so as to gain the most appropriate unit of meaning.

Above are brief descriptions of what sub-processes can be found at the lower-level processing of the comprehension process. All of these components are relatively automatic, especially for good readers. These lower-level processes are likely to occur and to be activated in one's working memory, which means that they all are active for a very short period of time. If they are correctly formed, they will be combined rapidly to create a network of meaning of the text at a higher level. However, if they are not formed appropriately, information might be lost and the reader will have to go back to the text and reactivate all of them again. These could increase the resources used and the processing time, which would result in an inefficient reading comprehension process. In order to support and enhance effective reading, reading

texts should be analyzed to find out the factors used at lower-level processes, such as amount or level of word familiarity or frequency, the level of syntactic complexity, and the number of proposition units of meaning provided. With this information, a particular text can be analyzed in order to ascertain the level of text difficulty or readability level. Therefore, it is possible to match the text with the most appropriate group of readers or to provide more suitable preparation before having the reader read the text.

Lower-level processing, though, is one key part; it is not the only component of the reading comprehension process. The next section will discuss another essential part of the process—higher-level processing.

The notion of higher-level processing began with changing views of language learning. From this development, how reading is defined was also adapted. The cognitive view of language learning has integrated the role of the reader into the process of reading. Goodman (1967, as cited in Paran, 1996) has defined reading as a psycholinguistic guessing game. In order to read a text, readers are required to sample the text, create hypotheses, confirm or reject the hypotheses using their own background knowledge and experiences, and continue this cycle until the whole meaning is extracted. The reader, therefore, is the center of the reading process, not the text. It can be said that reading is the process of making guesses about and interpreting the printed information with the integration of the reader's background knowledge and experiences. Smith (1994) supported this by claiming that reading is a purposeful and rational process which depends on the amount of background knowledge and the reader's expectations in order to make sense of the written language. This can be called top-down processing because the process begins from what is in the mind of the reader. Readers are the center of the reading process. Grabe and Stoller (2002) synthesized a list of higher-level processes as follows: the text model of comprehension, the situation model of reader interpretation, background knowledge or schema use and inferencing, and executive control processes.

The text model of comprehension is created from the combination of actively-formed proposition units that are formed in the lower-level processes. Kintsch (1998) and Pressley (2006) as cited in Grabe (2009b) stated that the text model of comprehension also requires the use of inference links to bridge or connect the new

propositions to the network of already-active propositions. Some examples of this inference link are conducted through the overlapping of words, noun phrases, or pronoun references. To clarify this process, when a new sentence is read, a new proposition is created from the combination of word recognition, syntactic parsing, and semantic proposition formation. The new proposition that contains the repetition of ideas or some elements similar to the previously-formed proposition will be selected and added to the network of meaning so as to form the text model of comprehension. Apart from creating links through the repetition of ideas or overlapping of words or phrases, the new proposition unit can be linked through the use of discourse propositions indicating contrast, examples, concession, etc. Therefore, readers that wish to have successful reading comprehension should efficiently form new proposition units and add them to previously-active proposition units so as to create a cohesive network of ideas of the text. The reading text which is cohesively written tends to be more simple for the reader to create the text model of comprehension. Halliday and Hasan (1976) identified five general categories of cohesive devices that could create and enhance the cohesion and coherence of texts. They are reference, ellipsis, substitution, lexical cohesion, and conjunction. Therefore, being able to analyze how the text is cohesively composed can help readers identify the readability level of the text being read, which finally could enhance the reading comprehension process.

Creating the text model comprehension is not the only process conducted at higher-level processes; readers are required to bring their reading experiences or schema to help with interpreting the meaning represented in the text. They are required to create a situation model of textual interpretation. Goldman, Golden, and van den Broek (2007), as cited in Grabe (2009b), referred to the situation model of textual interpretation as a situation model that “reflects the integration of prior knowledge with the information explicitly ‘in’ the text.” From this concept, it can be interpreted that readers are required to integrate some aspects of their existing knowledge with the information provided in the text in order to access the overall understanding or comprehension of the text. This is another component of the higher-level process that readers need to conduct so as to fulfill the process of comprehension. In order to deeply comprehend the text, readers should bring their schema beyond the text being read to create a situation model of interpretation. This is congruent with schema theory, which

states that readers activate their existing knowledge and combine it with the information provided in the target reading text (Cook, 1997; Kintsch, 1998). Readers bring both content and formal schema to their reading process. Content schema refers to the knowledge of the content domain of the text and formal schema is related to the knowledge of rhetorical organization and structure of various text types (Carrell, 1987). Studies have been conducted and revealed that schema has effects on reading comprehension. Especially in the EFL context, it is shown that integrating schema-activation activities or preparing appropriate content schema for the reader can boost his or her performance in reading comprehension (Burgoyne, Whiteley, & Hutchinson, 2013; Chou, 2011; Clark & Kamhi, 2014, Maghsoudi, 2012).

As can be seen in the above, readers are also required to make the most use of their schema, both content and formal schema, and inferences, as well as have executive control over their skills and strategies in order to reach the ultimate aim of reading—comprehension. Therefore, completing the higher-level processes depends very much on the level of proficiency and experience of the reader. Grabe and Stoller (2002) have stated that difficulties in reading may occur when readers do not have adequate background information, linguistic resources, or reading experience in the target language. In order to eliminate this difficulty, readers are required to engage in reading the text and tasks at the appropriate level to their ability or they are required to have proper preparation before approaching the reading text.

Since the role of readers and their schema has received much attention, the definitions and processes of reading have been expanded. Rumelhart (1977) for example has stated that reading includes the role of the interaction between the text and readers. Reading is defined as something that involves the reader, the text, and the interaction between the reader and the text. The interaction here can be referred to as the way that readers make use of their mind, schema, and also the information from the printed text for meaning extraction. Based on Rumelhart's idea, reading is a way of utilizing several knowledge sources simultaneously, either from the target text or from the reader in order to extract the meaning of the text. Stanovich (1980) provided more insight into the reading process by discussing the idea that readers make use of various knowledge sources, either from the text or their own schema, interactively, to compensate their understanding of the text. Grabe (2002) and Grabe and Stoller (2002)

also followed the interactive trends and defined reading as the ability to derive and form interpretations of the written text by using various sources of information. This view of reading also has changed how reading is processed.

The interactive model of text processing was first credited to Rumelhart (1977), with the concept that the reading process is sequential. Stanovich (1980) also supported this idea by saying that “a reading pattern is synthesized based on information provided simultaneously from several sources” (p.35). Interactive processing is considered to be the most comprehensive description of the reading process (Anderson, 2008). It is a process that combines the key features of both the bottom-up and top-down processing elements. Grabe and Stoller (2002) mentioned that the reader is required to be able to recognize the word in a fast and efficient way and combine the use of his or her background knowledge to help make inferences and predictions about the text. In order to master reading, readers are required to be interactive and flexible in their use of their cognitive activities. For readers, if they have already mastered these skills, they would be able to comprehend the texts with ease. On the other hand, they will face many problems in reading if they do not have sufficient resources to deal with the target text at hand. This would affect their reading performance. Readers with less mastery of employing different processes, various resources, and strategies interactively in reading will likely have poor reading performance.

Interactive processing, however, is unique to each individual reader. Even if it metaphorically tries to mirror actual reading activities, it is necessary to bear in mind that this kind of process depends on individual characteristics. Example variations can be either interactive bottom-up processes or interactive top-down processes (Urquhart & Weir, 1998). All of these variations result from the reader’s level of reading ability, the text difficulty and characteristics, reader’s strategic knowledge, the purpose of reading, as well as the kind of target reading tasks at hand. Therefore, it is not possible to definitely prescribe specific sequences of interactive process in reading. What can be concluded is that this kind of process requires the interaction of the reader to make use of both lower-level and higher-level processing in order to compensate for weaknesses or difficulties found in the reading activity.

In sum, these three types of processing are the performances that readers should master. Readers are encouraged to be flexible in employing different

comprehension processes in order to comprehend the text. That is to say, it might be more useful to utilize all sources of actions interactively, either from the bottom-up or top-down level.

How the reader processes the reading passages is considered as one key element of reading construct. Being able to conceptualize the construct of reading can promote deeper understanding of what a reading is. This could further inform about other aspects of reading, for example, reading assessment.

2.2 Reading assessment

Reading assessment has long been regarded as one of the effective ways to inform various stakeholders involved in reading, for example, readers, teachers, and policy makers. Via the use of reading assessment, the reader would have a clearer picture of their own reading ability, the teacher receives valid information to help them prepare their instructions to meet the needs of their students, and the policy maker can develop a constructive and manageable plan for their institution based on the reliable sources of evidences.

Reading assessment has served various purposes. Grabe (2009b) states five main purposes of reading assessment: reading-proficiency assessment, assessment of classroom learning, assessment for learning, assessment of curricular effectiveness, and assessment for research purposes. These purposes can be used as a guideline for organizing reading assessment. They can determine what to assess and how to perform the assessment. The first two purposes (reading-proficiency assessment and assessment of classroom learning) are overlapping in terms of their determination of what and how to assess. These two purposes aim at assessing the overall reading proficiency. Mostly, the assessment methods are conducted by using the standardized test and/or summative test because they could provide the results about students' reading ability, skills, and knowledge over a period of time. However, more tools can be employed for the assessment of classroom learning. Teachers may select the informal and alternative assessment such as quizzes, self-report, and interview. The third purpose "assessment for learning" is slightly different from the second purpose because it focuses more on the process of learning rather than on the product. The tools used for assessing reading

are focusing on engaging the students in their own learning and responding to their own weaknesses. The forth purpose “assessment of curricular effectiveness’ is acting like the program evaluation. The tools used are standardizing test, teachers’ interview, summative test as some examples. The obtained data is generally used for large-scale assessment or need analysis. The last one focuses on assessment for research purposes. This includes the uses of assessment in the area of research study, for examples, a research study that uses the assessment tools to assess the reading level or find out the learning outcomes after attending a course, and a research study that develops or validates a new assessment method.

Afflerbach (2008) also proposes three main questions that could also be used as a guideline for organizing the reading assessment. They are why, what, and how we assess. The question on “why do we assess?” is partly overlapping in terms of its determination of reading assessment purposes suggested by Grabe (2009b) such as using the assessment information to determine students’ reading achievement, to inform instruction, to illustrate the strengths and weaknesses of a reading program. Moreover, the question “why” also provides useful information which varies depending on who will use that specific information. The second question “what do we assess?” could elaborate the focus of reading assessment. The answer to this question would show how reading achievement is conceptualized. The specified reading achievement would help in designing reading instructions and selecting relevant assessment procedures. The last question proposed is “how do we assess?” This one focuses on exploring the method to examine and evaluate the reading achievement or development to suit the reading purposes and the construct of reading achievement. Thus, it can be concluded that the three questions are essential in administrating reading assessment.

2.3 Texts and the factors affecting textual difficulty

No matter what procedures are employed in reading assessment, the most important elements that should also be taken into consideration are related to the nature of reading. Anderson (2008) stated that there are four key elements involved in reading: the reader, the text, reading strategies, and fluency. Readers are considered to be the major contributor to reading comprehension since it is the reader that manipulate the

use of strategies and control the level of fluency while reading. Though readers play a major role in reading, there is another part of the puzzle to complete the view of the reading.

It is necessary to also refer to the text as the second key element of reading. Texts can be defined broadly as objects that can be read. Without the text, the reader would have nothing to read and interact with, and then comprehensible meaning would not be gained. The diversity and characteristics of the text can lead to the level of ease or difficulty of the text. Many features of the text, such as words, syntax, semantics, and genre, are the components of textual complexity.

From the above mentioned, it can be assumed that there are key elements that can affect reading comprehension. The reader, strategies, and fluency are elements that are difficult to control since they possess individual qualities. The text, on the other hand, has more room to be analyzed and the features to be ascertained, specifically linguistic features, which could affect the level of readability. Therefore, it is worth conducting further analysis in order to figure out the features of the text that either increase or ease the difficulty in reading the printed text. This point can be linked to the process of text selection.

As stated above, a text can also be considered as a key to reading comprehension. Without the text, comprehension would not occur. There are many factors related to the text that should be given more consideration, especially when selecting the text or passages to be used in teaching and testing activities. Readers should be made aware of these factors since they can affect how easy or difficult the reading passage can be processed.

The levels of textual difficulty are the results of many different factors. The factors that stem from the reader themselves are for example their levels of reading ability, their strategic knowledge, and their background knowledge of the reading text and the reading tasks. The difficulties caused within the reader themselves need to be dealt individually. It is difficult to generalize one solution to other cases, so each of the difficulties should be dealt with depending on the individual reader and the reading situation.

Another source that could affect the processing of a text lies in the target text itself. There are some features of reading texts that can affect their difficulty level.

Bean (1996), Shanahan, Fisher, and Frey (2012), and Shoebottom (2016), agree that the most important features that affect the difficulty of the reading text is difficult vocabulary and the difficulty of the concept expressed. The text that consists of too many difficult words such as less frequent words, words with more than one meaning, etc. is difficult to comprehend. Taberski (2000) supported the vital role of vocabulary in reading by stating that learners tend to place more attention on unknown vocabulary if the text is far more difficult and beyond their language proficiency. Learners, therefore in this case have greater chance to be too frustrated and they might give up on reading the text (O'Malley & Chamot, 1990).

Apart from the vocabulary, how the text is organized is also another key feature of textual difficulty. The sentence structure or syntax and the degree of cohesion between the strings of ideas organized in the printed text could also affect the ease of comprehension. Shoebottom (2016) supported the notion that a text that is composed with longer sentences and complex noun groups requires more attempts to read than a text with shorter sentences and simple noun groups. The degree of cohesion also affects the organization of the reading text. Texts with high cohesion will make it easier for readers to make meaningful links between the ideas in the text. If cohesive markers are omitted or the location of the noun and its referent is far apart, it will be difficult to make a connection, especially for novice readers (Shanahan et al., 2012).

Moreover, a lack of topic familiarity of the target text could also lead to reading difficulty. It is believed that readers bring their own schema to interact with the content of the target text (Carter & Nunan, 2002). If the reader has adequate schema, this could enhance comprehension. On the other hand, having less background knowledge or familiarity with the content could pose many problems in reading comprehension and also affect reading performance. Many studies have been conducted to determine the effects of schema on reading comprehension (Brantmeier, 2005; Hammadou, 1991, Nassaji, 2003; Qian, 2002). Much evidence has been put forward to support the essential role of schema in the reading comprehension process. Burgoyne, Whiteley, and Hutchinson (2013) concluded that learners make use of their background knowledge in reading comprehension, both in teaching and testing content. It is suggested that relevant prior knowledge should be used to facilitate reading comprehension. Ajideh (2003) has observed schema theory-based pre-reading tasks

and indicated that schema activation activities during pre-reading tasks provided positive impressions for students. They also exhibited better reading performance. Therefore, it might be difficult or impossible for readers that have inadequate or no background knowledge on the topic of the target reading passages to have an effective comprehension. This is because they might not be familiar with the range of vocabulary contained in the target texts, so they cannot make a link between the new information and their existing knowledge.

As stated above, two main objective features that can affect the difficulty of a text are the linguistic features and the topic area of the text. These two aspects should be considered when choosing the texts to be used in teaching and testing situations.

2.4 Text selection

The text selection process should be well organized and those that are responsible for the text selection should be aware of the factors, features, and characteristics of the selected text in order to choose the most appropriate text that can support and enhance meaningful reading comprehension. However, choosing appropriate reading materials is not an easy job and should be considered as one of the first priorities while developing reading instructions or reading tests. The choice of a text can make or break the success of a reading lesson; therefore, this process should be done with care. It is impossible to have one text that can fit all contexts because reading and readers are complex. However, some general guidelines for text selection have been suggested. For example, the text should be rich in ideas and information, the text should have a level of difficulty appropriate to the students' reading ability, and the text should support the purpose of the lesson. Hedges (2000) also supported the notion that it is necessary to select a text that matches the purposes of the reading instructions. Apart from the purpose, she also suggested that the issues of the reader' interest, the variety of topics, the length of the text, and also the rhetorical organization can also be taken into consideration when selecting the reading text for the reading class. Additionally, Urquhart and Weir (1998) also stated the importance of text-based factors—that they should have equal status in the development of teaching and testing

input with the reader, task, and reading output. These text-based factors involve the text type, the propositional content, the topic familiarity, the vocabulary, the channel, the size, and most importantly, the difficulty level of the selected text.

Additionally, McNamara, Graesser, McCarthy, and Cai (2014) suggested that the text selection process for students should be in the range of their zone of proximal development. Carrell (1987) also supported the idea that in order to promote learning, the level of difficulty of the texts used in instruction should also match the students' capabilities. This is congruent with one theory of second language acquisition—the input hypothesis, suggested by Krashen (1977). According to Krashen, language can be acquired when the learner is exposed to comprehensible input from the target language. Comprehensible input is the situation where the learner is exposed to input at the level of $i+1$, where “ i ” means their current level of language proficiency. The “ $+1$ ” refers to one step beyond their actual language proficiency. That is to say, the selected texts should not be too difficult or too easy for students to comprehend. If students are exposed to a text that is too difficult for them to comprehend, this could discourage them from learning and also increase their negative attitude toward their learning (Higgins, 2009). The key point is that the text used should be just right for the student, not too easy or too difficult. Lazar (2004) backed up this point by suggesting that the texts used in instruction should be at the level that students can read but have not mastered. From these statements, it seems that the text-selection process places a lot of focus on the level of difficulty and also on the students' proficiency level.

Apart from assigning the text within the range of proximal development and the students' profile of proficiency level, a text can also be selected based on the pedagogical aspect. This method of text selection is the responsibility of the teachers; they need to study their pedagogical goals and then select a text that matches and serves that purpose. The selection, generally, is done based on teachers' intuitions and teaching experiences (Klare, 1974 - 1975). Moreover, students' opinions toward the selected text are sometimes used in making decisions concerning whether the selected text should be used in the following semester or not. Most language teachers are likely to do this in the teaching situation because it is more efficient in terms of time and effort. However, the process of selection that is purely based on the teachers'

experience or intuitions is very subjective. Different teachers with different background knowledge will definitely have different judgements based on their selection and the results are likely to be unreliable. Moreover, there is no guarantee that the selected texts will still be valid with different groups of teachers and students, or even with slight changes in pedagogical purposes.

Another method of text selection is to set up guidelines or criteria for selecting the text to be used in reading and teaching. This method can reduce the subjectivity problem; however, it is still not an objective method. Even if there are criteria for text selection, the sources of the criteria are still based on the teachers' judgements. There is no definite guarantee that all of the criteria will be interpreted in the same way by different teachers. Moreover, it is not possible to rely on the criteria when having to choose the texts for different groups of learners. Selecting the text based on certain criteria is, therefore, considered too context-specific.

The above general methods for text selection are affected by their subjectivity and most of the processes are conducted based on the teachers' or curriculum developers' judgements. This might create validity problems since the decision for selecting a text is definitely not based on the features of the texts. Therefore, there is a need to search for a more objective, specific, text-based way to be used in the process of text selection.

One method suggested is to use a readability formula to analyze the texts' linguistic features by indicating the level of difficulty in order to match the text to the target readers, teaching, and testing situations. More than 50 readability formulas have been developed to serve this purpose (Chall, 1984). Using the results from readability formula analysis can provide a more objective method of text selection. The results gained can be reliable and more objective when compared to other methods. Although Weaver and Kintsch (1991) have discussed the idea that there have been some warnings against the reliance on readability formulas for estimating textual difficulty, it is still widely used as the one criterion for text selection because of its practicality and because all of the judgements are based on the text.

2.5 Readability and readability formulas

Readability can be generally defined as a measure of the predicted text difficulty by using different kinds of readability formulas (Davies, 1995). That means that it is a method of using readability formulas to help in the measurement of difficulty level. Klare (1963), Pikulski (2002), and Richards, Platt, and Platt (1992) defined readability as the indicator or a measure of ease or difficulty of textual comprehension. Further, Alderson and Urquhart (1984), Read (2000), and Wallace (1992) expanded the definition by indicating that the level of ease or difficulty of measure of the predicted text difficulty by using different kinds of readability formulas the text is from the analysis of the features or various aspects within the text. Nuttall (2005) supported the notion that these features originated from both the structural and lexical features.

From the above definitions of readability, it can be stated that readability research is comprised of studies related to the prediction of the difficulty level of the reading text. This can be done through the analysis of the text's features that might cause problems or of the comprehension of the text. The definition provided by Davies (1995) includes the word "measure.", and this could imply that finding the readability of the text should be done objectively and possible outcomes are likely to be presented in numbers or percentages, or it might require the use of mathematical calculation. Other definitions involve the use of words such as "features," "various aspects" of the text, and specifically "structural and lexical features". In the present study, therefore, readability is an indicator of how easy or difficult it is to read the text passage based on the analysis of the linguistic characteristics within the passage.

In order to determine the readability of the text, one is required to analyze many features that the writer used to compose the text which either ease or obstruct the comprehension of the text. Therefore, many scholars try to develop and try out their readability formulas in order to find the best way of predicting the difficulty or readability level of the reading text. This issue will be reviewed in the following part.

2.5.1 Historical development of readability formulas

Readability formulas have been used as a tool to find out the level of difficulty or readability of reading texts. Danielson (1987) referred to them as

mathematical equations that are developed to link the reader's comprehension to the linguistic characteristics of the reading materials. They are also used as a practical tool for the process of text selection. The beginning phase of developing a readability formula began with the ultimate aim of finding ways to estimate the difficulty level of the text before matching the text to readers. In the first era of readability formula development, only two main variables were used in determining the difficulty level—syntactic and semantic complexity. Hiebert (2011) stated that syntactic complexity can be estimated by the number of words per sentence, whereas the analysis of syllables per words or the list of frequent words could be used to measure the semantic complexity of the text. In this era, some of the popular traditional readability formulas are presented. They are reviewed as follows.

The Flesch Reading Ease Readability formula is considered one of the most popular traditional readability formulas and is still used in the present. It was developed by Rudolph Flesch in 1948. This formula rates the text and produces the results on a 100 point scale. The higher the score, the easier it is to comprehend. The formula for analysis and the interpretation of the Flesch Reading Ease score are presented in Figure 2.1 and Table 2.1 respectively.

$$206.835 - (1.015 \times \text{ASL}) - (84.6 \times \text{ASW})$$

ASL = average sentence length
ASW = average syllables per word

Figure 2.1 Flesch Reading Ease formula

Table 2.1

Interpretation of reading ease score

Reading Ease Score	Description
0-30	very difficult
30-40	difficult
50-60	fairly difficult

60-70	standard
70-80	fairly easy
80-90	easy
90-100	very easy

(Zamanian & Heydari, 2012, p. 45)

Another popular traditional readability formula is the Dale-Chall Formula, which was developed by Edgar Dale and Jeanne Chall in 1948 (Dubay, 2004). It was designed to correct the faults of the previous readability formula—the Flesch Reading Ease formula. In order to do this, a list of 3,000 easy words which were known to fourth-grade readers were produced and incorporated with sentence variables to be the main formula for analyzing the level of difficulty. The Dale-Chall Raw Score is given in formula shown in Figure 2.2. Table 2.2 shows the grade interval conversion.

Raw Score = 0.1579 PDW + 0.496 ASL + 3.6365	
Raw score = reading grade of a reader that can answer one half of the test questions on a passage	
PDW	= percentage of difficult words (words not on the Dale-Chall word list)
ASL	= average sentence length in words

Figure 2.2 Dale-Chall formula

Table 2.2

Grade interval conversion

Raw score	Grade interval
4.9 and below	4 th grade and below
5.0-5.9	5 th -6 th grade
6.0-6.9	7 th -8 th grade
7.0-7.9	9 th -10 th grade
8.0-8.9	11 th -12 th grade

9.0-9.9	Grade 16 through 15 (college level)
10 and above	Grade 16 and above (college graduate)

(Zamanian & Heydari, 2012, p.45)

Apart for the above two readability formulas; another popular one was developed by Gunning in 1952 with the aim of developing a readability formula for adults. That one was called the Fog-Index. Two main variables were used for analyzing the level of difficulty. The first one was the average sentence length and the other one was the number of words with more than two syllables for each one hundred words. Figure 2.3 shows the formula used for the analysis and Table 2.3 shows the index used for the interpretation.

$\text{Grade level} = 0.4 \times (\text{Average Sentence Length} + \text{Number of hard words})$ <p>where A hard word is defined as a word that is more than two syllables long</p>

Figure 2.3 Fox-Index formula

Table 2.3

Fox-Index interpretation

Fox-Index	Estimated Reading Grades
17	College graduate
16	College senior
15	College junior
14	College sophomore
Danger line 13	College freshman
12	High school senior
11	High school junior

	10	High school sophomore
Easy Reading Range	9	High school freshman
	8	Eighth grade
	7	Seventh grade
	6	Sixth grade

(Zamanian & Heydari, 2012, p.45)

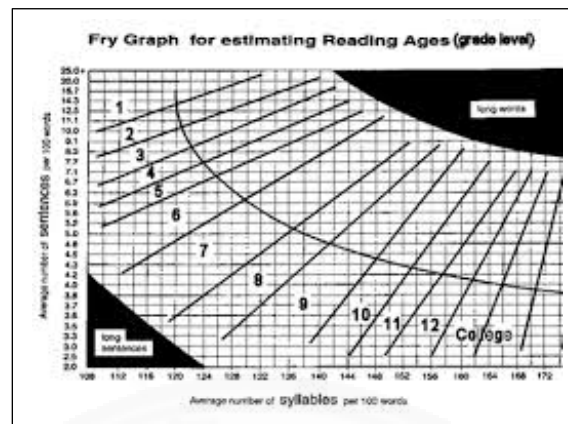
The above three popular traditional readability formulas brought a lot of attention to the field of readability studies. They provided an excellent tool for analyzing the level of difficulty of a text. Moreover, they also urged the need to develop better tools as well as to stimulate more studies on the factors affecting reading difficulty or reading success (Dubay, 2004). These three readability formulas also marked the end of classic readability studies.

Since there was a need to improve readability formulas, the second phase of developing began. In this period, many readability formulas were developed, improved, and published. They are reviewed as follows.

Fry's readability test was created by using a graph to help with the interpretation. This readability graph was designed for all ages; therefore, it was one of the most popular tests during that period. The algorithm used in Fry's readability test is shown in Figure 2.4 and also the graph for interpretation is presented in Figure 2.5.

1. Select samples of 100 words from the text
2. On the Y (vertical) axis of the Fry Graph, plot the average sentence length of the sample.
3. On the X (horizontal) axis of the Fry Graph, plot the average word length.
4. The zone on the graph that includes a point (corresponding to a sample) shows the grade score associated with that level associated with the entire text. Scores that appear in the shaded areas are invalid.

Figure 2.4 The algorithm of Fry's readability test



(Zamanian & Heydari, 2012, p.46)

Figure 2.5 Fry's interpretation graph

In 1969, G. Harry McLaughlin published his SMOG (Simple Measure of Gobbledegook) formula. He proposed another idea—that the average sentence and word length should not be added but multiplied. This could be accomplished by counting the number of words that have more than two syllables in thirty sentences. He named this the polysyllable count. Figure 2.6 is the formula that is used to analyze the text difficulty.

$$\text{SMOG Grading} = 3 + \text{square root of polysyllable count}$$

(Zamanian & Heydari, 2012, p.46)

Figure 2.6 SMOG readability formula

In 1975, another readability formula, the Flesch-Kincaid formula, was developed by recalibrating the original Flesch Reading Ease formula with the purpose of developing a readability formula that could rate texts and link the results to the U.S. grade school (Greenfield, 1999). For example, if the text was rated with a

score of six, it meant that a sixth grader could comprehend the document with ease. The formula used for the analysis is shown in Figure 2.7 below.

$$(0.39 \times \text{ASL}) + (11.8 \times \text{ASW}) - 15.59$$

Where

ASL = the average sentence length (the number of words divided by the number of sentences)

ASW = the average number of syllables per word (the number of syllables divided by the number of words)

(Zamaniah & Heydari, 2012, p.46)

Figure 2.7 Flesch-Kincaid formula

The New Dale-Chall readability formula is the revised version of the previous popular Dale-Chall readability formula. It was revised during the 1970s when there were controversies about the traditional formula. This revised version still used sentence length and word familiarity as the two main variables, but the list of word familiarity was updated by expanding the size of the corpus. Moreover, the results were also validated with a cloze score from Bormuth's (1971) study in readability. The New Dale-Chall readability formula provided a readability test by using the cloze score and also the grade level. Dubay (2004) referred to this formula as the most valid among the traditional popular readability formulas. However, there is still criticism about its failure to account for structural relationships, such as the cohesion in the text.

The Lexile framework is another popular readability formula that was developed by Smith, Stenner, Horabin, and Smith (1989) as a commercial tool. The two main variables were constructed based on the belief that reading comprehension depends on the familiarity of the semantic units and the syntactic complexity. Therefore, the developers of this readability formula created a scale that could be used to measure the word frequency, which is evidence of the semantic unit and the sentence length that can imply the level of syntactic complexity. The Lexile framework can give a score to the reader based on his/her ability to answer the comprehension questions and also assigns a score to the text. By matching the reader and the text based on the Lexile score, it is possible to determine beforehand whether the text is suitable for the target reader or not.

Advantage-TASA Open Standard for readability (ATOS) was developed by Renaissance Learning and Touchstone Applied Science Associates, Inc. It was constructed based on the traditional variables—the average characters per word, average words per complete sentence, and average grade level of words. The strength of this formula lies in the extensive development phase, which included data on the reading performance of thousands of students used in the process of grade-level equivalence. However, there are still some drawbacks to this formula. First, only 80% of the formula's performance has been published and it is not possible for the public to access the formula for commercial reasons.

Read X is also a new tool for matching the text to the reader. This software was developed by Miltsakaki and Troutt in 2007-2008. This readability formula also employs the traditional variables—number of sentences, number of words, number of long words, and number of letters in the text—in its analysis. Moreover, Read X is in the process of improving its predictive ability by including the ability to categorize the level of difficulty based on its theme. This is achieved by making a list of frequent words based on theme-based corpora. The developers have attempted to add features such as the user's knowledge to the analysis for the future versions. Read X is likely to be a more valid tool with high predictive value; however, its use is limited to analyzing only texts on the Web.

2.5.2 Strengths and weaknesses of earlier readability formulas

Earlier readability formulas have gained much popularity in the area of matching the text to the appropriate readers. Many scholars refer to them as practical tools that can produce objective results for measuring the level of a text difficulty. Klare (1980) has stated that the results from using readability formula to analyze the difficulty level of a text are better in terms of accuracy than using human judgment, even though the results cannot be definitely claimed as perfect. Additionally, the results gained from these readability formulas are objective and practical when there is a need to evaluate the difficulty of written materials because the results are in clear numbers to show the difficulty level of the text in precise terms (Bailin & Grafstein, 2001). Although there have been claims about the main variables used in the earlier readability formulas,

which focus only on the word and sentence level, Dubay (2004) has argued that these two basic variables, the word and sentence, can at least present the skeleton of a text. It is up to the teachers, researchers, and general users to expand this information with other aspects of the text, such as the organization, content, or even the writer's attitude and beliefs underlining the messages across the text. With the advance in technology, readability formulas have gained high practicality because of their convenient use via computers. Powell, Barry, and Redish (1981) have discussed the idea that computerized readability analysis, when it is used with understanding, is user-friendly, can be adapted for use with a variety of computers, and is good for generating more easily-comprehended written text. Apart from its strength in terms of practicality and objectivity, Fry (1989) also reported that readability formulas are valid tools and the gained results can be correlated with many other methods of measuring comprehension difficulty, such as comprehension checks using multiple-choice questions or cloze tests, oral reading errors, a readership that shows the number of readers reading a particular article, subvocalization, eye-voice spans, the function chaining that shows the number of words typed by the typist after the copy page is covered, controlled subjective judgment, and concurrent validity when compared to other types of readability formulas. Therefore, it can be concluded that the use of formulas provides access to the general level of a reading text before having readers approach the text and helps with deciding whether the text at hand is at the appropriate level or not. It is high in practicality and good for providing objective results concerning target reading texts and readers.

Although readability formulas have gained greater popularity in terms of use, they still have some limitations. First of all, the criticism concerns the main variables used in the readability formulas—that the word and sentence length is only at the surface level of the text (Kirkwood & Wolfe, 1980) and it cannot be a definite indicator of difficulty level. Since the variables used are only word and sentence length, it is possible that the results achieved are not valid. With these two surface variables, texts with jumbled sentences can possibly be analyzed as readable because they consist of short sentences and familiar words. The formulas generally are not congruent with the psycholinguistic theory of reading since they ignore the interaction between the reader and text, and many other factors related to

comprehension, such as cohesion, organization, the text, the reader's interest and purpose of reading, and the complexity of ideas contained in the text (Bertram & Newman, 1981). Moreover, Bailin and Grafstein (2001) also have discussed the idea that the assumption behind readability formulas is based on the belief that readability is a single event that can be measured by a statistical formula. They added that the level of easy or difficulty of a text depends on the individual reader's interaction with that particular text and many other factors influencing the comprehension process, and not a single measure of readability. Therefore, using a readability formula that shows a single number related to the level of difficulty might not produce a valid answer reflecting the text difficulty. Apart from these, Dreyer (1984) also stated that the principles behind readability formulas disregard the aspects of text comprehension, which concerns all of the aspects of the entire text. Schriver (1989) supported the notion that formulas ignore the organization and flow of ideas throughout the reading text. For this critic, readability formulas are likely to fail in measuring the difficulty level because they do not take into account many factors related to readability and also they cannot be used to measure comprehension (Jones & Shoemaker, 1994). Lastly, Zamanian and Heydari (2012) have stated that there are chances that different types of readability formulas can provide different results when they are used to analyze the same text. Moreover, readability formulas cannot be used to measure other aspects beyond the word and sentence level and the results are not helpful if one would like to know how well the reader can comprehend the texts.

Readability formulas are still widely used because of their practicality and because of the objectivity of the results, though there are critics in terms of validity. In order to solve the previous issues indicated by the critics, stating that readability formulas are less valid tools for readability checks, scholars in the field of psycholinguistics and discourse have conducted studies in order to re-evaluate these tools for greater readability checks. They, especially those in the field of psycholinguistics and discourse, also have more interest in developing a better readability formula that could capture the deeper features that explain how readers interact with a text to facilitate comprehension, such as textual cohesion, meaning construction, and others aspects that are involved in multilevel comprehension processes (Gernsbacher, 1997; McNamara et al., 1996 as cited in Crossley et al., 2008).

That is the starting point of developing a better readability formula that can take the aspects beyond word and sentence level into consideration. One such program is called Coh-Metrix (Graesser et al., 2004; Graesser & McNamara, 2011). It has been claimed to be able to eliminate the flaws of the earlier readability formulas and to be a more valid tool that analyzes the text's characteristics based on multilevel discourse comprehension. The results obtained from a Coh-Metrix analysis can infer the level of text difficulty. More details are discussed in the next part.

2.6 Coh-Metrix

There is a need to develop better readability formulas that can cover a wider range of text characteristics beyond the word and sentence level and to reduce the limitations of the traditional readability formulas. Coh-Metrix is one of the more advanced programs for analyzing the readability of a reading text (Graesser et al., 2004; Graesser & McNamara, 2011). This program has been developed to be an automated tool for text analysis. There are three original purposes of Coh-Metrix: 1) to offer many different automated analyses using several different knowledge sources in one tool; 2) to update the idea of "readability" to consider more modern theories on text and discourse rather than only relying on surface features such as word and sentence length; and 3) to be the first automated tool to measure text cohesion (McNamara & Graesser, 2011). Referring to all three purposes, Coh-Metrix can be considered a better tool for readability checking than other traditional readability formulas. It can be used to analyze texts on multiple levels of language and discourse, ranging from the word to discourse level (Graesser & McNamara, 2011; McNamara, Louwerse, McCarthy, & Graesser, (2010). This program is a bridge between the developments in computational linguistics and discourse processing, which could provide a tool to investigate the difficulty level of a text and its comprehension. Graesser and McNamara (2011) have claimed that Coh-Metrix is an advanced program that moves beyond the standard readability formulas. The measures incorporated in Coh-Metrix program are aligned with five out of six levels of the multilevels of language and discourse that are illustrated in the multilevel theoretical framework (Graesser & McNamara, 2011; Kintsch, 1998; Snow, 2002). The level begins word, syntax, explicit textbase, situation

model, and discourse genre and rhetorical structures. The sixth level, pragmatic communication between the writer and reader, is excluded because it is not relatively connected with the text characteristics. These five levels are focused on in Coh-Metrix because they can represent the structure, strategies, and also the processes underlining reading comprehension. The explanation of each level is illustrated below and all details about the Coh-Metric indices under each level are presented in appendix A.

2.6.1 Five levels of language and discourse

2.6.1.1 Words

Knowledge of vocabulary is considered an essential and basic need, which has a great impact on reading performance and level of comprehension (Perfetti, 2007). Different level of readers can benefit from different types of vocabulary knowledge. For example, beginning readers are likely to enjoy reading texts with simple vocabulary and texts that are full of words that are familiar to them in daily life (Hiebert & Fisher, 2007), whereas higher-level readers with more knowledge of phonology, orthography, morphology, and syllable structure might prefer texts with greater diversity of words because it is more challenging. Since vocabulary knowledge has a greater impact on reading performance, being able to detect and analyze the characteristic and features of words used in the text could help in predicting the difficulty level. In doing this, the Coh-Metrix program has presented many indices that can illustrate the lexical features of the text. They are as follows.

MRC psycholinguistic database

The MRC psycholinguistic database was developed by Coltheart (1981). This is a collection of words rated by humans using 26 psychological properties. Coh-Metrix uses five psychological properties as indices for textual analysis. They are age of acquisition, familiarity, concreteness, imagability, and Colorado meaningfulness. All of these psychological properties are represented in indices 95 to 99.

CELEX word frequency

CELEX word frequency is the relative frequency of words per million words. This database is created by the Dutch Centre for Lexical Information (Baayen, Piepenbrock, & Gulikers, 1995). The CELEX word frequency is analyzed

from a 17.9 million word corpus of public documents. The degree of word frequency definitely affects the level of text difficulty. Texts that are full of rare word are likely to need more time to process and comprehend than texts with more frequently-used words. Moreover, word frequency is aligned with world knowledge. Readers with less knowledge of rare words re likely to face more problems with textual comprehension (Perfetti, 2007; Snow, 2002; Stanovich, 1986). This aspect of word analysis is presented in indices 92-94.

WordNet

WordNet is a computation, lexical database that was inspired by psycholinguistic theories of human lexical representation (Fellbaum, 1998; Miller, Beckwith, Fellbaum, Gross, Miller (1990), as cited in McNamara et al., 2014). WordNet consists of more than 170,000 nouns, verbs, adjectives, and adverbs. The words are organized based on the semantic organization under their lexical concept, for example, synonym, polysemy, hypernym, and so on. They are represented in indices 100-103.

Part of speech

Coh-Matrix has incorporated two types of part of speech taggers: the Penn Treebank and the Charniak parser. The former part of speech tagger was developed by Marcus, Santorini, and Marcinkiewicz in 1993 and the latter was developed by Charniak in 2000. These taggers can analyze the text and assign the part of speech to both content words (nouns, verbs, adjectives, and adverbs) and function words (prepositions, determiners, and pronouns). Both content and function words are key support for textual comprehension. The analysis of the part of speech of the word is shown in indices 82-91.

2.6.1.2 Syntax

The aspect of syntax or syntactic complexity within the text is also another key feature that can point out the degree of textual difficulty. Study conducted by psycholinguists has demonstrated that the degree of syntactic complexity affects reading time and eye movements (Just & Carpenter, 1992; Rayner, 1998, as cited in McNamara et al., 2014). Additionally, longer sentences with higher syntactic complexity are likely to be ambiguous and to place greater processing load on the working memory than shorter sentences. It takes more time to find out the main verb

of the main clause if there are too many modifiers for the head noun and there will be too many words being held in the working memory before the reader can comprehend that particular part of the sentence (Graesser, Cai, Louwerse, & Daniel, 2006). This is also an indicator of textual difficulty. Coh-Metrix incorporates two types of contemporary parsers to analyze the syntax of the text. The first is the Apple Pie parser developed by Sekine and Grishman (1995). The second one is the Charniak parser. These two parsers will capture the surface syntactic features of the text and present the degree of density of each syntactic feature, such as noun phrases, verb phrases, and prepositional phrases, across the sentences, paragraphs, and the whole text as some examples. They are represented in indices 67-81.

2.6.1.3 Textbase

Textbase consists of the explicit information in the text. While reading, readers extract the propositions from the text. Van Dijk and Kintsch (1983, as cited in McNamara et al., 2014) defined the term proposition as the unit of meaning that contains the predicate and one or more arguments. The predicate is the main verb, the adjective, and the connective in the clause; and the argument is the nouns, pronouns, embedded propositions that contain the thematic roles, such as agent, patient, object, and time or location. In the aspect of reading, the comprehension of the text can be easier if readers can make a cohesive link between each proposition. On the other hand, textual difficulty tends to be higher if there are cohesion gaps between the propositions found in the text. Therefore, being able to track the use of the cohesive links between the propositions could predict the level of readability of a particular text. Coh-Metrix can identify the cohesion of a text. In doing this, the first method of analysis is identifying coreference cohesion, in other words, referential cohesion. Referential cohesion can occur when a noun, pronoun, or noun phrase refers to another constituent within the text. There are five types of lexical coreference indices provided in Coh-Metrix—noun overlapping, pronoun overlapping, argument overlapping, stem overlapping, and content word overlapping. They are in indices 28-37.

The second method of analyzing textbase cohesion is conducted by identifying discourse markers and connectives. Halliday and Hasan (1976), Louwerse (2001), and Sanders and Noordman (2000) as cited in McNamara et al., 2014 stated that text base cohesion can be created using a variety of discourse makers and

connectives categorized based on their purpose and meaning relationships. For example, there are connectives that aim at showing additive cohesion, temporal cohesion, causal/intentional cohesion, and logical cohesion. These connectives are also part of the indices (50-58) provided in Coh-Metrix. The use of discourse markers and connectives is not only related to textbase comprehension but it also is a strong indicator of the situation model of comprehension. The last method of analyzing the cohesiveness of a text can be done by extracting its lexical diversity. This aspect is clearly related to the level of textual difficulty because it is the index of the lexis or word within the text. Each word will carry its unique meaning. If the text consists of a wide variety of words, this also means a wide variety of new information for the reader to read and to integrate at the discourse level for meaning extraction and the text is likely to be more difficult to comprehend. On the other hand, if the text has a low level of lexical diversity, the cohesion of the text will be high because of the repetition of words in the text. This will ease the process of comprehension since the reader does not need to process every word in the text. Coh-Metrix consists of three types of indices used for analyzing the lexical diversity: type token ration, *vocd*, and Measure of Textual Lexical Diversity (MTLD), as in indices 46-49.

2.6.1.4 Situation model

Situation model comprehension is the level of representation that goes beyond the explicit text and integrates the use of inference and the world knowledge of the reader. The world knowledge and the degree of inference use might depend on each reader and is specific to the sociocultural context. However, there have been challenges in developing a bank of generic world knowledge to be representative of comprehension and creating relevant inferences in the field of artificial intelligence (Lenat, 1995; Schank & Abelson, 1977, as cited in McNamara et al., 2014). This is called Latent Semantic Analysis or LSA. This is a mathematical statistical technique for representing world knowledge based on a large corpus. The core idea is that the meaning of a word depends on the meaning of the surrounding words. Two words can be considered similar if they are likely to appear among the same surrounding words or contexts. Coh-Metrix applies the concept of LSA to identify the degree of textual coherence. The similarity of LSA scores are analyzed from the adjacent sentences at

the paragraph level. If the LSA similarity score decreases, it is likely that the textual difficulty will increase. They are represented in indices 38-45.

Apart from the analysis of LSA, the situation model is divided into five types based on discourse psychology (Zwaan & Radvansky, 1998, as cited in McNamara et al., 2014). They are causation, intentionality, time, space, and protagonists. The continuity of these five dimensions can create the cohesion or coherence of the text. It is connected through particles, which can be connectives, transitional phrases, adverbs, and so on. If these particles are missing, the text will lack continuity of information and this will create a cohesion break. Whenever the text has such a break, the reader is required to add information or to make inferences in order to comprehend the text. The need to make inferences will affect the level of textual difficulty. If readers are required to make too many inferences in the text based on too many missing particles, it will tend to be difficult for them to comprehend the text. This is also a burden on the working memory and affects the perceived difficulty of the text. Coh-Metrix has dimensions of situation models—causality, intentionality, and temporality—by focusing on the specific particles used in each dimension. If the particles are missing, there is a tendency that the text will be more difficult to comprehend. These dimensions are in indices 59-66.

2.6.1.5 Genre classification and rhetorical structure

Genre is defined as the category of a text. McNamara et al. (2014) claimed that readers are expected to understand the text better if they can classify the text genre. Many studies support this by stating that teaching and training the reader to recognize the genre and structure of the text enable them to have better reading performance (Meyer & Wijekumar, 2007; Oakhill & Cain, 2007; Williams, 2007, as cited in McNamara et al., 2014). Being able to identify the genre of the target reading text might be part of the clues in predicting the level of textual difficulty; however, this is not the method used in scaling the difficulty level. Though genre classification is not an effective way of scaling a text, knowing the genre and its rhetorical structure could definitely aid with reading comprehension. Zwaan (1994, as cited in McNamara et al., 2014) stated that advanced readers can activate and tailor their strategies used while reading to match the genre of the target text. Based on this assumption, Coh-Metrix incorporates some indices, such as the characteristics of words, sentences, and

connections between sentences, together under the principle of “narrativity” in order to classify the text into a continuum of narrative to science text (indices 12-13). However, this is not a clear categorization of genre and textual structure.

Above are the classifications of the underlined theory of multilevel language and discourse that Coh-Metrix has used as the basic principle in generating all of the indices used for textual analysis. In order to data analysis and presentation easier, Coh-Metrix has categorized all indices (1-106) into eleven categories, which will be presented in the next section.

2.6.2 Eleven categories of indices provided in Coh-Metrix

From the five basic levels of discourse comprehension above, Coh-Metrix generates 106 indices for a more specific text analysis and categorizes all of these indices into eleven groups in order to create a better illustration and understanding of the results. Brief descriptions of each category as well as the number of indices in each group are listed as follows.

Category 1: Descriptive (indices 1-11)

In category 1 as shown in Table 2.4, Coh-Metrix has analyzed the text to find out the descriptive information, such as the total number of words, sentences, and paragraphs, in the text, including the average number of letters, syllables, words, and sentences per paragraph and text.

Table 2.4

Category 1: Descriptive

Index	Descriptive	Abbreviation
1	Total number of paragraphs in the text	DESPC
2	Total number of sentences in the text	DESSC
3	Total number of words in the text	DESWC
4	Average number of sentences in each paragraph in the text	DESPL
5	Standard deviation of number of sentences in each paragraph in the text	DESPLd
6	Average number of words in each sentence in the text (sentence length)	DESSL

7	Standard deviation of words in each sentence in the text (sentence length)	DESSLd
8	Average number of syllables in all of the words in the text (word length)	DESWLsy
9	Standard deviation of syllables in all of the words in the text (word length)	DESWLsyd
10	Average number of letters in all of the words in the text (word length)	DESWLlt
11	Standard deviation of letters in all of the words in the text (word length)	DESWLltd

Category 2: Text easability principal component scores (indices 12-27)

In category 2 as presented in Table 2.5, Coh-Metrix has eight components that can estimate the features related to the easability of the target text. In this group, each text can be analyzed in order to find out the level of narrativity, syntactic simplicity, word concreteness, referential cohesion, deep cohesion, verb cohesion, connectivity, and temporality.

Table 2.5

Category 2: Text easability principal component scores

Index	Text easability principal component scores	Abbreviation
12	Narrativity, z score	PCNARz
13	Narrativity, percentile	PCNARp
14	Syntactic simplicity, z score	PCSYNz
15	Syntactic simplicity, percentile	PCSYNp
16	Word concreteness, z score	PCCNCz
17	Word concreteness, percentile	PCCNCp
18	Referential cohesion, z score	PCREFz
19	Referential cohesion, percentile	PCREFp
20	Deep cohesion, z score	PCDCz
21	Deep cohesion, percentile	PCDCp
22	Verb cohesion, z score	PCVERBz
23	Verb cohesion, percentile	PCVERBp
24	Connectivity, z score	PCCONNz

25	Connectivity, percentile	PCCONN _p
26	Temporality, z score	PCTEMP _z
27	Temporality, percentile	PCTEMP _p

Category 3: Referential cohesion (indices 28-37)

In category 3, as can be seen in Table 2.6, Coh-Metrix has explored the global and local overlapping in terms of noun, argument, stem, content word, and anaphor within the text. The overlapping or repetition of these words can imply the degree of the cohesion of the text.

Table 2.6

Category 3: Referential cohesion

Index	Referential cohesion	Abbreviation
28	Noun overlap, adjacent sentences, binary, mean	CRFNO1
29	Argument overlap, adjacent sentences, binary, mean	CRFAO1
30	Stem overlap, adjacent sentences, binary, mean	CRFSO1
31	Noun overlap, all sentences, binary, mean	CRFNOa
32	Argument overlap, all sentences, binary, mean	CRFAOa
33	Stem overlap, all sentences, binary, mean	CRFSOa
34	Content word overlap, adjacent sentences, proportional, mean	CRFCWO1
35	Content word overlap, adjacent sentences, proportional, standard deviation	CRFCWO1d
36	Content word overlap, all sentences, proportional, mean	CRFCWOa
37	Content word overlap, all sentences, proportional, standard deviation	CRFCWOad

Category 4: Latent semantic analysis (indices 38-45)

Category 4 is presented in Table 2.7, where Coh-Metrix has measured the semantic overlap between the sentences or between the paragraphs of the target text. This aspect will focus on the conceptual overlapping that is related to textual cohesion.

Table 2.7*Category 4: Latent semantic analysis*

Index	Latent semantic analysis	Abbreviation
38	LSA overlap, adjacent sentences, mean	LSASS1
39	LSA overlap, adjacent sentences, standard deviation	LSASS1d
40	LSA overlap, all sentences in paragraph, mean	LSASSp
41	LSA overlap, all sentences in paragraph, standard deviation	LSASSpd
42	LSA overlap, adjacent paragraphs, mean	LSAPP1
43	LSA overlap, adjacent paragraphs, standard deviation	LSAPP1d
44	LSA given/new, sentences, mean	LSAGN
45	LSA given/new, sentences, standard deviation	LSAGNd

Category 5: Lexical diversity (indices 46-49)

Table 2.8 presents the indices in category 5. In this category, Coh-Metrix analyzes the text in terms of the variety of unique words that occur in relation to the total number of words. The type-token ratio of content words and all of the words in the target text will be calculated. Apart from the type-token ratio, the Measure of Textual Lexical Diversity and the *vocd* are also included in this category. The MLTR is used for calculation when the mean length of the sequential word strings in a text that maintains a given TTR value. The *vocd* is calculated for fitting the TTR random samples with the ideal TTR curves in the target text.

Table 2.8*Category 5: Lexical diversity*

Index	Lexical diversity	Abbreviation
46	Lexical diversity, type-token ratio, content word lemmas	LDTTRc
47	Lexical diversity, type-token ratio, all words	LDTTRa
48	Lexical diversity, MTLT, all words	LDMTLD
49	Lexical diversity, <i>vocd</i> , all words	LDVOCD

Category 6: Connectives (indices 50-58)

In category 6 as shown in Table 2.9, Coh-Metrix analyzes all of the connectives found in the target text and differentiates them into groups of causal, logical, adversative and contrastive, temporal, additive, positive, and negative. These connectives imply the creation of cohesive links within the target text.

Table 2.9

Category 6: Connectives

Index	Connective	Abbreviation
50	All connectives incidence	CNCAII
51	Causal connectives incidence	CNCCaus
52	Logical connectives incidence	CNCLogic
53	Adversative and contrastive connectives incidence	CNCADC
54	Temporal connectives incidence	CNCTemp
55	Expanded temporal connectives incidence	CNCTempx
56	Additive connectives incidence	CNCAdd
57	Positive connectives incidence	CNCPos
58	Negative connectives incidence	CNCNeg

Category 7: Situation model (indices 59-66)

Table 2.10 presents category 7. In this category, Coh-Metrix explores evidence of the features that can be related to the reader's mental representation when a given context is activated. The focus will be on the finding the causal verbs and connectives that can lead to the activation of mental representations in a given context.

Table 2.10*Category 7: Situation model*

Index	Situation model	Abbreviation
59	Causal verb incidence	SMCAUSv
60	Causal verbs and causal particles incidence	SMCAUSvp
61	Intentional verbs incidence	SMINTEp
62	Ratio of casual particles to causal verbs	SMCAUSr
63	Ratio of intentional particles to intentional verbs	SMINTEr
64	LSA verb overlap	SMCAUSlsa
65	WordNet verb overlap	SMCAUSwn
66	Temporal cohesion, tense and aspect repetition, mean	SMTEMP

Category 8: Syntactic complexity (indices 67-73)

Table 2.11 shows the indices in category 8. In this category, Coh-Metrix examines the structure of sentences composed in the text in order to find out the degree of syntactic constructions. The obtained outcomes could reveal the complexity of the sentences, such as the average number of modifiers per noun and the use of embedded constituents. These complex structures can imply the reading difficulty regarding, for example, ambiguity, structural density, or ungrammatical sentences.

Table 2.11*Category 8: Syntactic complexity*

Index	Syntactic complexity	Abbreviation
67	Left embeddedness, words before main verb, mean	SYNLE
68	Number of modifiers per noun phrase, mean	SYNNP
69	Minimal Edit Distance, part of speech	SYNMEDpos
70	Minimal Edit Distance, all words	SYNMEDwrd
71	Minimal Edit Distance, lemmas	SYNMEDlem
72	Sentence syntax similarity, adjacent sentences, means	SYNSTRUTa
73	Sentence syntax similarity, all combinations, across paragraphs, mean	SYNSTRUTt

Category 9: Syntactic pattern density (indices 74-81)

As shown in Table 2.12, the results of category 9 are analyzed according to the density of syntactic patterns, word types, and phrase types. They are also related to syntactic complexity (category 8) because the number of words and phrase types can increase the density of the sentence structure. They definitely affect the processing of the texts. Besides calculating for the incidence of phrases, Coh-Metrix also measures the relative frequency of other sentence patterns, such as passive voice and negation.

Table 2.12

Category 9: Syntactic pattern density

Index	Syntactic pattern density	Abbreviation
74	Noun phrase density, incidence	DRNP
75	Verb phrase density, incidence	DRVP
76	Adverbial phrase density, incidence	DRAP
77	Preposition phrase density, incidence	DRPP
78	Agentless passive voice density, incidence	DRPVAL
79	Negation density, incidence	DRNEG
80	Gerund density, incidence	DRGERUND
81	Infinitive density, incidence	DRINF

Category 10: Word Information (82-103)

Table 2.13 presents category 10. In this category, multiple characteristics and the dimensions of words are analyzed because words have a huge impact on the efficiency of reading comprehension. In this group, Coh-Metrix measures the words according to many different groups, such as parts of speech and word frequency. Further, Coh-Metrix also employs psychological ratings by using two lexical databases, the MRC Psycholinguistic Database (Coltheart, 1981) and WordNet (Fellbaum, 1998; Miller et al., 1990) to help analyze the psychological rating of words,

which includes the age of acquisition, familiarity, concreteness, imagability, meaningfulness, polysemy, and hypernymy.

Table 2.13

Category 10: Word information

Index	Word information	Abbreviation
82	Noun incidence	WRDNOUN
83	Verb incidence	WRDVERB
84	Adjective incidence	WRDADJ
85	Adverb incidence	WRDADV
86	Pronoun incidence	WRDPRO
87	First person singular pronoun incidence	WRDPRP1s
88	First person plural pronoun incidence	WRDPRP1p
89	Second person pronoun incidence	WRDPRP2
90	Third person singular pronoun incidence	WRDPRP3s
91	Third person plural pronoun incidence	WRDPRP3p
92	CELEX word frequency for content words, mean	WRDFRQc
93	CELEX Log frequency for all words, mean	WRDFRQa
94	CELEX Log minimum frequency for content words, mean	WRDFRQmc
95	Age of acquisition for content words, mean	WRDAOAc
96	Familiarity for content words, mean	WRDFAMc
97	Concreteness for content words, mean	WRDCNCc
98	Imagability for content words, mean	WRDIMGc
99	Meaningfulness, Colorado norms, content words, mean	WRDMEAc
100	Polysemy for content words, mean	WRDPOLc
101	Hypernymy for nouns, mean	WRDHYPn
102	Hypernymy for verbs, mean	WRDHYPv
103	Hypernymy for nouns and verbs, mean	WRDHYPnv

Category 11: Readability (indices 104-106)

The last category of Coh-Metrix is presented in Table 2.14. This category aims at analyzing the level of readability of the target text into a single value, which can further be compared against other texts. There are three readability formulas used in this category: Flesch Reading Ease, Flesch-Kincaid Grade Level, and Coh-Metrix L2 Readability.

Table 2.14

Category 11: Readability

Index	Readability	Abbreviation
104	Flesch Reading Ease	RDFRE
105	Flesch-Kincaid Grade Level	RDFKGL
106	Coh-Metrix L2 Readability	RDL2

Above are all of the indices provided in Coh-Metrix. In order to understand and interpret the values obtained from these indices, Coh-Metrix also provides comparative norms, which will be described in the next section.

2.6.3 Comparative norms of Coh-Metrix

Coh-Metrix has developed norms to be used for comparing and interpreting the gained results for all 11 categories of the 106 indices. In this section, an explanation of how the norms are generated and a detailed description of how the norm “Language Arts” will be used in this study.

Coh-Metrix interpretative norms are created by employing a collection of English texts by Touchstone Applied Science Associates (TASA), Inc. This organization has created a large corpus named the TASA corpus. It is a collection of high school English texts that are divided into genres based on seven academic areas—Language Arts, Health, Home economics, Industrial Arts, Science, Social Studies, and Business. The TASA corpus consists of 119,627 paragraphs taken from 37,651 sample texts gained from all seven academic areas (McNamara, Graesser, &

Louwerse, 2012). Table 2.15 presents the breakdown of the sample texts by academic area.

Table 2.15

The breakdown of sample texts by academic area

Academic Areas	Number of Sample Texts	Number of Paragraphs
Language Arts	16,044	57,106
Health	1,359	3,396
Home Economics	283	403
Industrial Arts	142	462
Science	5,356	15,569
Social Studies	10,501	29,280
Business	1,079	4,834
Miscellaneous	675	2,272
Unmarked	2,212	6,305
Total	37,651	119,627

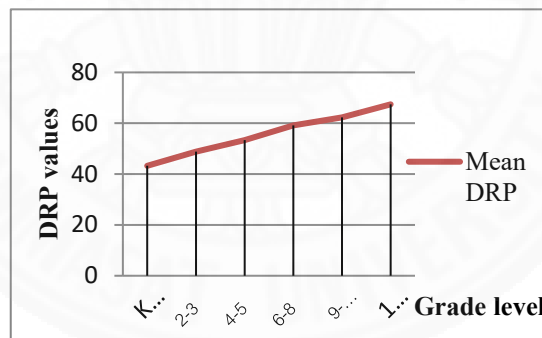
(McNamara, Graesser, & Louwerse, 2012)

Coh-Metrix has developed norms for comparing, interpreting, and understanding more about the analyzed values from the target texts. Based on the breakdown of the text samples gained from the TASA corpus, Coh-Metrix has calculated the norms for only three genres, Language Arts, Social Studies, and Science, due to their being the largest domains in the TASA corpus. These three academic areas are ranked the top three in terms of the number of sample texts. After the top three academic areas are selected, they are evaluated to find out their readability by using the Degree of Reading Power (DRP) (Koslin, Zeno, & Koslin, 1987). Then, all of the passages are classified into six grade bands according to their level of difficulty, as presented in Table 2.16 and Figure 2.8.

Table 2.16*Classification of reading passages based on difficulty levels*

Grade band	N	Mean DRP	Std. deviation	Minimum DRP	Maximum DRP
K-1	300	43.2465	2.33841	35.00	45.99
2-3	600	48.8362	1.45713	46.00	50.99
4-5	600	53.3161	1.44334	51.00	55.99
6-8	900	59.1749	1.34791	56.00	60.99
9-10	600	62.2777	0.90323	61.00	63.99
11-CCR	900	67.4324	3.10350	64.00	85.80

(Koslin, Zeno, & Koslin, 1987)



(Koslin, Zeno, & Koslin, 1987)

Figure 2.8 DRP values and grade levels

The graph in Figure 2.8 also shows the range of the DRP values that represents the level of text difficulty in each grade band. It can be seen from this graph that the DRP values can differentiate the level of difficulty of the reading passages in each grade level. The values clearly show that the passages found in the K-1 grade band are ranked as the easiest, whereas the passages gained from grade 11 to grade 12 or the college and career readiness/CCR grade band are the most difficult. Therefore,

calculating the norm for further interpretation is conducted based on valid data sources since the levels of difficulty constantly increase along with the grade levels.

In order to calculate the norm for each academic area, Coh-Metrix randomly selects 100 passages from each academic area and grade level (from kindergarten to CCR). The total chosen passages for each academic area is 1,300. Then, all 1,300 passages are analyzed by using the Coh-Metrix program and the results are calculated to find the mean and standard deviation, which are used as the norm for the data interpretation of each academic area.

2.6.3.1 The norm “Language Arts”

As stated above, Coh-Metrix has developed three sets of norms for data comparison and interpretation. These three sets of norms, “Language Arts”, “Social Studies”, and “Sciences”, are provided for analysis by Coh-Metrix because of their largest proportion of passages included in the TASA corpus. In this present study, only the norm for “Language Arts” was chosen to be the main criterion for data comparison and interpretation. This decision was made based on the definitions of this subject area. They are presented as follows:

Language arts is defined as “the subjects (as reading, spelling, literature, and composition) that aim at developing the student's comprehension and capacity for use of written and oral language” by Merriam Webster Dictionary.

Language arts is defined as “the subjects taught in elementary and secondary schools that aim at developing students' communication skills. These subjects include reading, writing, listening, and speaking”. This definition is defined by the International Reading Association (IRA) and the National Council of Teachers of English (NCTE).

Language arts is defined as learning how to communicate ideas through language, which includes four main components, listening, reading, speaking, and writing, as well as everything that relates to these four skills that can be considered part of the language arts subject area (Shafer, 2010).

Language arts is defined as the skills that include composition, speech, spelling, and dramatic. These subjects are taught in elementary and secondary schools to give students a thorough proficiency in using the language (Dictionary.com).

These definitions help to define the Language Arts subject. It can be clearly seen that the focus of these definitions is on providing teaching and training support in terms of four basic language skills—listening, reading, writing, and speaking—in communicating with others in appropriate contexts.

Considering these aforementioned definitions, the main concept and focus of the Language Arts subject area clearly match the policy of English teaching in Thailand. The following is an excerpt from the Basic Education Core Curriculum B.E. 2551 (A.D. 2008) concerning foreign language teaching in a description of the learning area of foreign language and the main content of what should be taught in the curriculum.

“The learning area for foreign languages is aimed at enabling learners to acquire a favorable attitude towards foreign languages, the ability to *use foreign languages for communicating in various situations*, seeking knowledge, engaging in a livelihood and pursuing further education at higher levels. Learners will thus have knowledge and understanding of stories and cultural diversity of the world community, and will be able to creatively convey Thai concepts and culture to the global society.

The main contents include:

- *Language for communication: use of foreign languages for listening, speaking, reading and writing, exchanging data and information, expressing feelings and opinions, interpreting, presenting data, concepts and views on various matters, and creating interpersonal relationships appropriately*

- Language and culture: use of foreign languages harmonious with the culture of native speakers; relationships, similarities, and differences between languages and cultures of native speakers; languages and cultures of native speakers and the Thai culture; and appropriate application
- Language and relationships with Other Learning Areas: use of foreign languages to link knowledge with other learning areas, forming the basis for further development, seeking knowledge and broadening the learners' world views
- Language and relationships with Community and the World: use of foreign languages in various situations, both in the classroom and in the outside community and the global society, forming a basic tool for further education, livelihood, and exchange of learning with the global society” (Basic Education Core Curriculum, 2008)

The highlighted parts in the above excerpt clearly show the similarity in terms of policy between the Basic Education Core Curriculum and the definition of Language Arts subject area. This could be a valid justification for selecting the norm of Language Arts to be the sole criterion for the data comparison and interpretation in this present study.

2.7 Previous studies on readability

Numerous research studies have been conducted in the field of readability in order to shed more light on how readability studies can benefit English language learning and teaching. Based on their uses, many studies have employed readability formulas to measure or evaluate the difficulty level of academic documents such as textbooks, survey questionnaires, and reports. The results from these studies are also used to match or compare the difficulty level of the text to the target readers' reading performance (Kouamé, 2010; Fuller et al., 2007; Hippensteel, 2015; Mahmood & Mahmood, 2011, Burton, 2014; Heydari, 2012; Izgi & Seker, 2012; Begeny & Greene,

2014). Besides using the results to match the text, some scholars have conducted studies for the purpose of developing or validating readability formulas by integrating other aspects related to comprehension processing (Thienpermpool & Ward, 2011; Ozasa et al., 2007; Vajjala & Meurers, 2012; Rezaee & Norouzi, 2011; Mikk & Elts, 1999; Tabatabaei & Bagheri, 2013; McNamara, Louwerse, Cai, & Graesser, 2005; Crossley et al., 2007; Crossley et al., 2008; Gupta, 2013; Duran et al., 2007).

The main use of readability formulas has been focused on examining the difficulty level of the target text or textbooks and the results have been used to compare or match the reading materials with the target readers' reading performance. Some studies employed only one readability formula while others employed more than one. Kouamé (2010) used one readability formula to help improve a survey questionnaire designed for low-literate readers. In this study, the researcher designed different sets of questionnaires. Each was graded based on the use of the Flesch-Kincaid formula and they had different levels of readability. Then, 65 low-literate participants were divided into two groups. Each group had to rate the clarity and their level of understanding of the survey questionnaires. The results showed that the easier version of the questionnaire gained a higher level of clarity and understanding from the subjects than the more difficult version. This could prove that the level of difficulty affects the degree of understanding.

Another study also employed one readability formula to assess the difficulty level of textbooks. Fuller et al. (2007) conducted a study to find out the correlation between the readability levels of pharmaceutical textbooks and the reading ability of year 3 pharmacy students in order to determine the reading level of the required reading materials. To do this, all of the pharmaceutical textbooks were analyzed for difficulty level by using the Gunning FOG readability formula. In order to measure the reading ability, all of the subjects were required to take the tests. Then, the results were compared and it was found that there was a great difference between the readability level of the textbooks and the students' reading ability. In other words, the reading level of the pharmaceutical textbooks was too difficult and it was beyond the students' reading ability.

Additionally, Hippensteel (2015) also used a readability formula to assess the difficulty level of the reading materials compare with the students' reading ability.

In this study, the Flesch-Kincaid readability formula was used to assess geoscience textbooks, laboratory manuals, and supplementary materials used by geoscience faculty at the University of North Carolina. From the readability analysis, it was found that most of the selected textbooks and laboratory manuals were at the same grade level of the students, whereas some of the assigned extra reading materials, especially the articles from the peer-reviewed journals, were far beyond the students' reading ability.

Apart from using only one readability formula to assess the difficulty level of the target reading materials, some studies have employed more than one formula. For example, Mahmood and Mahmood (2011) employed four readability formulas to examine the level of difficulty and reading age of English textbooks used in grade 3 in Panjab, Pakistan. They analyzed the results based on the use of Fry's Readability Graph, the Power-Sumner Kearsley Formula, the Flesch-Kincaid Formula, and the SMOG Formula. From the analysis, all four readability formulas presented consistent results. They suggested that the difficulty level and the reading age of English textbooks are far beyond the proficiency level of Pakistani grade 3 students. The results of this study confirmed that readability formulas are one of the convenient tools to help examine the difficulty level of English textbooks before using them in a learning situation.

Burton (2014) similarly conducted an experiment using three readability formulas. This study aimed at finding out whether the readability level of the selected textbooks affected the students' ability to learn general biology concepts. In order to do this, she prepared three versions of excerpts from a textbook for students to read. The first excerpt was the original version, whereas the second one had the technical terms removed. The third version was adapted by changing the sentence structure and simplifying some of the difficult words. All three versions were assessed using three readability formulas—the Flesch-Kincaid Grade Level (FKGL), the Coleman-Liau Index (CLI), and the Automated Readability Index (ARI)—in order to be certain that they had different levels of difficulty. Then, the students were tested on their comprehension of these selected excerpts. The readability analysis demonstrated consistency in the three readability formulas in terms of rank scores and the results showed that there were effects of difficulty level on the students' performance on the tests. That is to say, the students with access to the adapted version, either with the removal of the technical vocabulary or with changes in sentence structure, exhibited

better performance on the tests. The findings gained from these sample studies suggest that the difficulty level of the text had a great effect on the students' comprehension and learning. The results from these studies, therefore, confirmed the benefits of using readability formulas to examine the difficulty level of target texts.

From the above review, it was found that readability formulas can be a great tool to help assess the difficulty level of target reading materials and to compare them with the reader's reading performance. It seems to be a practical tool for those that are responsible for designing, selecting, preparing, or evaluating reading materials to suit target readers. However, some studies have found inconsistencies in the results.

Heydari (2012) for example found some inconsistencies among the different types of readability formulas. A study was conducted to find the correlation between the results from readability formulas and the reader's evaluation of difficulty level. Four readability formulas were employed: Flesch Reading Ease, Gunning's Fog-Index of readability, the SMOG index of readability, and Flesch-Kincaid. In this study, five passages were analyzed to find out the difficulty level by using four types of readability formulas and the reader's evaluation. The results from these two sources were then compared. It was found that there was no significant correlation among these two sources of analysis. The reader's evaluation of the text difficulty and the results from the readability formulas were not correlated.

Izgi and Seker (2012) also found the same results. They used four types of readability formulas (two classic formulas and two adapted formulas to be used in the Turkish context—the Flesch-Kincaid formula, the Gunning Fog formula, Ateşman, and Sönmez) to determine the readability level of texts used in 4th and 5th grade social science and science-technology textbooks in Turkey. The results showed some inconsistencies between different types of readability formulas. They suggested that when examining the level of difficulty within the text, relying only on the quantitative method might be inconsistent and less reliable.

The study of Begeny and Greene (2014) also presented some inconsistencies regarding various readability formulas. They examined the use of readability formulas to find out the actual correspondence between the difficulty levels of the texts by using oral reading fluency as the criterion for measuring the students' reading performance. The students were required to read out loud for the oral reading

fluency check to find out their actual reading performance when reading the passages. The performance was measured by the number of words read correctly within one minute. Three types of reading passages were prepared: passages below their grade level, passages right at their level, and passages above their grade level. Eight readability formulas were employed in this study: Dale-Chall, Flesch-Kincaid, FOG, Forcast, Fry, PSK, SMOG, and Spache. The results showed that there was only one readability formula—Dale-Chall—that could provide a reliable correspondence between the text difficulty and the students' oral reading performance. Seven other readability formulas were not consistent with the students' reading performance. The results also suggested that three more readability formulas—FOG, Lexile, and Spache—can be a valid indicator of text difficulty; however it depends on the passages from specific grade levels, not all. Three of them were only valid with some specific grade levels.

Besides using readability formulas to help evaluate the difficulty level of the target reading materials, there have also been studies that have aimed at developing and validating readability formulas by integrating other features related to text processing, starting at the lower level—words, to the higher level—sentences and paragraphs. They are as follows.

Thienpermpool and Ward (2011) were interested in developing a readability formula to match the specific context of use. They were aware of the essential role of vocabulary in text processing; therefore, they developed and validated a new readability index using vocabulary-based criteria for Thai university students. The program “Range” was employed to create a profile of the vocabulary in the target reading materials used in a Thai university. The obtained vocabulary frequency profiler was used as the main variable in this study and was used as the key criterion for predicting the readability level of the reading materials. The results, then, were compared with those gained from the traditional readability formulas and they showed a positive correlation. It can be concluded then that vocabulary can be a strong indicator for evaluating the difficulty level of target reading materials.

Adding vocabulary difficulty to the process of predicting the difficulty level of the target reading materials was also of interest to Ozasa et al. (2007). They conducted a study to experiment with the use of variables related to words for

measuring the difficulty level of EFL sample textbook materials. In their study, six combinations of variables—word difficulty, idiom difficulty, textbook-based word difficulty, textbook-based idiom difficulty, word length, and sentence length—were computed by using multiple regression analysis. According to all of the results, it was found that sentence length had the most predictive power than the other variables and textbook-word difficulty was the second most powerful predictor of readability level. Additionally, when considering the combination of variables, the most effective predictor of readability was the combination of sentence length, word length, textbook-based word difficulty, and textbook-based idiom difficulty.

Besides using words as the key variable in readability analysis, one study moved to a level beyond the word. Vajjala and Meurers (2012) added the use of syntactic features to the lexical features of the text for the assessment of the readability level of the target reading materials. In their study, they adapted a new readability formula that included lexical, syntactic, and traditional features (word and sentence length) to classify the reading passages into a range of difficulty levels. The analysis was divided into three groups or readability formulas: using pure lexical features, pure syntactic features, and a combination of all features. All three adapted formulas were consequently used to classify the passage. The results showed that the formula that combined all features could provide the best results at 93.3% accuracy. The second best result was from using the lexical features at 86.7%, whereas using pure syntactic features provided accuracy at 75.3%. Therefore, integrating the aspects of lexical and syntactic features into the readability formula can improve the predictive power of difficulty level.

Considering the features beyond the word level has also attracted the attention of other researchers. Rezaee and Norouzi (2011) for example investigated the relationships of three variables related to reading comprehension: readability of the written materials, readers' reading performance, and cohesive markers. In order to do this, they selected ten passages and used the Flesch and Fog readability formulas to evaluate the difficulty level. All ten passages were analyzed to count the number of cohesive markers. There were three types of cohesive markers: conjunctions, lexical markers, and grammatical markers. Then, all 67 subjects, who were divided into intermediate and advanced levels, were required to read and complete the

comprehension test. After all of the data were obtained, they were analyzed to find the correlation between the three factors. The results showed that there was a strong correlation between the readability level of the reading passages with the reader's reading performance. Only grammatical cohesion had a positive correlation with the readability of the reading texts. The number of conjunctions was not seen to have a correlation with the readability level or the reader's performance. There was a positive correlation between grammatical cohesion and intermediate readers. The performance of advanced readers had a strong correlation with the number of lexical cohesion in the reading texts. It can be concluded then that the cohesive features of reading material are another key element that possibly affects both difficulty level and readers' reading performance and they therefore should be taken into consideration when analyzing the text in order to ascertain difficulty level.

The abovementioned reveals that there are other essential features beyond the traditional measure of words and sentence length for readability formulas. The aspects of word difficulty, syntactic features, and cohesive markers are all possible factors affecting the readability of the reading materials and they therefore should be taken into consideration when evaluating the difficulty level of a reading text. Apart from these textual features, some studies have presented other aspects beyond the text that could possibly influence the ease or difficulty of textual comprehension.

Mikk and Elts (1999) experimented with formulating a readability formula that included both reader and text characteristics as indicators of difficulty level. In order to accomplish this, they included three aspects related to the reader: the amount of background knowledge related to the target reading text, the reader's thoughts toward the texts in terms of difficulty, and the interest level toward the text for the analysis. Regarding the text-based aspect, four groups of features were analyzed: the vocabulary knowledge of the target text, the abstractness of the content required in the text, the word length, and the sentence length. From these variables, they proposed two sets of readability formulas. The first formula focused more on the text features by adding the term density, and the oversized words and sentences to the formula. They claimed that this newly-formulated formula was more precise and informative in anticipating test performance after reading the target text. The second proposed formula was similar to the first one with the inclusion of the reader's background knowledge, thoughts toward

the difficulty level, and interest in the reading texts for further analysis. The results showed positive support to for hypothesis of the study. These two sets of readability formulas were proved to be effective in predicting the readability level of the target reading text.

Though the results from the above study indicated that adding the reader's related features could be valuable to readability studies, they might not be reliable. One study for example found inconsistencies between these readers' related features and the results gained from the readability formulas.

Tabatabaei and Bagheri (2013) were also interested in exploring the relationships among the variables beyond textual characteristics and readability level. They conducted a study in the Iranian context to explore the relationship between the readability of reading texts used at the high school level and the students' background knowledge and interests. In this study, the Flesch readability formula was used as the measurement of difficulty level. The students' background knowledge and interests were obtained using a Likert-scale questionnaire. From the analysis, they found that the level of interest had a positive correlation with the readability level of only some textbooks, whereas there was no significant relationship between the background knowledge and readability level. The results of this study, therefore, indicate that the use of the reader's background knowledge and interest might not be a reliable indicator for evaluating the readability level of target reading materials. They should be dealt with care when being integrated into readability studies.

To conclude, integrating more features beyond those that are used in traditional readability formulas (word and sentence length) can be valuable to improve the predictive power of readability analysis. These stated effective features, such as word difficulty, syntactic features, cohesive markers, and features related to the reader such as background knowledge, are all related to different levels of comprehension processing. Therefore, there has been an urge to improve readability formulas that can include all of these valuable features to be more effective, valid, and reliable by incorporating these features into the readability analysis.

Coh-Metrix—a computational program—was developed by McNamara et al. (2005) to analyze the linguistic features that are related to comprehension processing ranking from the basic level of word to the deeper level of the situation model of reading

comprehension, for example, cohesion, syntactic structure, the range of words, the semantic relationships among sentences, the situation model of reading comprehension, etc. Research studies have been conducted to validate the use of these variables in determining the readability level of the target reading text and this tool has been applied to textual analysis. Some of the key studies are reviewed in the following.

Crossley et al. (2007) experimented with the use of Coh-Metrix to measure text readability. They selected three variables, lexical-coreferentiality, word frequency, and syntactic complexity, to analyze 32 academic texts to find out the level of readability. The obtained scores were compared with the results from the traditional readability formulas. This study illustrates that these Coh-Metrix variables could provide similar results to the traditional readability formulas and they demonstrated better prediction in terms of reading performance because the variables included exhibited a better reflection of reading comprehension processing. This study was confirmed and strengthened by Crossley et al. (2008). They had used Coh-Metrix variables to measure cohesion and text difficulty. In their study, three indices, which were used in Crossley et al. (2007), were employed again to analyze different types of reading texts. They were lexical coreferentiality, syntactic sentence similarity, and word frequency. The gained findings confirmed the results from the previous study in 2007. It was found that these three variables could produce a more valid prediction of readability when compared to other traditional readability measures. These employed variables were related to cognitive processes and they also were linked to the psycholinguistic factors required in reading comprehension (decoding, syntactic parsing, and meaning construction); therefore, using Coh-Metrix in determining difficulty level has also strengthened the construct validity of the formula. Gupta (2013) also employed the Coh-Metrix tool to analyze the texts in four textbook series so as to compare the texts used across the series and grade levels. Five variables, length of text, lexical diversity, cohesion, use of the first person singular, and sentence syntax similarity, and the Flesch-Kincaid Grade Level, were chosen for the analysis. The results showed significant differences among these four textbook series in four out of five variables. When comparing the texts across the students' grade level, it was seen that the length of the text, lexical diversity, cohesion, and use of the first person singular of these four textbook series ranged appropriately. That means that the lower grade

level texts were easier to understand than the higher ones. Only one variable, sentence syntax similarity, yielded unexpected results. Sentence structure is believed to be gradually complex when grade levels are increased, but the results contradicted this expectation. The results gained from the Flesch-Kincaid Grade Level presented different levels from the level prescribed for each textbook. For example, the textbook used in grade one consisted of texts ranked for grade two based on the readability analysis. From this study, it can be concluded that the variables from Coh-Metrix are a better indicator of difficulty level than the use of the Flesch-Kincaid Grade Level. Duran et al. (2007) further conducted a study to validate the use of Coh-Metrix in evaluating text difficulty. In this study, two linguistic indices were employed as the main variable: referential overlap and vocabulary accessibility. They categorized 60 instructional science texts into two groups of easy and difficulty texts to comprehend and had all the texts analyzed by using Coh-Metrix. The gained Coh-Metrix results were compared with the subjects' reading performance measured by reading times and ability to recall the content of the text. The findings revealed a correlation between reading time and ability to recall with the results from Coh-Metrix. That is to say, the subjects had a better reading time and they could recall the content of the easier texts more than with the more difficult ones. This study implies that the indices from Coh-Metrix can differentiate the level of text difficulty and it can be beneficial for textbook selection.

From the reviewed studies, it can be claimed that the use of variables included in Coh-Metrix is an effective tool for determining the level of text readability. Coh-Metrix can provide a better indication than other traditional readability formulas since it includes indices that are related to the psycholinguistics theory of textual comprehension. The indices can analyze reading texts from the word to the sentence and discourse level, which cannot be accomplished using traditional readability formulas. Therefore, Coh-Metrix has high practicality and it can yield more valid results when being employed as a tool for measuring the difficulty level of texts.

2.8 Summary

This chapter had reviewed the theoretical background information on reading, including definitions of reading, the reading process, and text selection methods—general practices, readability formulas, as well as previous studies on readability. This information was reviewed to explain the rationale for conducting the study. The research methodology and procedures will be discussed in Chapter 3.



CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the methodology used in the study. The first part of the chapter focuses on the process of collecting and building the corpora. The second section explains the steps of how the data were analyzed and interpreted quantitatively and qualitatively. Each of the steps involved in conducting the study is described and justified as follows.

3.1 Building the corpora

Two sets of corpora were used in this research study: CEPT was the corpus of reading passages in the prescribed English textbooks by OBEC, and CONET was the corpus of the reading passages used in Thai national English tests.

3.1.1 Selection of the corpora

According to the research questions, this study aimed at exploring the readability levels, the linguistic characteristics, and the topic areas of passages used in the prescribed English textbooks and those used in Thai national English tests, so these two sources of data were collected in order to build the corpus for further data analysis.

3.1.1.1 Corpus of reading passages in the prescribed English textbooks (CPET)

CPET was compiled from the reading passages in the English textbooks prescribed by OBEC. As stated in chapter 1, OBEC is the organization responsible for proposing educational policy, developing plans, setting up educational standards and core curricula in line with the National Scheme for Education, and providing equitable education opportunities in all areas of Thailand. In the scope of English language teaching, OBEC has also set up schemes for English textbooks used in the main stream curriculum for all schools all over Thailand (both elementary and secondary schools). For the secondary school level, OBEC has certified a list of textbooks to be used as the main teaching resources for secondary school students (M.4

to M.6). The names of all 13 English textbooks from <http://academic.obec.go.th/textbook/web/> are listed in Table 3.1 below.

Table 3.1

List of English textbooks

No.	Grade level		
	M. 4	M. 5	M.6
1	Bridge 4	Bridge 5	Bridge 6
2	Elevator 1	Elevator 2	Elevator 3
3	English Explorer 1	English Explorer 2	English Explorer 3
4	English in Mind 4	English in Mind 5	English in Mind 6
5	Eyes Open Student's book 1	Eyes Open Student's book 2	Eyes Open Student's book 3
6	Flash on English Elementary Student's book	Flash on English Lower Intermediate Student's book	Flash on English Intermediate Student's book
7	Icon 1	Icon 2	Icon 3
8	MegaGoal 4	MegaGoal 5	MegaGoal 6
9	New World 4	New World 5	New World 6
10	Real Life Elementary	Real Life Pre-intermediate	Real Life Intermediate
11	Success 1	Success 2	Success 3
12	Upstream 4	Upstream 5	Upstream 6
13	World Club 1	World Club 2	World Club 3

CPET includes the reading passages under the reading sections in the list of English textbooks prescribed for grade 12 (Mattayom 6). All accompanied illustrations, such as pictures, tables, graphs, etc., were excluded from the present study because the focus of the study is aimed at analyzing the readability level, the linguistic characteristics, and the topic areas of reading passages. To yield a valid comparison between the two corpora, only the reading passages that are in the range of 80-400 words were compiled in the corpus. Two prescribed English textbooks were excluded (Megagoal and New World) because the passages included in these two

English textbooks did not meet the criteria. Therefore, 155 reading passages from eleven prescribed English textbooks were included in the corpus in order to increase the corpus size and to assure that it could be a true representation of the reading passages used in these levels of study. Moreover, a larger size corpus could better yield valid data. Samples of each English textbook, including the front cover and the scope of the books, are presented in Appendix C.

3.1.1.2 Corpus of reading passages used in Thai national English tests (CONET)

CONET was created from the collection of reading passages in Thai national English tests in the academic years 2005 to 2010 (6 academic years). Twenty reading passages that are in the range of 80-400 words were compiled. They were selected based on a practical reason because Thai national English tests administered from the year 2011 up to the present has not been publicly available.

3.2 Data analysis

The data analysis in this study was conducted in order to find out the average readability level, the linguistic characteristics, as well as the topic areas of the reading passages compiled in both corpora. The following sections describe in detail how the data were analyzed and interpreted.

3.2.1 Data analysis for research questions 1 and 2

The two corpora, CPET and CONET, were analyzed quantitatively by using Coh-Metrix. As reviewed in chapter 2 under the subtopic 2.5, Coh-Metrix consists of 106 indices categorized into 11 groups. Each category of Coh-Metrix presents different features of linguistic characteristics. Category 1 presents the descriptive information about the target reading passages (indices 1-11). Category 2 focuses on the principle components related to the text easability (indices 12-27). Category 3 displays the referential cohesion used in the passages (indices 28-37). Category 4 shows the latent semantic analysis (indices 38-45). Category 5 focuses on the lexical diversity within the passages (indices 46-49). Category 6 illustrates the use of connectives in the passages (indices 50-58). Category 7 presents the situation model

(indices 59-66). Category 8 and 9 display the syntactic complexity and syntactic pattern density respectively (indices 67-73 and 74-81). Category 10 shows the word information included in the target reading passages (indices 82-103). Lastly, category 11 presents the readability level under three types of readability formulas (indices 104-106). The detailed descriptions of the Coh-Metrix indices in each category are listed in appendix A.

The norm “Language Arts” was chosen as the main criterion because it was created from the data sources that were similar to the target data sources of the present study. Appendix B presents the norm “Language Arts,” which was used for analyzing the texts at different grade levels (kindergarten to grade 12 or college and career readiness), including the criteria for interpretation. After each corpus was analyzed via Coh-Metrix and interpreted using the norm ‘Language Arts’ as the criterion for identifying the linguistic characteristics, the results were compared. All of the results were divided into two parts in order to answer the research questions.

The first part of the quantitative analysis aimed to answer the first research question. It focused on finding the average readability level of the reading passages contained in both corpora. In doing this, the results achieved from category 11 are presented. In this category, three readability formulas—Flesch Reading Ease (index 104), Flesch-Kincaid Grade Level (index 105), and Coh-Metrix L2 Readability (index 106)—were used to calculate the readability level. The results from all passages were then calculated to find the average readability levels in both corpora. After obtaining the means and SDs of the three indices, they were interpreted by using the norm “Language Arts” (see Appendix B) in order to explore the readability level contained in the target reading passages. To do this, an example of interpretation based on the norm “Language Arts” (three types of readability formulas, indices 104 -106) is shown in Table 3.2.

Table 3.2
The norm “Language Arts” for indices 104-106

No.	Grade level	K-G1		G 2-3		G 4-5		G 6-8		G 9-10		G 11-CCR		Interpretation
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
104	RDFRE	95.495	3.854	87.917	3.890	80.502	5.292	70.209	5.873	62.299	7.797	51.092	9.258	higher value = easier
105	RDFKGL	1.941	0.838	3.796	0.775	5.610	1.494	8.381	2.233	10.242	30.120	12.240	3.315	lower value = easier
106	RDL2	27.133	6.216	22.239	4.978	19.238	4.755	15.467	5.032	13.397	4.103	11.808	5.045	higher value = easier

Table 3.2 shows the mean values returned from the Coh-Metrix analysis of indices 104-106, which were classified based on different grade levels from kindergarten to college and career readiness (CCR) or grade 12. The interpretation of the norm was made based on the tendency of the increasing or decreasing of the mean value of each index throughout the ranges of grade levels. For index 104 (Flesch Reading Ease), the mean value from the lowest grade band (K- G1) was ranked the highest, and it continuously decreased when the grade levels were higher. In K-1, the mean value of index 104 was 95.495 and the mean value of Grade 11 to CCR was 51.092; therefore, it could be interpreted that the higher mean value found in index 104 represents a lower readability level of the reading passage. For index 105 (Flesch-Kincaid Grade Level), the mean value from K- G1 was ranked the lowest and it increased when the grade levels were higher (K-G1 = 1.941, G 2-3 = 3.796, G 4-5 = 5.610, G 6-8 = 8.381, G 9-10 = 10.242, G 11-CCR = 12.240); therefore, it could be interpreted that the lower mean value found in index 105 represents a lower readability level of the reading passage. Moreover, the Flesch-Kincaid Grade Level readability formula analyzed the readability level by showing the results based on the grade level used in the US context. For index 106 (Coh-Metrix L2 Readability), the mean value from the lowest grade band (K- G1) was ranked the highest and this decreased throughout the higher grade levels. In K-G1, the mean value of index 106 was 27.133 whereas the mean value of Grade 11 to CCR was only 11.808; therefore, it could be concluded that the higher mean value found in index 106 shows a lower readability level of the reading passage.

The second part of the quantitative analysis was conducted to answer the second research question. It focused on exploring the linguistic characteristics of the two corpora. In order to do this, the findings from categories 1-10 of Coh-Metrix were the main data sources for data presentation and interpretation. Among these, 10 indices, which present the standard deviation values, were excluded from the data presentation (indices 5, 7, 9, 11, 35, 37, 39, 41, 43, and 45). Moreover, two indices were excluded from the data presentation since they did not have the analyzed values from the Coh-Metrix program (indices 57 and 58); therefore, there were altogether 91 indices in 10 categories. The process of data analysis was carried out as in the first part of the quantitative analysis. The mean values of all of the Coh-Metrix analyses from the two

corpora were calculated to find the average values and SDs. The average means of the indices from CPET and CONET, then, were analyzed by using t-test to find out the significantly different indices. Only the significantly different indices were interpreted by using the norm 'Language Arts' (see Appendix B), and they were compared to explore the linguistic characteristics of the reading passages from the two different corpora.

3.2.2 Data analysis for research question 3

In this part, the analysis focused on the topic areas of the passages in both corpora: CEPT and CONET. This was added to the data analysis because the topic familiarity and the lack of content or topic background knowledge is a part of the factors affecting text difficulty. For example, if the reader is not familiar with the content of the passage, they are likely to be exposed to some unfamiliar concepts in the text. Moreover, the concepts would be difficult for them to understand because they do not have adequate background knowledge on the topic taught and tested. This could affect how they comprehend the reading passage, both in the teaching and testing situations. Therefore, it is worth analyzing the two corpora to see whether the topic areas used in the teaching and testing materials are congruent and have some shared content areas. Conducting the analysis to categorize the passages into topic areas and to compare the results between the passages from the prescribed English textbooks and Thai national English tests provides a clearer picture of the balance of the topic area used between the teaching and testing situations. The results from the CPET provide a picture of content familiarity that the students achieve from their English textbooks. Similarly, the results from the content analysis of the CONET provide a picture of the topic selected in the tests. By comparing these two sources of data, the similarities and differences provide a picture of the text topic familiarity, which is one factor affecting the level of difficulty of reading passages.

In order to conduct the analysis, the following steps were employed.

a) 58 English textbooks in the local market were analyzed focusing on the content and scope of the study to find out the shared topic areas. In doing this, 15 topic areas were generated, as seen in Table 3.3.

Table 3.3*Topic areas*

people	place	learning and education
finance and money	food	health
environment and nature	culture	technology
crime	family	tourism and travel
science	art	home and house

b) All passages from CPET and CONET were read through and sorted into categories under the same topic area. This process was conducted by three raters (the researcher and two other interraters). All of the raters received the reading passages in CPET and CONET with a list of topic areas. They were all free to add new topic areas to the list depending on their judgement. A discussion among the three raters was also set up in order to find the mutual agreement on giving the name to the topic areas.

c) In order to eliminate the issue of subjectivity, all of the results from the raters were analyzed to find the interrater reliability by using Cohen's kappa. This method was proved by Conger (1980) to define the kappa results for the measures of agreement from multiple raters. Then, the K results were interpreted using the interpretation proposed by Altman (1999), as shown in Table 3.4 below.

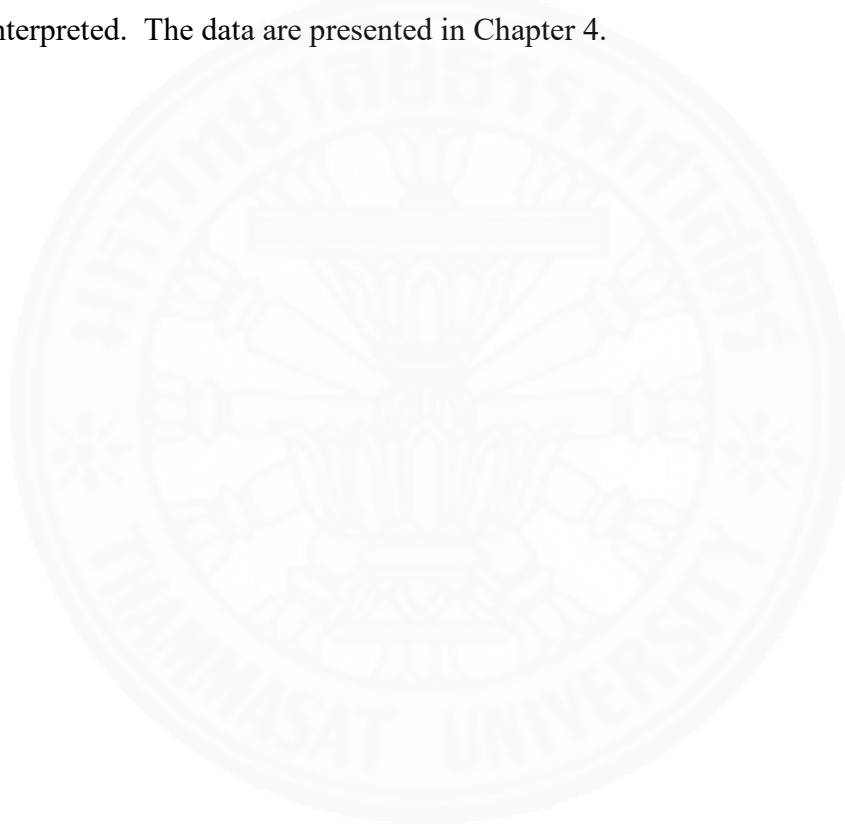
Table 3.4*Kappa's value interpretation*

Value of kappa	Strength of Agreement
< 0.00	–
0.00 – 0.20	Poor
0.21 – 0.40	Fair
0.41 – 0.60	Moderate
0.61 – 0.80	Good
0.81 – 1.00	Very good

d) The results from CPET and CONET were compared in order to find the similarities and differences in the terms in the topic areas.

3.3 Summary

This chapter has described the research methodologies used in the present study, including the detailed process of collecting and building the two corpora, CPET and CONET and how the gained data were quantitatively and qualitatively analyzed and interpreted. The data are presented in Chapter 4.



CHAPTER 4

RESULTS

4.1 Introduction

This chapter presents the findings of the present study. The results will be presented to answer the research questions related to the readability level, the linguistic characteristics, and the topic areas comparing the reading passages in the two corpora: CPET and CONET. The Coh-Metrix program was used as the main instrument, as indicated earlier. It was used to answer research questions 1 and 2. Coh-Metrix indices 104 to 106 were used to answer research question 1, and indices 1 to 103 were used to answer research question 2. They are displayed as follows.

4.2 The readability levels

In order to answer research question 1, “What are the readability levels of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different?,” the indices from category 11: Readability (indices 104-106) of Coh-Metrix, were used as the tool. Index 104 represents the readability level from the Flesch Reading Ease formula. Index 105 shows the readability level analyzed by the Flesch Kincaid Grade level, and index 106 is the readability level from the Coh-Metrix L2 Readability Formula. In order to interpret the values, for index 104 and index 106, a higher value represents a less difficult reading passage, whereas a lower value shows a more difficult reading passage. For index 105, a higher value represents a more difficult reading passage while a lower value shows a less difficult reading passage. The data from both corpora were calculated in order to ascertain the readability levels (see Tables 4.1 and 4.2). Then the average values of the readability levels were compared (see Table 4.3). They are displayed as follows.

Table 4.1

The readability levels of CPET (TB1-TB11): Means (M) and standard deviations (SD)

Textbooks (CPET)	104 Flesch Reading Ease		105 Flesch-Kincaid Grade Level		106 Coh-Metrix L2 Readability	
	M	SD	M	SD	M	SD
TB1	68.952	10.647	7.305	2.032	15.124	2.032
TB2	71.517	7.065	7.113	1.945	18.814	1.945
TB3	<u>78.407</u>	14.605	<u>5.135</u>	2.575	<u>20.611</u>	2.575
TB4	<i><u>65.809</u></i>	12.288	<i><u>8.043</u></i>	2.507	<i><u>10.538</u></i>	2.507
TB5	71.498	9.625	6.714	2.165	17.831	2.165
TB6	<i><u>65.690</u></i>	13.655	<i><u>7.799</u></i>	2.379	17.068	2.379
TB7	75.121	7.522	6.175	0.997	<u>20.684</u>	0.997
TB8	73.352	11.074	6.453	1.921	17.037	1.921
TB9	75.676	10.156	<u>5.896</u>	2.340	<i><u>14.771</u></i>	2.340
TB10	<i><u>65.308</u></i>	4.275	<i><u>7.849</u></i>	0.967	<i><u>13.300</u></i>	0.967
TB11	71.802	14.642	6.455	2.012	18.112	2.012

Table 4.1 presents the readability levels of the passages in CPET from all eleven prescribed English textbooks (TB1-TB11) analyzed by using the three readability formulas (Index 104: Flesch Reading Ease, Index 105: Flesch-Kincaid Grade Level, and Index 106: Coh-Metrix L2 Readability). In the table, the values that are bold and underlined represent the least difficulty levels whereas those that are italicized and have dotted underlines show the most difficult levels.

As shown in Table 4.1, the results from all three readability formulas confirm that TB3 is the easiest among all eleven textbooks. The average readability value from index 104 (M = 78.407 SD = 14.605) is the highest among all eleven textbooks, showing that TB3 contains the easiest reading passages. Index 105 also

presents that the reading passages contained in TB3 are graded the lowest when compared to the passages in the other textbooks. It can be seen that the average grade level of the reading passages in TB3 ($M = 5.135$ $SD = 2.575$) is approximately in the same range as the reading passages in TB9 ($M = 5.896$ $SD = 2.340$). It was also found that TB3 and TB7, analyzed using index 106, had the easiest readability level ($M = 20.611$ $SD = 2.575$, $M = 20.684$ $SD = 0.997$). Moreover, the results from index 106 show that TB7 also contains the easiest reading passages as well.

Table 4.1 also presents the most difficult reading passages in all 11 English textbooks. The top three most difficult reading passages, analyzed using index 104, were found in TB 10 ($M = 65.308$ $SD = 4.275$), TB 6 ($M = 65.690$ $SD = 13.655$), and TB4 ($M = 65.809$ $SD = 12.288$). These three English textbooks were also analyzed as the top three most difficult ones according to index 105, but they were ranked in a different order. It can be seen from index 105 that TB4 ($M = 8.043$ $SD = 2.507$) is the textbook that contains the most difficult reading passages, followed by TB10 ($M = 7.849$ $SD = 0.967$) and TB6 ($M = 7.799$ $SD = 2.379$). TB 4 and TB 10 were also analyzed using index 106 as the top two textbooks that consist of the most difficult reading passages (TB4: $M = 10.538$ $SD = 2.507$, TB10: $M = 13.300$ $SD = 0.967$). TB9 ($M = 14.771$ $SD = 2.340$) was ranked as the third textbook that had the most difficult reading passages using index 106, which is different from the other two readability formulas, showing that TB6 is more difficult than TB9.

To sum up, the results from the three readability formulas (indices 104-106) are congruent in terms of the least difficult textbook. They all show that TB3 is the easiest one among the eleven textbooks. Though index 106 shows that TB7 is the easiest, its readability value is about the same as that gained from TB3. For the top three difficult textbooks, indices 104-105 present the same results, although they are in a different order. TB4, TB6, and TB10 were the textbooks that contained the most difficult reading passages when compared to the other 11 textbooks analyzed. Index 106 also supports the results obtained from index 104 and index 105 in that TB4 was the most difficult textbook. However, it presents different results from index 104 and 105 by adding TB9 and TB10 as two more difficult textbooks.

Table 4.2

The readability levels of CONET: Means (M) and standard deviations (SD): T1-T6

Test (CONET)	104 Flesch Reading Ease		105 Flesch-Kincaid Grade Level		106 Coh-Metrix L2 Readability	
	M	SD	M	SD	M	SD
T1	64.894	18.265	<u>7.616</u>	2.999	10.033	0.694
T2	<u>42.697</u>	10.518	<i>11.048</i>	2.199	<u>9.593</u>	0.921
T3	58.622	2.942	8.946	0.859	<u>13.829</u>	5.376
T4	<u>66.255</u>	8.573	8.022	1.646	10.571	4.033
T5	60.560	19.209	9.327	3.915	<u>9.358</u>	5.282
T6	64.972	2.860	<u>7.936</u>	0.636	12.810	2.130

Table 4.2 presents the readability levels of all passages in CONET. Again, the bold and underlined values represent the least difficulty level, whereas the italicized and dotted underlined values show the most difficulty level.

As displayed in Table 4.2, the reading passages in T1, T3, T4, and T6 were analyzed as the easiest by all three readability formulas. However, each readability formula presents them in different rank orders. Index 104 shows that T4 (M= 66.255 SD = 8.573) was the easiest among the six tests, whereas T1 and T6 were analyzed as the easiest using index 105. Index 106 revealed that T3 contained the easiest reading passages. For the test that contained the most difficult reading passages, T2 was analyzed as the top most difficult test according to index 104 and index 105 (index 104: M = 42.697 SD = 10.518, index 105: M = 11.048 SD = 2.199). Though index 106 presented incongruent results by showing that T5 (M = 9.358 SD = 5.282) was the test that contained the most difficult reading passages, T2 (M = 9.593 SD = 0.921) was ranked as the second most difficult test.

In sum, indices 104-106 illustrate congruent results in terms of the test that contains the most difficult reading passages. All of the obtained data showed that T2

was the most difficult test among all 6 tests. For the test that had the lowest readability level (T1, T3, T4, and T6), each index showed a different rank order.

In order to compare the readability levels of the reading passages from both sources, Tables 4.3 show the readability values of all English textbooks and English test.

Table 4.3

Comparison of the average readability levels of passages from CPET and CONET: Means (M) and standard deviations (SD)

Index	CPET		CONET	
	Mean	SD	Mean	SD
104 Flesch Reading Ease	<u>70.684</u>	12.070	<u>60.189</u>	13.935
105 Flesch-Kincaid Grade Level	<u>6.889</u>	2.255	<u>8.696</u>	2.416
106 Coh-Metrix L2 Readability	<u>16.476</u>	6.076	<u>10.932</u>	3.339

Table 4.3 displays the average readability levels gained from the two corpora (CPET and CONET). As can be seen, all three readability formulas yielded congruent results, indicating that the reading passages in CPET were easier than those found in CONET. All of the results from these three indices were interpreted based on the norm “Language Arts”, as mentioned in Chapter 2, in order to answer the first research question, and they showed that the readability level of the reading passages in CPET were easier for the reader to comprehend than those in CONET.

For index 104, the Flesch Reading Ease and index 106, the Coh-Metrix L2 Readability, the higher value represents a lower level of difficulty. The average readability value of CPET, which was higher than that of CONET, showed that the reading passages from CPET were easier than those of CONET (index 104: $M=70.684$ $SD=12.070 > M=60.189$ $SD=13.936$). The values from the third readability formula (Index 106: Coh-Metrix L2 Readability) provides strong support for the

aforementioned readability formulas, as they presents the same results, showing that the reading passages from CPET are easier than the passages from CONET ($M=16.476$ $SD=6.076 > M=10.932$ $SD=3.339$). These results are congruent with those from the second readability formula: index 105 ‘Flesch-Kincaid Grade Level,’ which displays that the reading passages in CPET are easier than those found in CONET (index 105: $M=6.889$ $SD=2.255 < M=8.696$ $SD=2.416$).

To sum up, all three readability formulas provide the congruent results. The reading passages compiled in CPET are less difficult that those in CONET.

4.3 The linguistic characteristics

In order to answer research question 2, “What are the linguistic characteristics of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different?,” the Coh-Metrix program was also used as the main instrument. For the linguistic characteristics, the Coh-Metrix indices in the first 10 categories were used. They included descriptive (indices 1-11), the text easability principle component scores (indices 12-27), referential cohesion (28-37), latent semantic analysis (indices 38-45), lexical diversity (indices 46-49), connectives (indices 50-58), the situation model (indices 59-66), syntactic complexity (indices 67-73), syntactic pattern density (74-81), and word information (indices 82-103). As mentioned earlier in 3.2.1, the indices, which showed the standard deviation value, were excluded from the data presentation (index 5, 7, 9, 11, 35, 37, 39, 41, 43, and 45). Moreover, indices 57 and 58 were also excluded because these two indices did not have the analyzed values. Therefore, 91 indices were illustrated in the following data presentation in order to answer the second research question.

Ninety-one indices in the 10 categories with their means, standard deviations, and t-values to illustrate the linguistic characteristics of the reading passages comprised in CPET and CONET are presented in Tables 4.4 to 4.13.

Table 4.4

Category 1: Descriptive: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 1: Descriptive						
1	Total number of paragraphs in the text	2.368	1.348	4.700	2.515	4.072*
2	Total number of sentences in the text	10.219	3.732	12.700	6.853	1.589*
3	Total number of words in the text	136.813	43.841	186.300	101.824	2.148*
4	Average number of sentences in each paragraph in the text	5.136	2.412	3.134	1.626	-3.603*
6	Average number of words in each sentence in the text (sentence length)	14.043	3.436	15.424	3.874	1.668*
8	Average number of syllables in all of the words in the text (word length)	1.441	0.126	1.548	0.157	3.491*
10	Average number of letters in all of the words in the text (word length)	4.408	0.409	4.755	0.482	3.500*

Note: * significant

The data obtained from Table 4.4 are shown in category 1: Descriptive. All seven descriptive indices (indices 1, 2, 3, 4, 6, 8, and 10) show significant differences in the average values of the Coh-Metrix analysis between those from CPET and CONET at the significant point of 0.05. It can be concluded that the passages from CPET are significantly different from those gained from CONET in terms of total number of paragraphs (index 1: $t = 4.072$, $p = 0.05$), sentences (index 2: $t = 1.589$, $p = 0.05$), and words (index 3: $t = 2.148$, $p = 0.05$) in the text. Moreover, the average numbers of sentences per paragraph (index 4: $t = -3.603$, $p = 0.05$), the average number of words in each sentence (index 6: $t = 1.668$, $p = 0.05$), as well as the average number of syllables (index 8: $t = 3.491$, $p = 0.05$) and letters per word (index 10: $t = 3.500$, $p = 0.05$) were also significantly different.

Table 4.5

Category 2: Text easability principle component scores: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 2: Text easability principle component scores						
12	Narrativity, z score	0.308	1.043	-0.515	0.764	-4.322*
13	Narrativity, percentile	57.585	29.427	33.753	21.859	-4.390*
14	Syntactic simplicity, z score	-0.113	0.738	-0.086	0.974	0.150
15	Syntactic simplicity, percentile	45.929	23.676	47.716	45.930	0.706
16	Word concreteness, z score	0.756	1.039	28.039	23.677	1.148
17	Word concreteness, percentile	67.781	27.180	72.446	23.725	0.732*
18	Referential cohesion, z score	-0.666	1.023	-1.291	1.104	-2.550*
19	Referential cohesion, percentile	30.554	26.621	19.294	26.087	-1.784*
20	Deep cohesion, z score	0.290	1.313	0.489	0.930	0.855*
21	Deep cohesion, percentile	56.079	32.383	64.668	24.000	1.440*
22	Verb cohesion, z score	-0.108	1.082	-0.235	0.918	-0.503
23	Verb cohesion, percentile	45.988	29.735	43.713	28.198	-0.324
24	Connectivity, z score	-2.510	1.774	-1.470	1.763	2.469*
25	Connectivity, percentile	10.115	19.127	25.629	28.694	2.351*

26	Temporality, z score	0.237	1.249	-0.187	0.999	-1.459*
27	Temporality, percentile	58.798	32.383	45.670	29.131	-1.724*

Note: * significant

Table 4.5 displays the data obtained from the category 2: Text easability principle component scores. The table illustrates eight principles of text easability presented in z scores and percentiles. Therefore, there were eight pairs of indices. From these pairs, five (narrativity, referential cohesion, deep cohesion, connectivity, and temporality) showed that the mean values were significantly different. They were indices 12 and 13 ($t = -4.322$ and -4.390 , $p = 0.05$), indices 18 and 19 ($t = -2.550$ and -1.784 , $p = 0.05$), indices 20 and 21 ($t = 1.440$ and -0.503 , $p = 0.05$), indices 24 and 25 ($t = 2.469$ and 2.351 , $p = 0.05$), and indices 26 and 27 ($t = -1.459$ and -1.724 , $p = 0.05$). On the other hand, two pairs of indices, whose mean values of CPET and CONET were not significantly different, were indices 14 and 15 (syntactic simplicity) and indices 22 and 23 (verb cohesion). There was one pair of indices that presented a contrast result (indices 16 and 17). The results from index 16 (word concreteness: z score) showed an insignificance in the mean values whereas those from index 17 (word concreteness: percentile) showed a significance in the mean values ($t = 0.732$, $p = 0.05$).

Table 4.6

Category 3: Referential cohesion: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 3: Referential cohesion						
28	Noun overlap, adjacent sentences, binary, mean	0.253	0.217	0.235	0.180	-0.343
29	Argument overlap, adjacent sentences, binary, mean	0.457	0.225	0.361	0.178	-1.827*

30	Stem overlap, adjacent sentences, binary, mean	0.327	0.237	0.327	0.202	-0.009
31	Noun overlap, all sentences, binary, mean	0.222	0.173	0.255	0.177	0.811*
32	Argument overlap, all sentences, binary, mean	0.399	0.191	0.351	0.182	-1.061*
33	Stem overlap, all sentences, binary, mean	0.289	0.205	0.351	0.189	1.283*
34	Content word overlap, adjacent sentences, proportional, mean	0.094	0.054	0.060	0.048	-2.715*
36	Content word overlap, all sentences, proportional, mean	0.077	0.040	0.062	0.041	-1.644*

Note: * significant

Table 4.6 shows the data obtained from category 3: Referential cohesion. The table presents the group of referential cohesion of passages in CPET and CONET. From the eight indices, two indices that showed no significant differences in the mean values were noun overlap (index 28) and stem overlap (index 30) in adjacent sentences. The other 6 indices that had mean values between CPET and CONET that were significantly different were index 29 ($t = -1.824$, $p = 0.05$), index 31 ($t = 0.811$, $p = 0.05$), index 32 ($t = -1.061$, $p = 0.05$), index 33 ($t = 1.283$, $p = 0.05$), index 34 ($t = -2.715$, $p = 0.05$), and index 36 ($t = -1.644$, $p = 0.05$).

Table 4.7

Category 4: Latent semantic analysis (LSA): Means (M), standard deviations (SD), and t-values

		CPET		CONET		t
		Mean	SD	Mean	SD	
Category 4: Latent semantic analysis						
38	LSA overlap, adjacent sentences, mean	0.179	0.097	0.167	0.085	-0.526

40	LSA overlap, all sentences in paragraph, mean	0.156	0.087	0.169	0.077	0.641
42	LSA overlap, adjacent paragraphs, mean	0.252	0.217	0.257	0.167	0.110
44	LSA given/new, sentences, mean	0.248	0.062	0.255	0.056	0.473

Note: * significant

Table 4.7 displays the data obtained from category 4: Latent semantic analysis (LSA). The table consists of four indices that present the means of the LSA overlap in adjacent sentences (index 38), all sentences (index 40), adjacent paragraphs (index 42), and given and new at the sentence level (index 44). According to the table, none of the indices showed significant differences in the use of LSA between CPET and CONET.

Table 4.8

Category 5: Lexical diversity: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 5: Lexical diversity						
46	Lexical diversity, type-token ratio, content word lemmas	0.843	0.072	0.835	0.076	-0.448
47	Lexical diversity, type-token ratio, all words	0.669	0.066	0.665	0.079	-0.290
48	Lexical diversity, MTLD, all words	90.646	29.259	110.325	33.841	2.780*
49	Lexical diversity, <i>vocd</i> , all words	69.647	47.914	96.706	58.316	2.316*

Note: * significant

Table 4.8 shows the data obtained from category 5: Lexical diversity. The table consists of four indices concerning a variety of unique words that occur in the target text. The analysis of the data revealed that CPET and CONET were significantly

different in terms of MLTD and *vocd* [index 48 ($t = 2.780$, $p = 0.05$)] and index 49 ($t = 2.316$, $p = 0.05$)], whereas the mean values of the type-token ratio of content words (index 46) and all words (index 47) contained in the passages in CPET and CONET were not significantly different.

Table 4.9

Category 6: Connectives: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 6: Connectives						
50	All connectives incidence	89.285	25.293	79.718	19.822	-1.627*
51	Causal connectives incidence	23.904	15.181	28.031	10.752	1.177*
52	Logical connectives incidence	38.536	19.712	33.358	18.047	-1.116*
53	Adversative and contrastive connectives incidence	16.092	12.188	14.925	12.401	-0.402
54	Temporal connectives incidence	16.510	12.367	16.727	12.032	0.074
55	Expanded temporal connectives incidence	20.345	14.116	28.174	12.640	2.360*
56	Additive connectives incidence	50.463	20.313	34.898	16.521	-3.287*

Note: * significant

Table 4.9 displays the data obtained from category 6: Connectives. The table illustrates the number of connectives used in the target passages. Six indices were presented for different types of connectives (indices 51-56) and one index (index 50) showed the overall use of connective incidence. As can be seen from the table, the overall use of connectives in CPET and CONET (index 50: $t = -1.627$, $p = 0.05$) was significantly different. Moreover, the mean values of the causal connective (index 51: $t = 1.177$, $p = 0.05$), logical connective (index 52: $t = -1.116$, $p = 0.05$), expanded

temporal connective (index 55: $t = 2.360$, $p = 0.05$), and additive connective (index 56: $t = -3.287$, $p = 0.05$) were also significantly different. On the other hand, the mean values of the adversative and contrastive connective and temporal connective (indices 53 and 54) did not show significant differences between CPET and CONET.

Table 4.10

Category 7: Situation model: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 7: Situation model						
59	Causal verb incidence	29.190	15.863	25.349	13.394	-1.035*
60	Causal verbs and causal particles incidence	39.692	19.568	38.021	15.515	-0.367
61	Intentional verbs incidence	20.622	13.641	24.475	9.199	1.653*
62	Ratio of casual particles to causal verbs	0.325	0.367	0.497	0.459	1.919*
63	Ratio of intentional particles to intentional verbs	0.888	0.882	0.819	0.664	-0.335
64	LSA verb overlap	0.073	0.050	0.078	0.046	0.491
65	WordNet verb overlap	0.416	0.161	0.511	0.134	2.517*
66	Temporal cohesion, tense and aspect repetition, mean	0.875	0.121	0.841	0.098	-1.231*

Note: * significant

Table 4.10 shows the data obtained from category 7: Situation model. From the table, it can be seen that there are five indices that show significant differences in the mean values. They are indices 59 ($t = -1.035$, $p = 0.05$), 61 ($t = 1.653$, $p = 0.05$), 62 ($t = 1.919$, $p = 0.05$), 65 ($t = 2.517$, $p = 0.05$), and 66 ($t = -1.231$, $p = 0.05$). The other three indices revealed that the mean values between CPET and CONET were not

significantly different. They are found in indices 60 (Causal verbs and causal particles incidence), 63 (Ratio of intentional particles to intentional verbs), and 64 (LSA verb overlap).

Table 4.11

Category 8: Syntactic complexity: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 8: Syntactic complexity						
67	Left embeddedness, words before main verb, mean	3.236	1.885	4.662	3.227	1.934*
68	Number of modifiers per noun phrase, mean	0.780	0.263	0.966	0.243	2.995*
69	Minimal Edit Distance, part of speech	0.684	0.057	0.705	0.064	1.532*
70	Minimal Edit Distance, all words	0.909	0.041	0.935	0.026	2.748*
71	Minimal Edit Distance, lemmas	0.891	0.042	0.915	0.031	2.484*
72	Sentence syntax similarity, adjacent sentences, mean.	0.091	0.039	0.091	0.050	0.000
73	Sentence syntax similarity, all combinations, across paragraphs, mean	0.083	0.033	0.081	0.025	-0.235*

Note: * significant

Table 4.11 displays the data obtained from category 8: Syntactic complexity. The table consists of indices that present the syntactic complexity of the passages from CPET and CONET. There are seven indices altogether. Among these seven indices, there were no significant differences in terms of sentence syntax similarity either at the adjacent sentence level or at the overall sentence level across the paragraphs (indices 72 and 73). However, when analyzing more deeply into the specific syntactic complexity indices, the data showed that there were significant differences in

the syntactic complexity defined in the number of words before the main verb or left embeddedness (index 67: $t = 1.934, p = 0.05$), the number of modifiers per noun phrase (index 68: $t = 2.995, p = 0.05$), the minimal edit distance of part of speech (index 69: $t = 2.484, p = 0.05$), all words (index 70: $t = 2.748, p = 0.05$), and lemma (index 71: $t = 2.995, p = 0.05$).

Table 4.12

Category 9: Syntactic pattern density: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 9: Syntactic pattern density						
74	Noun phrase density, incidence	380.674	51.738	368.237	26.893	-1.701*
75	Verb phrase density, incidence	210.489	47.549	207.672	38.073	-0.254
76	Adverbial phrase density, incidence	30.827	16.780	25.058	16.119	-1.453*
77	Preposition phrase density, incidence	100.125	30.272	107.853	25.631	1.092*
78	Agentless passive voice density, incidence	6.260	9.297	9.063	9.533	1.265*
79	Negation density, incidence	5.265	8.208	4.581	5.354	-0.363
80	Gerund density, incidence	16.739	14.708	23.860	11.616	2.081*
81	Infinitive density, incidence	15.201	12.035	17.344	12.419	0.747*

Note: * significant

Table 4.12 shows the data obtained from category 9: Syntactic pattern density. The table displays the syntactic pattern density of the passages in CPET and CONET. As can be seen from the table, there are eight indices in this category. The results showed that six indices had significant differences in their mean values. There were differences in the density of the syntactic pattern of the noun phrases (index 74: $t = -1.701, p = 0.05$), adverbial phrases (index 76: $t = -1.453, p = 0.05$), preposition

phrases (index 77: $t = 1.092$, $p = 0.05$), agentless passive voice (index 78: $t = 1.265$, $p = 0.05$), gerunds (index 80: $t = 2.081$, $p = 0.05$), and infinitives (index 81: $t = 0.747$, $p = 0.05$). However, the use of verb phrase density (index 75) and negation density (index 79) did not show any significant differences between CPET and CONET.

Table 4.13

Category 10: Word information: Means (M), standard deviations (SD), and t-values

		CPET		CONET		
		Mean	SD	Mean	SD	t
Category 10: Word information						
82	Noun incidence	276.617	58.920	312.181	53.305	2.566*
83	Verb incidence	131.450	35.012	134.471	26.983	0.371
84	Adjective incidence	77.539	33.428	85.966	28.585	1.077*
85	Adverb incidence	53.743	27.899	41.944	21.271	-1.822*
86	Pronoun incidence	87.657	55.423	52.902	34.131	-3.934*
87	First person singular pronoun incidence	20.892	35.215	4.129	17.368	-3.489*
88	First person plural pronoun incidence	6.668	13.770	3.490	5.992	-1.018*
89	Second person pronoun incidence	13.319	21.693	17.120	19.752	0.745*
90	Third person singular pronoun incidence	24.005	38.914	7.372	15.052	-3.621*
91	Third person plural pronoun incidence	11.326	14.645	8.499	10.682	-1.062*
92	CELEX word frequency for content words, mean	2.297	0.184	2.128	0.137	-4.990*
93	CELEX Log frequency for all words, mean	3.005	0.124	2.884	0.124	-4.103*
94	CELEX Log minimum frequency for content words, mean	1.268	0.525	0.956	0.569	-2.476*

95	Age of acquisition for content words, mean	319.383	45.225	336.675	44.376	1.613*
96	Familiarity for content words, mean	577.327	10.370	572.729	8.134	-1.907*
97	Concreteness for content words, mean	393.500	35.802	403.859	25.873	1.251*
98	Imagability for content words, mean	425.858	32.258	431.875	25.818	0.801*
99	Meaningfulness, Colorado norms, content words, mean	437.005	17.554	442.078	18.742	1.207*
100	Polysemy for content words, mean	3.931	0.557	4.002	0.452	0.547
101	Hypernymy for nouns, mean	6.091	0.670	6.448	0.727	2.223*
102	Hypernymy for verbs, mean	1.561	0.265	1.721	0.197	2.605*
103	Hypernymy for nouns and verbs, mean	1.732	0.317	2.044	0.210	5.839*

Note: * significant

Table 4.13 displays the data obtained from category 10: Word information. The table presents word information analyzed from the passages in CPET and CONET. There are 22 indices in this category. The Coh-Metrix analysis showed that there were only two indices of which the mean values from both sources (CPET and CONET) were not different. They are indices 83 (verb incidence) and 100 (polysemy for content words). The rest of the indices in this category illustrate the significant differences in the mean values. They are indices 82, 84-99, and 101-103. These indices indicate that CPET and CONET are significantly different in the use of nouns (index 82: $t = 2.566$, $p = 0.05$), adjectives (index 84: $t = 1.077$, $p = 0.05$), adverbs (index 85: $t = -1.800$, $p = 0.05$), pronouns (index 86: $t = -3.934$, $p = 0.05$), first person singular pronouns (index 87: $t = -3.489$, $p = 0.05$), first person plural pronouns (index 88: $t = -1.018$, $p = 0.05$), second person pronouns (index 89: $t = 0.745$, $p = 0.05$), third person singular pronouns (index 90: $t = -3.621$, $p = 0.05$), third person plural pronouns (index 91: $t = -1.062$, $p = 0.05$), CELEX word frequency for content words (index 92: $t = -4.990$, $p = 0.05$), CELEX log frequency for all words (index 93: $t = -4.103$, $p = 0.05$), CELEX log minimum for content words (index 94: $t = -2.476$, $p = 0.05$), age of acquisition (index

95: $t = 1.613, p = 0.05$), familiarity (index 96: $t = -1.907, p = 0.05$), concreteness (index 97: $t = 1.251, p = 0.05$), imagability (index 98: $t = 0.801, p = 0.05$), and meaningfulness for content words (index 99: $t = 1.207, p = 0.05$), as well as hypernymy for nouns (index 101: $t = 2.223, p = 0.05$), verbs (index 102: $t = 2.605, p = 0.05$, and nouns and verbs (index 103: $t = 5.839, p = 0.05$).

To sum up, tables 4.4 – 4.13 present the overall means, standard deviations, and t-values of all the indices based on the Coh-Metrix analysis of CPET and CONET under categories 1 to 10. From all 103 indices, ten indices presenting the standard deviation (indices 5, 7, 9, 11, 35, 37, 39, 41, 43, and 45) were excluded. Moreover, two indices (index 57: positive connective incidences and index 58: negative connective incidences) under category six did not have the analyzed values from the Coh-Metrix program. Thus, both indices were excluded, and so there were only 91 indices presented for the data presentation. Overall, significant differences in the means between CPET and CONET were found in 68 out of 91 indices, which accounted for 74.72% of the indices.

Generally, there were significant differences in terms of linguistic characteristics analyzed by the Coh-Metrix program between CPET and CONET. Therefore, it was considered worth analyzing more deeply to see whether these linguistic characteristics could affect the readability of the reading passages composed in CPET and CONET. In doing this, category 4: Latent semantic analysis, was excluded since there were no significant differences between the mean values of CPET and CONET. Tables 4.14- 4.22 illustrate the comparison of the indices in the nine categories that the indices were found significantly different between CPET and CONET.

Table 4.14*CPET's vs. CONET's linguistic characteristics in category 1*

		CPET		CONET		Interpretation	Results	
		Mean	SD	Mean	SD		CPET easier	CONET easier
Category 1: Descriptive								
1	Total number of paragraphs in the text	2.368	1.348	4.700	2.515	-	-	-
2	Total number of sentences in the text	<u>10.219</u>	3.732	12.700	6.853	lower value = easier	✓	
3	Total number of words in the text	<u>136.81</u> 3	43.841	186.30 0	101.82 4	lower value = easier	✓	
4	Average number of sentences in each paragraph in the text	<u>5.136</u>	2.412	3.134	1.626	higher value = easier	✓	
6	Average number of words in each sentence in the text (sentence length)	<u>14.043</u>	3.436	15.424	3.874	lower value = easier	✓	
8	Average number of syllables in all of the words in the text (word length)	<u>1.441</u>	0.126	1.548	0.157	lower value = easier	✓	
10	Average number of letters in all of the words in the text (word length)	<u>4.408</u>	0.409	4.755	0.482	lower value = easier	✓	

Table 4.14 presents Coh-Metrix's results of indices in category 1: Descriptive from CPET and CONET. Index 1 did not have an interpretation from the norm of "Language Arts"; therefore, this index was excluded. In order to interpret the results for indices 2, 3, 6, 8, and 10, lower values represent the easier level. For index 4, higher values show the less difficult level.

In this category, the Coh-Metrix results from all six indices illustrate that the reading passages from CPET were easier than those from CONET. The passages in CPET had fewer sentences in the text than the passages in CONET (index 2: M =

10.219 SD = 3.732 < M = 12.700 SD = 6.853). Moreover, the total number of words in the CPET passages was lower than that found in CONET (index 3: M = 136.813 SD = 43.841 < M = 186.300 SD = 101.824). Index 4 shows the average sentences in each paragraph in which the mean value of the passages in CPET showed a greater number of sentences in each paragraph than in CONET (index 4: M = 5.136 SD 2.412 > M = 3.134 SD = 1.626). This indicates that the passages in CPET are longer than those in CONET. For the average number of words in each sentence, the results showed that CPET had a lower number of words per sentence than CONET (Index 6: M = 14.643 SD = 3.436 < M = 15.424 SD = 3.874). Moreover, index 8 also shows that CPET's passages were lower in terms of the average number of syllables in all of the words than CONET's passages (index 8: M = 1.441 SD = 0.126 < M = 1.528 SD = 0.157). In addition, the average number of letters in all of the words found in CPET was also lower than in CONET (index 10: M = 4.408 SD = 0.409 < M = 4.755 SD = 0.482), indicating that the CPET passages were composed of words of shorter length than the passages in CONET.

Table 4.15

CPET's vs. CONET's linguistic characteristics in category 2

		CPET		CONET		Interpretation	Results
		Mean	SD	Mean	SD		
Category 2: Text easability principle component scores							
12	Narrativity, z score	<u>0.308</u>	1.043	-0.515	0.764	higher value = easier	✓
13	Narrativity, percentile	<u>57.585</u>	29.427	33.753	21.859	higher value = easier	✓
17	Word concreteness, percentile	<u>67.781</u>	27.180	72.446	23.725	higher value = easier	✓
18	Referential cohesion, z score	-0.666	1.023	<u>-1.291</u>	1.104	higher value = easier	✓
19	Referential cohesion, percentile	<u>30.554</u>	26.621	19.294	26.087	higher value = easier	✓

20	Deep cohesion, z score	<u>0.290</u>	1.313	0.489	0.930	lower value = easier	✓
21	Deep cohesion, percentile	<u>56.079</u>	32.383	64.668	24.000	lower value = easier	✓
24	Connectivity, z score	-2.510	1.774	<u>-1.470</u>	1.763	higher value = easier	✓
25	Connectivity, percentile	10.115	19.127	<u>25.629</u>	28.694	higher value = easier	✓
26	Temporality, z score	<u>0.237</u>	1.249	-0.187	0.999	higher value = easier	✓
27	Temporality, percentile	<u>58.798</u>	32.383	45.670	29.131	higher value = easier	✓

Table 4.15 presents the CPET and CONET results of the indices in category 2: Text easability principle component scores. Eleven indices were found to be significantly different between CPET and CONET. In order to interpret the results, the higher values in indices 12, 13, 17, 18, 19, 24, 25, and 27 represent a less difficult level whereas the lower values in indices 20, and 21 indicate the easier level.

As mentioned earlier, these 11 indices can be placed into five pairs and a half in order to present the values in the z scores and percentile of each principle. The first pair (indices 12 and 13) presents the z score and percentile of the principle of narrativity. The second pair is indices 18 and 19, which show the results of referential cohesion. Indices 20 and 21 are the pair of the deep cohesion principle. The principle of connectivity is paired from indices 24 and 25. The last pair is the temporality principle, which is composed of indices 26 and 27. The only one significantly-different index which cannot be paired is index 17, which shows the percentile values of the word concreteness principle.

According to the table, the three pairs of text easability principle component scores showed that CPET's linguistic characteristics were found in lower readability reading passages than those of CONET. They are the principle component of narrativity (index 12: $M = 0.308$ $SD = 1.043 > M = -0.515$ $SD = 0.764$, and index 13: $M = 57.585$ $SD = 29.427 > M = 33.753$ $SD = 21.859$), deep cohesion (index 20: $M = 0.290$ $SD = 1.313 < M = 0.489$ $SD = 0.930$ and index 21: $M = 56.079$ $SD = 32.383 < M = 64.668$ $SD = 24.000$), and temporality (index 26: $M = 0.237$ $SD = 1.249 > M = -$

0.187 SD = 0.999) and index 27: $M = 58.798$ SD = 32.383 > $M = 45.670$ SD = 29.131). On the other hand, a pair of connectivity indices (index 24: $M = -2.510$ SD = 1.774 > $M = -1.470$ SD = 1.763 and index 25: $M = 10.115$ SD 19.127 > $M = 25.629$ SD = 28.694) and the percentile value of word concreteness (index 17: $M = 72.446$ SD = 23.725 > $M = 67.781$ SD = 27.180) showed that CONET had greater word concreteness, which helps to evoke a mental image more than in CPET, suggesting that this linguistic characteristic is likely to be found in the easier reading passages. These linguistic characteristics in CONET support the ease of comprehension. However, a pair of referential cohesion principles presented contrasting results (indices 18 and 19). For index 18: referential cohesion - z score ($M = -0.666$ SD = 1.023 < $M = -1.291$ SD = 1.104), the results showed that CONET was easier than CPET while index 19: referential cohesion – percentile ($M = 30.554$ SD = 26.621 > $M = 19.294$ SD = 26.087) indicated that CPET was easier than CONET.

Table 4.16

CPET's vs. CONET's linguistic characteristics in category 3

		CPET		CONET		Interpretation	Results	
		Mean	SD	Mean	SD		CPET easier	CONET easier
Category 3: Referential cohesion								
29	Argument overlap, adjacent sentences, binary, mean	0.457	0.225	<u>0.361</u>	0.178	lower value = easier		✓
31	Noun overlap, all sentences, binary, mean	<u>0.222</u>	0.173	0.255	0.177	lower value = easier		✓
32	Argument overlap, all sentences, binary, mean	0.399	0.191	<u>0.351</u>	0.182	lower value = easier		✓
33	Stem overlap, all sentences, binary, mean	<u>0.289</u>	0.205	0.351	0.189	lower value = easier		✓
34	Content word overlap, adjacent sentences, proportional, mean	<u>0.094</u>	0.054	0.060	0.048	higher value = easier		✓
36	Content word overlap, all sentences, proportional, mean	<u>0.077</u>	0.040	0.062	0.041	higher value = easier		✓

Table 4.16 displays the Coh-Metrix results for category 3: Referential cohesion. In this category, the mean values from the Coh-Metrix analysis suggested that there were six indices that were significantly different between CPET and CONET. In order to interpret the mean values of indices 29, 31, 32, and 33, lower mean values presented an easier readability level while higher values in indices 34 and 36 indicated a lower readability level.

The mean values of four indices revealed that CPET had linguistic characteristics that were found more in easier reading passages than in CONET. They were noun overlaps in all sentences (index 31: $M = 0.222$ $SD = 0.173 < M = 0.255$ $SD = 0.177$), stem overlaps in all sentences (index 33: $M = 0.289$ $SD = 0.205 < M = 0.351$ $SD = 0.182$), content word overlaps in adjacent sentences (index 34: $M = 0.094$ $SD = 0.054 > M = 0.060$ $SD = 0.048$, and content word overlaps in all sentences (index 36: $M = 0.077$ $SD = 0.040 > M = 0.062$ $SD = 0.041$). There were only two indices that demonstrated that CONET was easier than CPET. They were index 29: argument overlaps in adjacent sentences ($M = 0.457$ $SD = 0.225 < M = 0.361$ $SD = 0.178$) and index 32: argument overlaps in all sentences ($M = 0.399$ $SD = 0.191 < M = 0.351$ $SD = 0.182$).

Table 4.17

CPET's vs. CONET's linguistic characteristics in category 5

		CPET		CONET		Interpretation	Results	
		Mean	SD	Mean	SD		CPET easier	CONET easier
Category 5: Lexical diversity								
48	Lexical diversity, MTLT, all words	<u>90.646</u>	29.259	110.325	33.841	lower value = easier	✓	
49	Lexical diversity, <i>vocd</i> , all words	<u>69.647</u>	47.914	96.706	58.316	lower value = easier	✓	

Table 4.17 is a list of the significantly-different indices between CPET and CONET. In order to interpret the results, lower values in indices 48 and 49 indicated a lower readability level. It was found that in terms of lexical diversity using MTLT and

vocd in all words, the reading passages in CPET had a lower readability level than those composed in CONET. The average mean values of these linguistic characteristics were found more in CPET, which indicated that CPET contained fewer difficult reading passages. They were index 48: MLTD of all words ($M = 90.646$ $SD = 29.259$ $< M = 110.325$ $SD = 33.841$) and index 49: *vocd* of all words ($M = 69.647$ $SD = 47.914$ $< M = 96.706$ $SD = 58.316$).

Table 4.18

CPET's vs. CONET's linguistic characteristics in category 6

		CPET		CONET		Interpretation	Results
		Mean	SD	Mean	SD		
Category 6: Connectives							
50	All connectives incidence	89.285	25.293	<u>79.718</u>	19.822	lower value = easier	✓
51	Causal connectives incidence	<u>23.904</u>	15.181	28.031	10.752	lower value = easier	✓
52	Logical connectives incidence	38.536	19.712	<u>33.358</u>	18.047	lower value = easier	✓
55	Expanded temporal connectives incidence	<u>20.345</u>	14.116	28.174	12.640	lower value = easier	✓
56	Additive connectives incidence	50.463	20.313	<u>34.898</u>	16.521	lower value = easier	✓

Category 6 shows evidence of connective uses in the reading passages composed in CPET and CONET. In this category, two indices were excluded since they were not significantly different (indices 53 and 54) and two other indices were also left out because there were no values from the Coh-Metrix analysis. Therefore, five indices were put into the table to present the significant differences between CPET and CONET. In order to interpret the results in this category, lower values indicate a lower level of readability.

Among these five indices, two of them indicated average mean values, which support the notion that the reading passages in CPET are easier than those found in CONET. They are index 51: causal connective incidence ($M = 23.904$ $SD = 15.181 < M = 28.031$, $SD = 10.725$), and index 55: expanded temporal connective incidence ($M = 20.343$ $SD = 14.116 < M = 28.17$ $SD = 12.640$). Additionally, three significant indices suggested that the reading passages in CONET are easier than those in CPET. They are index 50: all connectives ($M = 89.825$ $SD = 25.293 < M = 79.718$ $SD = 19.822$), index 52: logical connective incidence ($M = 38.536$ $SD = 19.712 < M = 33.358$ $SD = 18.047$), and index 56: additive connective incidence ($M = 50.463$ $SD = 20.313 < M = 34.898$ $SD = 16.521$).

Table 4.19

CPET's vs. CONET's linguistic characteristics in category 7

		CPET		CONET		Interpretation	Results	
		Mean	SD	Mean	SD		CPET easier	CONET easier
Category 7: Situation model								
59	Causal verb incidence	<u>29.190</u>	15.863	25.349	13.394	higher value = easier	✓	
61	Intentional verb incidence	20.622	13.641	<u>24.475</u>	9.199	higher value = easier		✓
62	Ratio of casual particles to causal verbs	<u>0.325</u>	0.367	0.497	0.459	lower value = easier	✓	
65	WordNet verb overlap	0.416	0.161	<u>0.511</u>	0.134	higher value = easier		✓
66	Temporal cohesion, tense and aspect repetition, mean	<u>0.875</u>	0.121	0.841	0.098	higher value = easier	✓	

Category 7 presents the results of the situation model analyzed. In this category, five indices were found to be significantly different between CPET and CONET. In order interpret the results, the higher values in indices 59, 61, 65, and 66 illustrate a lower level of readability while lower values in index 62 indicate a lower level of readability.

Among the five indices, three of them suggested that these features of linguistic characteristics in CPET were easier than those found in CONET. They are index 59: Causal verb incidence ($M = 29.190$ $SD = 15.863 > M = 25.349$ $SD = 13.394$), index 62: Ratio of casual particles to causal verbs ($M = 0.325$ $SD = 0.367 < M = 0.497$ $SD = 0.456$) and index 66: Temporal cohesion, tense and aspect repetition ($M = 0.875$ $SD = 0.121 > M = 0.841$ $SD = 0.098$). The other two indices showed that the reading passages in CONET were easier than those in CPET (index 61: Intentional verbs incidence: $M = 24.475$ $SD = 9.199 > M = 20.622$ $SD = 13.641$ and index 65: WordNet verb overlap: $M = 0.511$ $SD = 0.134 > M = 0.416$ $SD = 0.161$).

Table 4.20

CPET's vs. CONET's linguistic characteristics in category 8

		CPET		CONET		Interpretation	Results	
		Mean	SD	Mean	SD		CPET Easier	CONET easier
Category 8: Syntactic complexity								
67	Left embeddedness, words before main verb, mean	<u>3.236</u>	1.885	4.662	3.227	lower value = easier	✓	
68	Number of modifiers per noun phrase, mean	<u>0.780</u>	0.263	0.966	0.243	lower value = easier	✓	
69	Minimal Edit Distance, part of speech	0.684	0.057	<u>0.705</u>	0.064	higher value = easier		✓
70	Minimal Edit Distance, all words	0.909	0.041	<u>0.935</u>	0.026	higher value = easier		✓
71	Minimal Edit Distance, lemmas	0.891	0.042	<u>0.915</u>	0.031	higher value = easier		✓
73	Sentence syntax similarity, all combinations, across paragraphs, mean	<u>0.083</u>	0.033	0.081	0.025	higher value = easier	✓	

Category 8 displays the syntactic complexity of the reading passages in CPET and CONET. There are seven indices in this category. The results showed that one index had the same values. The other six indices presented significantly different mean values among CPET and CONET. In order to interpret the results, lower values

in indices 67 and 68 indicate a lower level of readability. Higher values in indices 69, 70, 71, and 73 represent a less difficult level.

The results revealed that some of the linguistic characteristics showed significantly-different results. The reading passages in CPET are easier than those in CONET in the aspect of left embeddedness or the number of words before the main verb (index 67: $M = 3.236$ $SD = 1.885 < M = 4.662$ $SD = 3.227$), the number of modifiers per noun phrase (index 68: $M = 0.780$ $SD = 0.263 < M = 0.966$ $SD = 0.243$), and the sentence syntax similarity of all combinations across the paragraphs (index 73: $M = 0.083$ $SD = 0.033 > M = 0.081$ $SD = 0.025$). For CONET, it was found that there were indices that showed linguistic characteristics, and they indicated that CONET's reading passages were easier than those in CPET. They were the minimal edit distance of part of speech (index 69: $M = 0.705$ $SD = 0.064 > M = 0.684$ $SD = 0.057$), the minimal edit distance of all words (index 70: $M = 0.935$ $SD = 0.026 > M = 0.909$ $SD = 0.041$), and the minimal edit distance of lemmas (index 71: $M = 0.915$ $SD = 0.031 > M = 0.081$ $SD = 0.042$).

Table 4.21

CPET's vs. CONET's linguistic characteristics in category 9

		CPET		CONET		Interpretation	Results	
		Mean	SD	Mean	SD		CPET easier	CONET easier
Category 9: Syntactic pattern density								
74	Noun phrase density, incidence	380.674	51.738	<u>368.237</u>	26.893	lower value = easier		✓
76	Adverbial phrase density, incidence	<u>30.827</u>	16.780	25.058	16.119	higher value = easier	✓	
77	Preposition phrase density, incidence	<u>100.125</u>	30.272	107.853	25.631	lower value = easier	✓	
78	Agentless passive voice density, incidence	<u>6.260</u>	9.297	9.063	9.533	lower value = easier	✓	
80	Gerund density, incidence	<u>16.739</u>	14.708	23.860	11.616	lower value = easier	✓	

81	Infinitive density, incidence	15.201	12.035	<u>17.344</u>	12.419	higher value = easier	✓
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Table 4.21 presents the CPET and CONET results for the indices in category 9: Syntactic pattern density. Six indices were found to be significantly different between the passages composed in CPET and CONET. In order interpret the results, lower values in indices 74, 77, 78, and 80 indicated a lower readability level whereas higher values in indices 76 and 81 showed less readability level.

The results showed that CPET's reading passages were easier than those of CONET in four indices. They are index 76: the density of adverbial phrases ($M = 30.827$ $SD = 16.780 > M = 25.058$ $SD = 16.119$), index 71: the density of preposition phrases ($M = 100.125$ $SD = 30.272 < M = 107.853$ $SD = 25.631$), index 78: the density of the agentless passive voice ($M = 6.260$ $SD = 9.297 < M = 9.063$ $SD = 9.533$), and index 80: the density of gerund incidences ($M = 16739$ $SD = 14708 < M = 23.860$ $SD = 11.616$). The other two indices indicated that CONET was easier than CPET in the density of noun phrases (index 74: $M = 368.237$ $SD = 26.893 < M = 380.674$ $SD = 51.738$) and the density of infinitives used in the reading passages (index 81: $M = 17.344$ $SD = 12.419 > M = 15.201$ $SD = 12.035$).

Table 4.22

CPET's vs. CONET's linguistic characteristics in category 10

		CPET		CONET		Interpretation	Results
		Mean	SD	Mean	SD		
Category 10: Word information							
82	Noun incidence	<u>276.617</u>	58.920	312.181	53.305	lower value = easier	✓
84	Adjective incidence	<u>77.539</u>	33.428	85.966	28.585	lower value = easier	✓
85	Adverb incidence	<u>53.743</u>	27.899	41.944	21.271	higher value = easier	✓
86	Pronoun incidence	<u>87.657</u>	55.423	52.902	34.131	higher value = easier	✓

87	First person singular pronoun incidence	<u>20.892</u>	35.215	4.129	17.368	higher value = easier	✓
88	First person plural pronoun incidence	<u>6.668</u>	13.770	3.490	5.992	higher value = easier	✓
89	Second person pronoun incidence	13.319	21.693	<u>17.120</u>	19.752	higher value = easier	✓
90	Third person singular pronoun incidence	<u>24.005</u>	38.914	7.372	15.052	higher value = easier	✓
91	Third person plural pronoun incidence	11.326	14.645	<u>8.499</u>	10.682	lower value = easier	✓
92	CELEX word frequency for content words, mean	<u>2.297</u>	0.184	2.128	0.137	higher value = easier	✓
93	CELEX Log frequency for all words, mean	<u>3.005</u>	0.124	2.884	0.124	higher value = easier	✓
94	CELEX Log minimum frequency for content words, mean	<u>1.268</u>	0.525	0.956	0.569	higher value = easier	✓
95	Age of acquisition for content words, mean	<u>319.383</u>	45.225	336.675	44.376	lower value = easier	✓
96	Familiarity for content words, mean	<u>577.327</u>	10.370	572.729	8.134	higher value = easier	✓
97	Concreteness for content words, mean	393.500	35.802	<u>403.859</u>	25.873	higher value = easier	✓
98	Imagability for content words, mean	425.858	32.258	<u>431.875</u>	25.818	higher value = easier	✓
99	Meaningfulness, Colorado norms, content words, mean	437.005	17.554	<u>442.078</u>	18.742	higher value = easier	✓
101	Hypernymy for nouns, mean	<u>6.091</u>	0.670	6.448	0.727	lower value = easier	✓
102	Hypernymy for verbs, mean	1.561	0.265	<u>1.721</u>	0.197	higher value = easier	✓
103	Hypernymy for nouns and verbs, mean	<u>1.732</u>	0.317	2.044	0.210	lower value = easier	✓

Category 10 displays the word information for the reading passages in CPET and CONET. There were 20 significantly-different indices between CPET and CONET. In order to interpret the results, the lower values in indices 82, 84, 91, 95, 101,

and 103 illustrated a less difficult level whereas the higher values in indices 85, 86, 87, 89, 90, 92, 93, 94, 96, 97, 98, 99, and 102 indicates a lower readability level.

According to the table, more than half of these significantly-different indices (14 indices) indicate that the reading passages in CPET are at a low readability level than those in CONET. CPET's reading passages are easier than those of CONET in terms of number of nouns (index 82: $M = 276.617$ $SD = 58.920 < M = 312.181$ $SD = 53.305$), number of adjectives (index 84: $M = 77.539$ $SD = 33.428 < M = 85.966$ $SD = 28.585$), number of adverbs (index 85: $M = 53.743$ $SD = 27.899 > M = 41.944$ $SD = 21.271$), number of pronouns (index 86: $M = 87.657$ $SD = 55.423 > M = 92.902$ $SD = 34.131$), and the first person singular pronoun (index 87: $M = 20.892$ $SD = 35.215 > M = 4.129$ $SD = 17.368$). Moreover, CPET's reading passages were also easier than those of CONET in the use of the first person plural pronoun (index 88: $M = 6.668$ $SD = 13.770 > M = 3.490$ $SD = 5.992$) and the third person singular pronoun (index 90: $M = 24.005$ $SD = 38.914 > M = 7.372$ $SD = 15.052$). Additionally, some classifications of words illustrate that CPET is easier than CONET. They are the CELEX word frequency for content words (index 92: $M = 2.297$ $SD = 0.184 > M = 2.128$ $SD = 0.137$), the CELEX log frequency for all words (index 93: $M = 3.005$ $SD = 0.124 > M = 2.884$ $SD = 0.124$), the CELEX log minimum frequency for content words (index 94: $M = 1.3268$ $SD = 0.525 > M = 0.956$ $SD = 0.569$), the age of acquisition of content words (index 95: $M = 319.383$ $SD = 45.225 < M = 336.675$ $SD = 44.376$), the familiarity of content words (index 96: $M = 577.327$ $SD = 10.370 > M = 572.729$ $SD = 8.134$), the hypernymy for nouns (index 101: $M = 6.091$ $SD = 0.670 < M = 6.448$ $SD = 0.727$), and the hypernymy for nouns and verbs (index 103: $M = 1.732$ $SD = 0.317 < M = 2.044$ $SD = 0.210$).

On the other hand, six indices indicated that CONET was easier than CPET. They are the use of second person pronouns (index 89: $M = 17.120$ $SD = 19.752 > M = 13.319$ $SD = 21.693$) and third person plural pronouns (index 91: $M = 8.499$ $SD = 10.682 < M = 11.326$ $SD = 14.645$). Some of the classifications of words also illustrated that CONET was easier than CPET. This can be seen in the concreteness of the content words (index 97: $M = 403.859$ $SD = 25.873 > M = 393.500$ $SD = 35.802$), the imaginability of the content words (index 98: $M = 431.875$ $SD = 25.818 > M = 425.858$ $SD = 32.258$), the meaningfulness of the content words based on Colorado norms (index

99: $M = 442.078$ $SD = 18.742 > M = 437.005$ $SD = 17.554$), and the hypernymy of the verbs (index 102: $M = 1.721$ $SD = 0.197 > M = 1.561$ $SD = 0.265$).

4.4 The topic areas

In order to answer research question 3, “What are the topic areas of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different,” the proposed list of topic areas was generated as follows.

All of the reading passages contained in CPET and CONET were read through, analyzed, and grouped into the same category if they were under the same topic area by three raters (the researcher and two interraters). All of the raters were free to add more topic areas to the list. Then, all of the obtained results were statistically analyzed using Cohen’s kappa in order to ascertain the interrater reliability of the results. The following tables present the average kappa results analyzed from all pairs of raters and the average kappa results.

Table 4.23

CPET Kappa results

Raters	k	sig.	Interpretation
Rater 1 vs. Rater 2	0.978	< 0.005	Very good
Rater 1 vs. Rater 3	0.971	< 0.005	Very good
Rater 2 vs. Rater 3	0.978	< 0.005	Very good
Average	0.975	< 0.005	Very good

Table 4.24*CONET Kappa results*

Raters	k	sig.	Interpretation
Rater 1 vs. Rater 2	0.941	< 0.005	Very good
Rater 1 vs. Rater 3	0.941	< 0.005	Very good
Rater 2 vs. Rater 3	0.882	< 0.005	Very good
Average	0.921	< 0.005	Very good

As seen from Tables 4.23 and 4.24, Cohen's kappa was run in order to determine if there was agreement between all three raters' judgements on the classification of the reading passages into topic areas. The average k showed that there was almost perfect agreement between all raters: $k = 0.975$, $p < 0.005$ for the classification of the CPET reading passages and $k = 0.921$, $p < 0.005$ for the classification of the CONET reading passages.

The following table presents the final list of topic areas from all three raters, the classification of the reading passages in each topic area by each rater, and the average percentage of reading passages in each topic area, analyzed using CPET and CONET. Among all 19 topic areas, 13 topic areas were from the pre-generated list (see Table 3.3), and six topic areas were added by the raters while analyzing the data. The added topics were sport (no. 7), social issues (no. 8), entertainment (no. 10), history of organization (no. 14), transportation (no. 16), and fashion (no. 17).

Table 4.25*CPET: List of topic areas, number of passages, and percentages*

No.	Topic Area	Rater1	Rater 2	Rater 3	Average Percentage (%)
		No. of passages	No. of passages	No. of passages	
1	People	36	36	37	23.44
2	Crime	17	17	17	10.97

3	Technology	15	14	15	9.46
4	Tourism and travel	14	14	13	8.82
5	Place	11	12	12	7.53
6	Health	7	8	7	4.73
7	Sport	8	7	7	4.73
8	Social issues	6	6	7	4.09
9	Culture	6	6	5	3.66
10	Entertainment	5	6	6	3.66
11	Food	5	5	5	3.23
12	Learning and education	5	5	5	3.23
13	Environment/nature	5	4	4	2.80
14	History of organization	4	4	4	2.58
15	Finance and money	3	3	3	1.94
16	Transportation	3	3	3	1.94
17	Fashion	2	2	2	1.29
18	Science	2	2	2	1.29
19	Family	1	1	1	0.65
Total		155	155	155	100%

According to Table 4.25, the top-five topic areas that contained the highest number of reading passages were people (23.44%), crime (10.97%), technology (9.46%), tourism and travel (8.82%), and place (7.53%).

As can be seen from the table, the topic area “people” was the category that contained the highest number of reading passages. From the total number of passages included, it can be calculated as 23.44%. Further analysis showed that the reading passages in this topic area could be categorized into three sub-categories. The first one was the passages related to biography, which was the largest among the three. The second one concerned descriptions of a person’s life event. The last one was under the structure of questions and answers, which focused on consulting about life issues.

The second topic area, which was one of the top five, was the topic of “crime.” According to the data, there were 17 reading passages out of the total 155 at

10.97%. Under this topic area, the reading passages were grouped under three types of sub-topics. The biggest sub-group was reports. The second sub-group was jokes or a description of a silly crime. The last sub-group was a short excerpt from a novel whose main idea described a criminal investigation.

According to the analysis, the topic area “technology” was at the third rank, accounting for 9.46% of the total passages in CPET. In this topic area, the reading passages were categorized into two main sub-categories. The first one was a review of a website or new gadget and the second one was a description of an innovation or new technology.

The fourth rank of topic areas was “tourism and travel.” In this category, the total percentage was 8.82%. The passages under this topic area were further analyzed into three main subgroups. First, there were passages focusing on the describing of a trip. Secondly, there were tour advertisements. Lastly, they were questions and answers focusing on asking about tourist attractions and where to visit.

“Place” was ranked fifth in the top-five topic areas that had the highest number of reading passages. According to the analysis, the total percentage of this topic area was 7.53%. All of the passages under this topic were passages that described a place.

Table 4.26

CONET: List of topic areas, number of passages, and percentages

No.	Topic Area	Rater1	Rater 2	Rater 3	Average Percentage (%)
		No. of passages	No. of passages	No. of passages	
1	Health	5	5	5	25
2	Crime	4	4	4	20
3	Business	3	2	2	11.67
4	Finance and money	2	2	3	11.67
5	Social issues	2	2	2	10
6	Entertainment	1	1	1	5
7	Environment and nature	1	1	1	5

8	Food	1	1	1	5
9	Technology	1	1	1	5
10	Work	0	1	0	1.67
Total		20	20	20	100%

Table 4.26 presents the total list of topic areas and the total number of passages from CONET in each topic area categorized by all three raters. Among the total 10 topic areas, six of them were from the pre-generated list (see Table 3.3) and four topic areas were added by the raters while analyzing the data. They were business (no. 3), social issues (no. 5), entertainment (no. 6), and work (no. 10). According to the table, the top-five topic areas that contained the highest number of reading passages were “health” (25%), “crime” (20%), “business” (11.6%), “finance and money” (11.6%), and “social issues” (10%).

In Table 4.26, the topic area “health” was in the first-ranked category that contained the highest number of reading passages. The data show that there were five reading passages that were categorized under this topic area, accounting for 25% of the total. Of the five passages included, two of them were passages that described an illness or symptom. One of them explained types of medication and their effects, and another passage was a research report. The last passage gave suggestions on how to have healthy skin.

“Crime” was in the second rank of topic areas analyzed from the passages in CONET. In this group, it was found that there were four reading passages, comprising 20% of the total. The passages under this topic area were further analyzed and grouped into two categories. The first one was related to a news report that consisted of three passages. The second group had one reading passage that described legal punishment.

According to the analysis, the topic areas “business” and “finance and money” were in the same rank. Each of these topic areas accounted for 11.66% of the total. For the topic area of business, the reading passages were about a company profile, job advertisements, and how business problems are solved. For the topic area of finance and money, the reading passages were about financial services and suggestions on how to save money.

The fourth rank of topic areas from CONET was “social issues.” In this category, the total percentage was 10%. Two reading passages under this category were news reports about donations and problems of fewer numbers of zoos in the community.

According to the analysis, it was found that eight topic areas were shared between the two corpora. They were “crime,” “health,” “technology,” “social issues,” “entertainment,” “food,” “environment and nature,” and “finance and money.” Figure 4.1 illustrates the shared topic areas and their percentages.

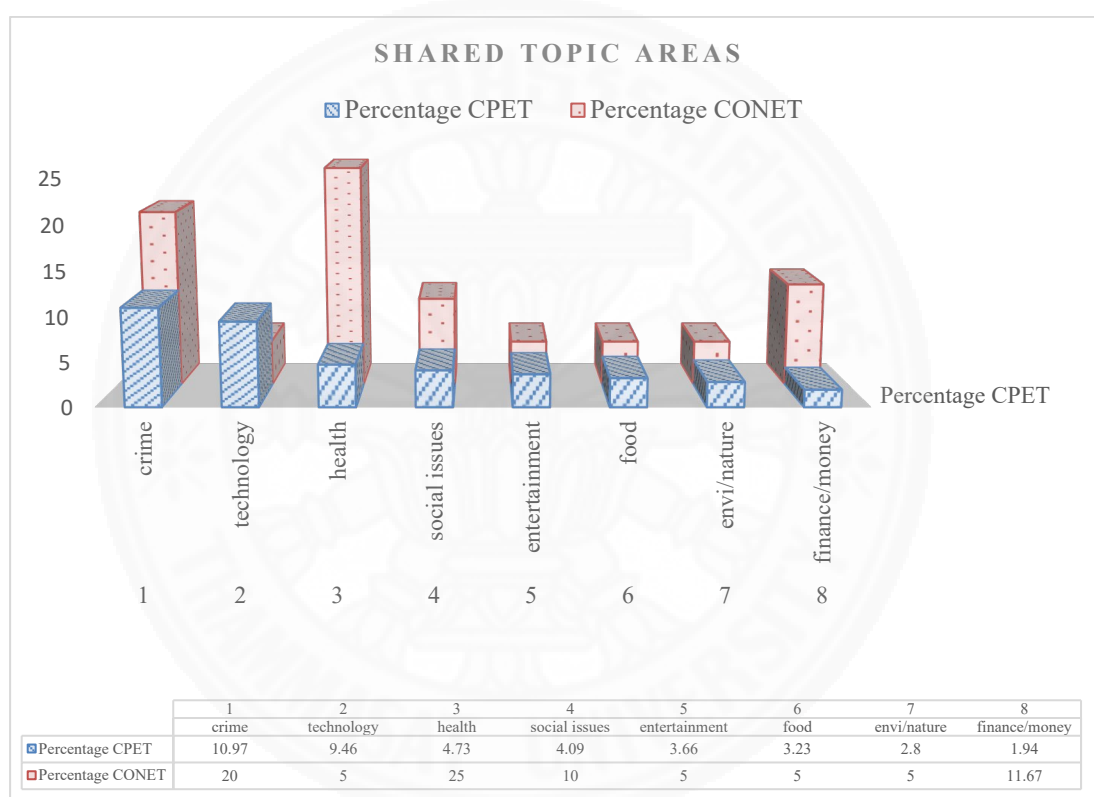


Figure 4.1 Shared topic areas and percentages

As seen in the figure, “Crime” is the only shared topic area found in the top-five topic areas from CPET and CONET. In CPET, this topic area was ranked second with a percentage of 10.97. For CONET, “Crime” was marked in the second rank with the percentage of 20. When analyzed more deeply, it was found that most of the content of the reading passages from CPET and CONET was about the report of a crime. In CPET, half of the total passages in this group presented information related to a report, and three out of four reading passages in CONET were the same. It can be

summarized that this topic area was quite similar between the teaching and testing materials.

There were seven other topic areas that were shared between CPET and CONET. Two of them were ranked in the top five of CONET (Health and Finance and money) and one topic area (Technology) was in the top five of CPET. They are illustrated as follows.

“Technology” was a topic area that was similarly found in CPET and CONET and was ranked in the top five of CPET. According to the analysis, this topic area was at 9.46% in CPET and 5% in CONET. The findings showed that most of CPET’s reading passages under this topic focused on product/website reviews or describing an innovative technology. The only reading passage under this topic area found in CONET was also a website review.

“Health” was also a shared topic between CPET and CONET. It was ranked as the top topic area that contained the highest number of reading passages in CONET, accounting for 25% in CONET and 4.73% in CPET. The analysis revealed that the reading passages in CONET presented information related to research reports describing symptoms or providing more information about medications, whereas most of the reading passages in CPET were about healthcare suggestions.

“Social issues” were another shared topic area found in CPET and CONET. Four point zero nine percent of the reading passages in CPET and 10% in CONET were categorized under this group. The reading passages under this topic were about reports on social problems or social events. The reading passages found in CPET and CONET were quite similar.

“Entertainment” was another topic area shared between CPET and CONET. The percentages were 3.66% and 5% in CPET and CONET respectively. It was found that most of CPET’s reading passages under this topic area presented a movie review or an extract from a novel where CONET’s reading passages were jokes.

“Food” is also a shared topic area. In CPET, the percentage was 3.23% while it was 5% in CONET. The reading passages under this category focused on describing types of food where the only reading passage in this group of CONET presented a food review.

The next shared topic area was “Environment/nature.” The results showed that 5% of CONET’s reading passages were under this topic area while CPET was at 2.8%. Most of CPET’ reading passages were related to news reports whereas CONET’s passages were about suggestions on how to deal with environmental problems.

“Finance/money” was the last shared topic area between CPET and CONET. In CPET, this topic area was ranked last and earned only 1.94% from the total reading passages. The passages were about a description of various definitions of money. In CONET, this topic area was, however, ranked in the top five with a percentage of 11.67%. The focus on the reading passages in CONET was providing more information on financial services and suggestions on how to save money.

Apart from these eight shared topic areas, there were 13 topic areas that were not shared between CPET and CONET. It was noticeable that three out of five topic areas that were ranked in the top five in CPET were not found in CONET. They are “people” (23.44%), “tourism and travel” (8.82%), and “place” (7.53%). In CONET, one topic area that was in the third rank, “business” (11.67%), is not included in the list of CPET’s topic areas.

From the analysis, it is obviously seen that there are some limitations in terms of shared topic areas between CPET and CONET. Some topic areas that are found in teaching materials are rarely found in testing materials.

4.5 Summary

This chapter presents the overall findings in answer to the three research questions. A detailed comparison of readability levels, linguistic characteristics, and topic areas between CPET and CONET was presented. A discussion based on the outstanding findings will be presented in Chapter 5, including the recommendations and limitations of the present study.

CHAPTER 5

DISCUSSION AND CONCLUSION

This chapter aims at summarizing the findings to answer the three research questions, followed by a discussion to illustrate the possible explanations of the key findings. Then, the practical recommendations and limitations will also be presented.

5.1 Summary of the findings and discussion

This part of the study presents a summary of the key findings from the data analysis and the discussion. They are presented in accordance with the research questions. There are three subtopics in this section: (i) the readability levels of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET); (ii) the linguistic characteristics of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET); and (iii) the topic areas of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET).

5.1.1 The readability level of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET)

The following are brief answers to the first research question, “What are the readability levels of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different?”

The average readability levels of the reading passages used in CPET analyzed by three readability formula were as follows: Flesch Reading Ease: $M = 70.684$ $SD = 12.070$, Flesch Kincaid Grade Level: $M = 6.889$ $SD = 2.225$, and Coh-Metrix L2 Readability Formula: $M = 16.476$ $SD = 6.076$. For the reading passages used in CONET, the average readability levels were $M = 60.189$ $SD = 13.935$ (Flesch

Reading Ease), $M = 8.696$ $SD = 2.416$ (Flesch Kincaid Grade Level), and $M = 10.932$ $SD = 3.339$ (Coh-Metrix L2 Readability Formula).

According to the analysis, all three readability formulas showed congruent results in that the reading passages in CPET were easier than the reading passages in CONET. Higher values in the Flesch Reading Ease and Coh-Metrix L2 Readability Formula indicated that the reading passages in CPET were less challenging than those in CONET. The results from the Flesch Kincaid Grade Level clearly showed that the average readability level of the reading passages in CPET and CONET were at different grade levels. In CPET, the average level of the passages were compatible with those used in grade 6 whereas the passages in CONET had the readability level as those used in grade 8. This means that the readability levels of the teaching and testing materials were incongruent. The students were exposed to easier teaching materials while their tests were a lot more challenging than what they had been taught in class.

Regarding the depth analysis of each corpus, it was found that there was a variety of readability levels among all 11 prescribed English textbooks (CPET). The first readability formula, Flesch Reading Ease, presented a range of average readability of all 11 English textbooks as 65.809 – 78.407, while TB3 contained the easiest reading passages and TB10 had the most difficult reading passages. For the second readability formula, Flesch Kincaid Grade Level, the range of average readability was from 5.135 -7.849, showing that the reading passages in TB3 were ranked at the lowest grade level and those found in TB4 were at the highest grade level. For the last readability formula, the Coh-Metrix L2 Readability, the range was from 10.538 – 20.684 and the reading passages in TB 7 and TB3 were found to be the easiest and those in TB4 were the most difficult. All three readability formulas indicated that TB3 has the easiest reading passages while TB4 and TB10 have the most difficult reading passages. When considering the overall range of readability levels of all 11 prescribed English textbooks, it was found that the readability levels were quite similar. All three readability formulas showed congruent results in terms of the easiest and most difficult English textbooks. However, these results revealed different levels of readability that might have an effect on how students are taught and how they prepare for a test. It can be concluded that the English textbooks, which are prescribed to be

used at the same grade level, have different levels of difficulty. This can affect the students' learning and how they cope with Thai national English tests.

For CONET, the outcomes of the analysis also showed different levels of difficulty among all six sets of tests. Flesch Reading Ease presented the range of the average readability of the tests as 42.697- 66.255, showing that T4 contains the easiest reading passages, and T2 has the most difficult reading passages. For the Flesch Kincaid Grade Level, the range was from 7.616 – 11.048, where T1 and T6 were found to be the easiest test while T2 was the most difficult. For the Coh-Metrix L2 Readability Formula, the range of average readability was 9.358 – 13.829, indicating that T3 as the test that contained the easiest reading passages; on the other hand, T2 and T5 were the tests that had the most difficult reading passages. Generally, all readability formulas present congruent results in that T2 had the most difficult reading passages of all. However, there were various results in terms of the tests that were composed of the easiest reading passages. All three readability formulas revealed different results. The inconsistency of the readability levels found in the tests might be a result of various aspects. For example, different test designers might be recruited and they might have different judgements regarding text selection. This might affect both the difficulty level of the reading passages comprised in Thai national English tests, which are supposed to be consistent in terms of difficulty level.

As can be seen that the passages used in the tests are more difficult than those in the textbooks, this might have an effect on the test results. Shohamy (1993) and Hughes (2003) have discussed the notion that the results of a test could lead to crucial consequences and impacts on various stakeholders, and this can cause a “washback” on the students, teachers, and schools. The most important stakeholder in this situation is the students, who are directly affected by the tests (Pan & Newfields, 2012). They are the ones that are prescribed to both use the textbooks and to take the tests. First, it seems to be a little bit unfair for the students to take an achievement test that is more difficult than what they have been taught at their grade level. This incongruent readability level can be one possible aspect that causes anxiety. Aydin (2009) claims that test anxiety has a significant effect on students' learning and test performance. Moreover, a study of Lunrasri (2014) also specifically stated the perception of students toward the O-NET. Most students are afraid of having a low

score on the O-NET. Additionally, they have stated that the O-NET is more difficult than what they have been taught in class, especially the vocabulary part. Some students have claimed that there are words that they have never seen or have never been taught before. Being introduced to the simpler teaching materials but being forced to take a more difficult test can be a crucial negative washback.

Consequently, these students might turn to tutoring schools in order to prepare themselves for the tests because what they have been taught might not be enough to help them cope with Thai national English tests. This is one of the educational fairness problems because not every student can afford to have extra tutoring. Goodman (2017) states that this issue is a pivotal aspect of the tests. It is commonly assumed that urban students in Thailand are likely to score higher on the tests than rural students due to having more access to educational technology and private tutoring. This issue can partly have a big impact on the educational setting in the social context. Messick (1996) stated that the social consequences of testing have “consequential validity” and can be part of a broader concept of test validity.

The teachers can also be affected by this impact as well. There might be pressure from either the school policy, the student’s parents, or even the students themselves on the teachers to effectively support students to cope with this situation. Alderson and Wall (1993) indicated that there are big influences from the tests that force teachers to do what they would not otherwise necessarily do and this definitely makes a difference regarding teaching practice. Cheng (2003) also provides support that teaching practice can be adapted or changed because of the pressure during a high-stakes test. In doing so, there might be a chance that the teachers will ignore the prescribed teaching materials and select the actual tests that were used in the previous years or mock tests, as teaching materials. Vernon (1956, as cited in Alderson & Wall, 1993) stated that when teachers place more emphasis on what is tested, the curriculum can be distorted because teachers focus on or teach only what appears on the tests and ignore other contents prescribed by the curriculum. This definitely adds a burden to the teachers’ responsibility, especially in the case of Thailand. Lunrasri (2014) states that some Thai teachers report a negative washback from high-stakes tests on their teaching practice. They have to spend more time preparing their lessons for the tests than teaching the content prescribed by the curriculum. Students, therefore, will miss

the chance to learn what is actually prescribed for them or to improve their language skills and proficiency.

The schools or institutions might also get pressure from this imbalance difficulty level of the teaching and testing materials as well. According to the indicators set by the Office for National Education Standards and Quality Assessment (ONESQA), the O-NET results are used as one of the twelve indicators for school quality evaluation (ONESQA, 2012). The results of this high-stakes test, then, have a great impact on teaching and learning practices, and especially the school administration. According to Goodman (2017), many of the stakeholders, specifically the principals, believe that the O-NET scores are the most important indicators of quality. Low O-NET scores can lead the school to both fail in the quality evaluation and lose the school's reputation. The school principals have to use great effort in order to improve the scores and pass the quality evaluation. Bailey (1999) stated that there is a tendency for schools to have to add extra classes for test preparation due to the powerful influence of the tests. The impact of this high-stakes test is not limited only to the case of Thailand. According to a study of Sundayana, Meekaeo, Purnawarman, and Sukyadi (2018), there is evidence that schools in Thailand and Indonesia have set up the special test preparation programs to enhance both the test content and the students' test-taking skills before the actual test date. This evidence is supported by a study of Lunrasri (2014), which revealed that the school principals in one province of Thailand have prescribed the teachers to set up a special class to go over the old test and to tutor and train the students to cope with the actual test.

5.1.2 The linguistic characteristics of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET)

In order to answer the second research question, “What are the linguistic characteristics of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different?” 91 indices from 10 categories were selected as the tool to provide a clearer picture of the linguistic characteristics of the reading passages in CPET and CONET. Based on the t-test results, 68 indices from nine categories

showed significant differences between the passages in CPET and CONET. The indices in category 4, “Latent semantic analysis,” showed no significant differences. A summary of the significant results is presented by category in the following.

The first category presents the descriptive characteristics of the target corpus. From the data obtained, six indices showed significant differences between CPET and CONET. Overall, CPET’s passages were significantly shorter in terms of words and sentences. Moreover, the interpretation from the norm also suggested that these descriptive characteristics found in CPET were relevant to the characteristics, which are normally compiled in the easier reading passages. It can be said that CPET is composed of shorter passages, sentences, and words than those found in CONET. Based on the theoretical foundation of traditional readability formulas in which the length of words and sentences is the base criterion for the justification of readability level (Flesch, 1948; Chall & Dale, 1995; Zamanian & Heydari, 2012), the obtained results outstandingly show that the passages compiled in CPET are definitely easier than those in CONET since they are composed of shorter words and sentences. Moreover, the passages with longer words and sentences can cause ambiguity (Handayai, 2014) and add greater demand to one’s working memory while processing the texts (Just & Carpenter, 1992). Ozuru, Rowe, O’Reilly, and McNamara (2008) also clearly indicates that more words in a sentence are one of the factors that makes passages potentially more difficult to understand. All of this may result in comprehension failure.

Category 2 presents six pairs of easability component scores. It can be summarized that CPET exhibits evidence of having an easier readability level in four of the six pairs when compared to CONET. They are narrativity, referential cohesion, deep cohesion, and temporality. For CONET, there were only two pairs of easability components, word concreteness and connectivity, that could can be features that support the comprehension process.

To discuss this in greater detail, the narrativity scores that were found more in CPET might be evidence that represents the genres of the reading passages that were used to a greater extent in the teaching materials. Most of English textbooks in Thailand are theme- or topic-based. Therefore, they might contain more narrative passages that have the characteristics of narrative texts than those found in the tests.

McNamara et al. (2014) claimed that a text, which is high in narrativity, tends to have more familiar oral language that is easier to understand. Moreover, when comparing genres, the passages that contain more characteristics of narrativity are more likely to be easier to process than the reading materials that are more informational, especially for younger readers (Ismail & Yusof, 2016).

Moreover, CPET has greater evidence of referential and deep cohesion than that found in CONET. This evidence of referential cohesion and deep cohesion illustrate that the passages in CPET have more overlapping of ideas across the sentences. This makes the concept and content of the passages more explicit and connected. In addition, they make the passages in CPET easier to understand and this can support the comprehension process. With explicit coreference, it will be easier for readers to make a connection and understand the relationships of ideas and meaning among the propositions, clauses, and sentences across the whole passages (Halliday & Hasan, 1976; McNamara & Kintsch, 1996). Furthermore, a text with low referential cohesion can be problematic and cause frustration for readers that read independently (Isamail & Yusof, 2016).

Other evidence to support the idea that CPET contains easier features that help with the comprehension of reading passages is the score on “temporality,” which reveals the cues of time used in the passages. The cues of time are one of the features related to the genre of narrativity because stories are likely to be narrated through time sequences. Moreover, the temporality score also represents the consistency of tense and aspect within the reading passages as well. Therefore, it enhances the comprehending process since the reader does not have to worry too much about the tense while processing the reading passages (McNamara et al., 2014).

From all six pairs of easability component scores, CONET has only two pairs that represent the features that are found to a greater extent in less-difficult reading passages. The first one is “word concreteness.” The passages in CONET have more concrete words. This means that the words in CONET are more concrete and meaningful than those found in CPET. This could help the reader in terms of using concrete words to evoke the mental images and to create a situation model of the reading process. A passage that contains words that are more concrete and familiar could give the reader more time for using their working memory to process and

comprehend the passage (Perfetti, 2007). Silfhout (2014) also states that texts that contain many concrete words are more interesting and this could assist with better comprehension than abstract texts.

Apart from the feature of word concreteness, CONET is also distinctive in the features of “connectivity.” This feature shows the use of adversative, additive, and comparative connections more than that found in CPET. The use of explicit connective words can reduce the effort of making inferences during the comprehension process, which can support the ease of reading. Graesser et al. (2004) have stated that the texts that are high in connectives can provide great help in making connections between the concepts presented in the text and the reader’s existing knowledge. This results in clearer coherent mental representation. Silfhout, Evers-Vermeul, and Sanders (2015) also have stated that reading a text with explicit connective words can promote higher performance on comprehension tasks than reading implicit or non-connective texts. Furthermore, the evidence of connective words used in CONET can be inferred from the genre of the reading passages comprised in the test materials as well. Graesser, McNamara, and Louwse (2003) indicated that some cohesive devices have a distinctive role in presenting the rhetorical structure of passages. The uses of adversative, additive, and comparative connectives imply that the passages are mainly focused on providing information than narrating the story. It can be interpreted that the passages in CONET are likely to include more informational text than narrative text based on the evidence of higher numbers of adversative, additive, and comparative uses.

Category 3 presents the referential cohesion by analyzing the overlapping of words in the reading passages. These repeated words throughout the reading passages are the linguistic cues that help the reader make an explicit connection between clauses and sentences in the comprehension process (Halliday & Hassan, 1976; McNamara & Kintsch, 1996). From the results obtained, it was found that CPET has more overlapping of nouns, stems, and content words than CONET. These overlapping words indicate repeated concepts and ideas throughout the sentences in the passages, especially in terms of the nouns and pronouns that are used to make reference to the agents that carry out the action in the reading passages. Graesser, McNamara, and Louwse (2003) have stated that the use of pronouns is the most frequent evidence

that shows and links the connecting relations within a text and this aids in creating explicit cohesion in the comprehension process. The results suggest that CPET has more exactly-repeated words than CONET, which makes the passages more cohesive and this could ease comprehension. Hall et al. (2015) have stated that a high cohesive text generally has a higher degree of repetition than a low cohesive one.

Moreover, the evidence of having more repeated words in CPET can be related to the general linguistic features of the reading passages in CPET as well. With a higher degree of repetition, especially regarding nouns and content words, it can also be interpreted that the passages in CPET have a low variety of vocabulary uses. This could be one linguistic characteristic that marks the difference between the passages in CPET and CONET. This result is confirmed by the data in category 5 below.

Category 5 analyzes the lexical diversity in the target reading passages. The obtained results are also congruent with those of category 3: Referential cohesion, mentioned above. It was found that CPET has less lexical diversity than CONET, which means that there is less variety of words used in the passages. CPET has a higher record of word repetition. As mentioned above, more repeated words that are listed in CPET help to promote the feature of explicit cohesive links in the passages. Shakiba, Saif, Asadzadeh, and Ghavam (2013) report that high cohesive texts have a potential role in signifying comprehension success since this is evidence that shows that most of the sentences within the passages are more connected via these local cohesive words. Therefore, this eases the comprehension processing.

Category 6 shows evidence of the connectives used in the passages comprised in CPET and CONET. The findings confirm the results found in category 2: the principle of text easability, that CONET has more types of connective uses than those in CPET. Britton and Gulgoz (1991) and Millis and Just (1994) as cited in Bayraktar (2014) states that the explicit connectives that link each text element can enhance textual coherence and results in promoting successful comprehension. A study of Sanders and Noordman (2000) also summarizes that explicit linguistic markers or connective words have an influence on online text procession and help with processing time.

In CONET, the results show the combination of all connectives, logical connectives and additive connectives, whereas the records of the causal connectives and expanded temporal connectives are found more in CPET. The different types of connectives found in these two corpora can illustrate the text organization of the reading passages used in both sources. For example, the use of logical and additive connectives might show that CONET contains more informational passages, whereas the use of causal and temporal connectives in CPET is more likely to connect with the causal information and time that might be found more in narrative texts.

The obtained results of the linguistic characteristics in category 7 also confirm the outstanding features of the reading passages in CPET and CONET. In this category, the incidence of causal and intentional verbs, which is the base line for creating the situational model of reading, was found to a greater extent than in CPET. Again, this indicates the type of text organization used in CPET and CONET. As discussed by McNamara et al. (2014), the use of causal and intentional verbs can lead to the characteristics of the text organization. Narrative texts are likely to use causal verbs more than informational passages. The evidence from the analysis support the notion that the reading passages in CPET tend to be more narrative since they have more evidence of causal verb incidence. On the other hand, CONET's reading passages have more records of intentional verbs, which suggests that the reading passages in CONET are more informational.

The data from the analysis can be briefly summarized in category 8 in that the syntactic structure in CPET is less complicated than that found in CONET. This means that the number of left embeddedness found in CPET is smaller than that in CONET. It can be said that the lengths of the noun phrases in CPET are shorter than those in CONET, and this might shorten the time needed for the comprehension process. Moreover, the number of modifiers per noun phrase in CPET is smaller than in CONET. This makes the noun phrases in CPET less complicated and easier to understand because they are shorter. Coh-Metrix Version 3.0 (2013) makes a claim that the number of modifiers and words before the main verb provides a great index for the working memory load. The shorter the noun phrases and the fewer the modifiers could reduce the load of the working memory and make the comprehension process easier. Another outcome that supports the fact that CPET has less sentence complexity

than CONET is the analysis of sentence syntax similarity. It was found that the sentence construction of the passages in CPET was generally more consistent, and that resulted in making the passages easier for readers to process. Crossley, Allen, and McNamara (2011) stated that similar syntactic structure requires lower cognitive demand so that more attention can be paid to extracting the meaning from texts.

However, the analysis in category 8 also revealed that CONET is outstanding in terms of the minimal edit distance of all words, parts of speech, and lemmas. The minimal edit distance is used to measure the uniformity and consistency of word uses. The value represents the amount of modification required in order to make two sentences have the same syntactic composition. From the analysis, it can be interpreted that in terms of the minimal edit distance in terms of all words, parts of speech, and lemmas used, the passages in CONET are more consistent in terms of the position of these three types of words in the sentences. CONET requires less modification to make two sentences have consistent sentence composition and this could partly make the comprehension process easier.

The findings from category 9, “syntactic pattern density” demonstrate that CPET has syntactic patterns that are found to a greater extent in the less difficult passages. They are adverbial phrases, prepositional phrases, agentless passive voice, and gerund density. For CONET, the significant results showed only two syntactic patterns: noun phrases and infinitives, which were more used in the easier reading passages. These findings present the features of the linguistic characteristics in the syntactic patterns between the two corpora and can illustrate the type and density of syntactic patterns used in the reading passages. The density of the syntactic patterns could affect the processing difficulty of the text. For example, the text that has a higher record of nouns and verb phrases tends to be more informationally dense (McNamara et al., 2014). Therefore, they require a deeper qualitative analysis in order to analyze each syntactic pattern.

Category 10 is the results of the word information. In this category, the results were divided into two groups: grammatical words (part of speech) and the characteristics of words (e.g. frequency). To briefly summarize, CPET is more distinctive in terms of word information. For the part of speech group, CPET has more records of nouns, adjectives, adverbs, pronouns (first person singular and plural, and

the third person singular) than CONET. It can be interpreted then that CPET makes more use of these parts of speech than CONET, which has only the evidence of more second person pronoun and third person plural pronoun uses. When considering the type of pronoun used, it can be interpreted that the content found in the passages of CPET has more pronoun uses than CONET, especially first person singulars (I and we). They are regarded as one linguistic characteristic that marks the outstanding narrative features of the reading passages in CPET (Somasundaran et al., 2018). The reading passages in CPET, therefore, have more narrative features than those found in CONET.

Another group of word information shows the characteristics of words used in the passages. According to the results, CPET has more uses of word characteristics, which is congruent with the words found in the easier reading passages. That is to say, the frequency of words used is higher than that found in CONET, which indicates that CPET contains more frequently-used and daily words. Bailin and Grafstein (2016) indicated that word frequency has a relation with the ease of comprehension processing, where it can be interpreted that passages with high-frequency words and with words that are familiar to the reader are likely to be easier to understand. On the other hand, passages that contain infrequently-used and unfamiliar words often require greater effort in understanding of the text, resulting in poor reading performance (Perfetti, 1985). Moreover, the characteristics of age of acquisition and familiarity also indicate that CPET employs the words that are likely to be acquired at the early learning stage of readers, and they are more familiar to the reader. These distinctive characteristics of words found in CPET are one of the main reasons that make the passages in CPET easier to comprehend. However, there is some evidence of word characteristics found in CONET, which can also support the comprehension process as well. The reading passages in CONET have higher numbers of word concreteness, imagability, and the meaningfulness of content words. That is to say, the content words used in CONET are more concrete and meaningful, and they help evoke mental representation on the part of the reader, which could make the comprehension process easier.

To briefly summarize, the data obtained from the analysis clearly show that CPET has more linguistic characteristics that potentially support and make the comprehension process easier than that of CONET. In other words, the reading

passages in CPET tend to be easier to comprehend based on the linguistic characteristics that are similar to those used in low readability level passages. The linguistic characteristics found in CONET, though they are smaller in number when compared to CPET, could make reading comprehension easier, and some could compensate each other. For example, CONET has longer sentences but there is evidence of connectives that could help in processing these long and complicated sentences. Additionally, CONET has smaller numbers of using high-frequency words, but the content words found in CONET might be easier to process since they are more concrete and meaningful. It can be concluded then that the analysis reveals the overall linguistic features that are evident in the passages in CPET and CONET. Some of them make the comprehension process easier and might mark the uniqueness of the reading passages used as teaching and testing materials. These linguistic characteristics enable students to be more successful in reading comprehension; therefore, teachers should conduct the analysis of the required reading materials to see what linguistic characteristics their students might need to know. Knowing this, teachers can teach the linguistic characteristics needed so that the students might have more support and this could enable them to have better reading performance.

5.1.3 The topic areas of the reading passages used in the English textbooks prescribed by OBEC (CPET) and Thai national English tests (CONET)

In order to answer the third research question, “What are the topic areas of the reading passages used in the English textbooks prescribed by OBEC (CPET) and those used in Thai national English tests (CONET)? To what extent are they different?” a brief answer is summarized below.

According to the analysis, it was found that the reading passages in CPET and CONET were quite different in terms of topic areas. The results from CPET indicated that there were 19 topic areas altogether, and the top five topic areas that had highest number of reading passages were “people” (23.44%), “crime” (10.97%), “technology” (9.46%), “tourism and travel” (8.82%), and “place” 7.53%). On the other hand, the results from CONET showed that there were ten topic areas and the top-five topic areas were “health” (25%), “crime” (20%), “business” (11.67%), “finance and money” (11.67%), and “social issue” (10%).

It was noticeable that “*crime*” was the only one topic area that was shared and ranked in the top-five by CPET and CONET. According to the analysis, this topic is commonly used in both teaching and testing materials. It has a larger number of reading passages in CPET and CONET since it is ranked the second from the top five in both corpora (CPET: 10.97% and CONET: 20%). Apart from this topic area, CPET and CONET also have other topic areas that were shared, but they were not ranked in the top five. They were “technology,” “health,” “social issue,” “entertainment,” “food,” “environment and nature,” and “finance and money.” Although these topic areas were shared between CPET and CONET, the proportion of percentages were quite different. Table 5.1 illustrates the percentages of these shared topic areas.

Table 5.1

List of shared topic areas and their percentages

Topic areas	CPET	CONET
Crime	10.97	20
Technology	9.46	5
Health	4.73	25
Social issues	4.09	10
Entertainment	3.66	5
Food	3.23	5
Environment/nature	2.8	5
Finance/money	1.94	11.67

The percentages of the shared topic areas found in CPET and CONET illustrate that there is an imbalance in the proportion of teaching and testing reading passage. As can be seen, seven out of all eight shared topic areas (crime, health, social issues, entertainment, food, environment/nature, and finance/money) have lower percentages in CPET than in CONET. These topic areas are taught in the lesser proportion via the use of the prescribed English textbooks, but they are included more

in the tests, especially the topic areas “health”, “crime”, and “finance and money”. The only topic area that is taught more in the prescribed English textbooks but was found less in the tests was “technology.” From these findings, it is clearly seen that even some of the topic areas are shared between the teaching and testing materials, although their proportion is quite different. Students have less exposure to these topic areas, but they are required to read the reading passages under these less familiar topic areas in the tests. This could be one essential factor that has an impact on the difficulty of the tests and the students’ test performance.

Further, there were some topic areas that were not shared among these two corpora. The obtained findings revealed that three of the top-five topic areas in CPET (“people: 23.44%,” “tourism and travel: 8.82%,” and “place: 7.53%”) did not appear in the list of topic areas analyzed from CONET. These three topic areas had a large proportion of reading passages in the prescribed English textbooks. Students are exposed to these areas while studying; however, these topic areas are neglected when selecting the reading passages to be used in the tests. On the other hand, two topic areas in CONET (“business: 11.67%” and “work: 1.67%”) were not found in CPET. Therefore, it can be confirmed that the topic areas that had a large proportion of reading passages in the tests were not congruent with those that were found in the teaching materials.

From the researcher’s direct experience in the field of English language teaching and testing, general topic areas are normally assigned to test designers to be a larger umbrella for selecting the reading passages. Generally, three broad categories are commonly assigned: science and technology, social studies, and business. In order to provide a bigger picture of the topic areas analyzed from the two corpora, all topic areas were regrouped under three broader categories: science and technology, social studies, and business. The obtained data revealed a broader picture of the reading passages that were found in the teaching and testing materials. Table 5.2 provides the classification of the topic areas under three broader categories and their percentages.

Table 5.2

Classification of topic areas under three broader topics and their percentages

CPET			CONET		
Science and Technology	Social Studies	Business	Science and Technology	Social Studies	Business
1. Technology 2. Health 3. Food 4. Environment and nature 5. Science	1. People 2. Crime 3. Tourism and Travel 4. Place 5. Sport 6. Social issues 7. Culture 8. Entertainment 9. Learning and Education 10. History of Organization 11. Transportation 12. Fashion 13. Family	1. Finance and money	1. Health 2. Environment and Nature 3. Food 4. Technology	1. Crime issues 2. Social issues	1. Business 2. Finance and money 3. Work
21%	79.59%	1.94%	40%	35%	25.01%

It is noticeable from the proportion of percentages found in Table 5.2 that CPET has greater focus in the area of social studies than the area of science and the area of technology and business. As can be seen from the table, the percentage of "social studies" is greatly higher than the other two categories (social studies: 79.59%, science and technology: 21%, business: 1.94%). On the other hand, three major topic areas in CONET do not show much difference (social studies, 35%, science and technology: 40%, and business: 25.01%). Considering the percentages of these categories, there is a big difference between the proportion of reading passages used in the teaching and testing materials. For the first category, "science and technology," the results showed a percentage of 21% in CPET, and the percentage is almost double in CONET. This illustrates that there is greater focus on "science and technology" in the testing materials than in the teaching materials. This finding is similar to the finding found in the category of "business," which was 25.01% in the tests and only 1.94% in the teaching materials. The results indicate that the testing materials provide a bigger proportion of reading passages related to "business" while this category received the least attention in the teaching materials. It was only 1.94% of all the reading passages

in CPET. This means that students have less exposure to passages concerning business, but they have to read them in the tests. On the other hand, the category of “social studies,” which had the largest proportion of reading passages in CPET (79.59%), was found to be only 35% in CONET. This means that the students are exposed to many reading passages related to “social studies” while learning through the use of the prescribed English textbooks, but they do not find many reading passages related to social studies in the tests. This evidence indicates a high impact of topic areas on the students because of the imbalance of the topic areas between the prescribed English textbooks and the tests. Thus, the students’ test performance might be affected.

The rationales behind this might be related to the process of material design. In order to design or select the materials to be used as teaching or testing materials, the ultimate goal is to follow the standards stated in the core curriculum. As mentioned by Nunan (1988), the material design should be based on the curriculum. In terms of achievement tests, Flateby (2014) recommends that the test should represent the content prescribed in the course and the depth of learning aspects that are required to be achieved in the course. However, there might be other factors affecting the consideration of this during the selection process. Tomlinson (2011) had stated that most of the material designers rely on their intuition, inspiration, and repertoire when they design materials. This could have an effect on the selected reading passages because each material designer might have different interests, and their interests can affect how the reading passages are selected to be used as teaching and testing materials.

Moreover, there are other factors to be considered when designing teaching and testing materials. In terms of the teaching materials, the information related to the target students is one of the major considerations. Students’ interests are regarded as one of the primary concerns. Crandall (1995) stated that interesting content could boost the students’ motivation to read, learn, and encourage them to be more efficient and effective readers. This could be a reason why the topic areas “people”, “tourism and travel”, and “place” under the broader category of “social studies” have the highest number of reading passages included in the textbooks. These topic areas might be in the area of the students’ interest, for examples, the biography of famous people or celebrities. On the other hand, the reading passages compiled as test materials might be chosen with different considerations. In term of test materials, it is necessary

that the reading passages serve as a tool to help assess the students' achievement. The selected passages should have the characteristics that could enable students to, for example, employ the expected reading strategies after being taught in a class. The reading passages should encourage and help the students to perform at their highest level of ability (Bachman & Palmer, 1996).

Moreover, as the tests are administered year by year, there is a need to choose passages that are related to recent and current affairs to make the tests up to date. These considerations might affect the choices of the topic areas of the reading passages for the test materials.

Another rationale why there are some imbalances between the topic areas found in CPET and CONET might be related to the test specifications. From the analysis, only three reading passages were found in each set of the tests. Therefore, it is not practical to include all the topic areas included in the prescribed English textbooks in the tests due to the limitation of the number of reading passages and time. The test designers, therefore, might select passages that enable them to test the skills and knowledge that are required to be assessed and overlook the topic areas. However, the consideration of the topic areas should also be taken into consideration while selecting the reading passages for the tests.

The major findings of this part of the present study revealed large differences in terms of the topic areas of the reading passages included in the teaching and testing materials. The number of shared topic areas can lead to topic knowledge, which is part of content schema. Based on schema theory, topic knowledge or content schema is considered to be an essential element that can either enhance or obstruct reading comprehension. Ke (2004) pointed out that whether content schemata are present or absent, it will definitely make a difference regarding reading comprehension.

For practical reasons, it is possible that the tests cannot cover all the topic areas that have been taught in the curriculum. However, there should be some adequate and congruent topics in order to reduce the effect of inadequate schemata. Students that learn through the use of these prescribed English textbooks tend to have limited topic knowledge, especially for certain topic areas such as "finance and money" or "business," which are seen in fewer reading passages or are not found in the English textbooks. This possibly has an effect on how students approach the reading passages

as well as their performance on the tests. Many studies have confirmed that having some background knowledge about the topic of a reading passage definitely enhances reading comprehension and promotes better memory (McNamara & Kintsch, 1996; Al-Shumaimeri, 2006, Rawson & Van Overschelde, 2008). Miller and Keenan (2009) have reported that students who are equipped with adequate prior knowledge comprehend texts better than those that have limited or poor schemata.

Besides, the aspect of culturally relevant text is one of the factors affecting the students' topic knowledge. Students who are equipped with irrelevant cultural background knowledge are likely to do poorly in reading since they cannot make a meaningful link or relate their background knowledge to the target reading text (Ebe, 2010).

Relevant topic knowledge is one of the significant elements in facilitating reading comprehension. In some models of reading comprehension, for example, the construction-integration model (Kintsch, 1998), topic knowledge is the source that readers use to interact with the new information provided in the target passages in order to develop mental representation of the text. It will enhance the processing of the text and it is clearly stated that whenever the information provided in the text is congruent with the reader's topic knowledge, the target reading text will be typically easier to comprehend than texts whose information is unfamiliar or inconsistent (Whiteley & Hutchinson, 2013).

To conclude, the obtained results for this research question clearly illustrate a gap between the topic areas in the teaching materials (CPET) compared with those in the tests (CONET). The results demonstrate an imbalance in the topic areas and their different proportions of reading passages. Some of the topic areas that have a large proportion of reading passages found in the English textbooks are not relevant to the topic areas included in the tests and vice versa and this could have an impact on the students' performance on the tests.

5.2 Pedagogical implications

5.2.1 Implications for teachers

According to the study, the results revealed that the reading passages in CPET and CONET are quite different in terms of readability level, linguistic characteristics, and topic areas. These incongruent outcomes have an impact on all stakeholders, especially teachers. Therefore, some pedagogical implications are as follows.

The teachers are the ones that receive a direct impact from this situation. They are required to use these prescribed English textbooks in their class as well as prepare their students to cope with O-NET. The results revealed differences in terms of readability level, linguistic characteristics, and topic areas between the teaching and testing materials. However, these factors are beyond the control of the teachers. They have to follow the content prescribed in the curriculum and use the listed English textbooks in their teaching. It is suggested that there are some considerations for teachers to be aware of when preparing the materials for their teaching.

During the material preparation process, the factors concerning the students, the reading passages, and the test materials should be taken into consideration. The teachers should know their students' proficiency level. This can be ascertained by employing many types of tests to assess the students' actual proficiency. In this way, teachers will obtain more information related to the students' ability levels and take this into considerations when preparing their teaching materials or selecting supplementary materials.

In order to select supplementary materials, more texts analysis tools should be employed. For example, the teachers should analyze the English textbooks and the tests in terms of readability levels, linguistic characteristics, and also the range of topic areas included. In order to do this, many computational tools can be applied, for example, using readability formulas and/or text analysis tools such as Coh-Metrix. This can guarantee that the reading passages selected to be used as supplementary teaching materials are in the range of readability, not too easy or too difficult, for the students. Krashen's theory of input hypothesis can play a part in this process. It is

suggested that teaching materials prepared for students, especially second language students, should be comprehended at a plus-one level above their current proficiency (Krashen, 1985; Long, 1983a as cited in Loschky, 1994). Moreover, the analysis of the target reading materials can illustrate the types of linguistic characteristics in the teaching and testing materials. The linguistic characteristics of the reading passages can portray the required grammatical knowledge that is useful for students in tackling the meaning of the reading passages. Moreover, teachers can prepare their students in terms of topic knowledge via the selected reading materials as well.

According to these pedagogical implications, students can be supported in terms of both learning and test preparation at the same time. This is how students can be taught and prepared for tests without relying too much on using the test materials in teaching or focusing only on test-taking strategies and tutoring.

5.2.2 Implications regarding test preparation

More preparations should be made in order to design tests. Test designers might need to go over and conduct a deep review of what is prescribed in the core curriculum, what content is provided in the prescribed English textbooks, as well as the scope of the tests. In doing this, they might have a clearer picture of how to design a test and to select appropriate reading passages for reading comprehension sections. Since the O-NET is designed to be used as an achievement test and the main purpose is for assessing the student's learning achievement after Grade 12 (Mattayom 6), the tests therefore should be able to measure the students' achievement after they finish their study. If the tests are far too difficult for the students, the results would not be an effective evaluation (Adebule, 2009).

Adequate background knowledge is one key essential in enhancing reading comprehension and the results of the present study clearly indicate that there is a large gap in the topic knowledge between the reading passages in the teaching and testing materials. Regarding this issue, it might be good support if test designers are more aware of the important role of content schemata in reading comprehension. It might make a difference and help improve the validity of the national test if there was a greater balance in the topic knowledge necessary for comprehending the reading passages since O-NET is purposed to be used as an achievement test for assessing the

learning performance of students after Mattayom 6 graduation. If the test materials are far more different in terms of topic knowledge, it would definitely affect the test performance and also the test results. The students' scores might not reveal their actual achievement since there are too many factors that make the test materials more challenging. For these reasons, the role of topic knowledge should be taken into consideration when designing the test materials.

5.2.3 Implications regarding the list of prescribed English textbooks

The list of prescribed English textbooks should be revised. There have been many attempts to improve how the English language is administered in the basic education in Thailand. For example, the Ministry of Education has announced the English Language Learning and Teaching Reform, suggesting that CEFR need to be incorporated into the administration of English language learning and teaching in January 2014. In May 2014, OBEC announced guidelines on how to put the new policy into action. Following this, the English Language Institute (established by OBEC in 2007) set up a team and produced a manual on how to administer English language learning and teaching based on the new policy. Much support can be found in this manual, for example, prescribing expected CEFR levels for each grade level, how CEFR can be used in curriculum development, how to incorporate CEFR in classes, samples of teaching materials, and assessment methods based on CEFR, as well as how CEFR can be used in the teacher's professional development. Moreover, the link between CEFR and the Basic Education Core Curriculum (2008) is also illustrated. However, evidence of creating a new list of English textbooks used as the main teaching materials is not apparent. Though new books have been added to the list, they are not graded by using CEFR. Therefore, it is suggested that CEFR should be used as one criterion in selecting the textbooks for the list of prescribed English textbooks.

If these recommendations were taken into consideration, it would provide good support for English language teaching in the local contexts of Thailand. Students would have a chance to learn and be taught by using materials that are relevant to the new policy. Moreover, the contents of the tests would also be congruent with what has been taught at their grade level. This could give the tests high validity since

it would be designed to test what has been taught and the content would not too difficult for the target students. The test results would produce more effective evaluation.

In addition, it is advisable that more research studies in exploring how to measure the readability level that goes beyond purely employing traditional readability formulas should be conducted. In the present study, although more computational tools were utilized to analyze the reading passages and linguistic features were revealed that might obstruct reading success or make it more successful, the focus was only based on the reading passage, which is only one combination of reading success. There are other aspects related to reading success, such as readers and their reading activities, which should be further studied.

5.3 Limitations

The present study employed Coh-Metrix as the main instrument for the data analysis. With the purpose given from the developers (McNamara et al., 2014), Coh-Metrix aims to provide a tool for automatically analyzing the given texts on a large scale. The obtained output provides qualified and objective linguistic features in the target text that illustrate how challenging reading texts are or the degree to which how well the reader can process and comprehend the information in the text. However, in order to estimate the difficulty level of the reading text, there are other fundamental considerations, such as the reader and the reading tasks or activities. The interaction of the reader and the target reading text in terms of reading proficiency level, motivation, and also reading purposes has some effects on the comprehension process. Moreover, the requirements of the reading tasks also interact with how readers tackle the text. These factors were beyond the scope of this present study. Therefore, in order to interpret or generalize the results of the present study, it should be done with careful consideration because the study aims at estimating the difficulty level of reading texts by considering only one fundamental factor: the text.

Although there are gaps between the shared topic knowledge between CPET and CONET, it does not mean that students that have been taught using these ranges of prescribed reading materials will totally lack topic knowledge for helping them to cope with the test materials. The prescribed English textbooks are believed to

be a huge source for providing and supporting students' learning, but there are many other sources of topic knowledge provided. Moreover, the extent to which students employ their topic knowledge in their comprehension of the reading passages in the tests still require more room for exploration. Therefore, a limited amount of topic knowledge provided for a test can have an impact on test performance, but it might not be the only factor that affects the students' reading comprehension of the tests.

5.4 Conclusion

Readability is one of the essential aspects that should be taken into consideration when designing or selecting the reading passages to be used either for teaching or testing materials. The present study investigated various aspects related to text readability by exploring beyond the surface level of reading passages by taking linguistic characteristics and topic areas into account when analyzing the difficulty level. Moreover, the study has filled some of the gaps in the literature by comparing the readability between the reading passages in the teaching and testing materials. This study has resulted in a number of recommendations and implications that have been made based on the findings. It is expected that the insights gained from this study will contribute to the field of English language teaching (ELT), especially in the area of testing reading comprehension. Although this study has accomplished its objectives, there is still more room for further study to illustrate the broader aspects of the factors affecting the difficulty level of reading passages and more contributions could be added to the literature of readability.

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APPENDIX A

LINGUISTIC CHARACTERISTICS: COH-METRIX INDICES

No: Coh-Metrix Indices		Abbreviation	Description
1. Descriptive		-	Coh-Metrix provides descriptive indices to help the user to check the Coh-Metrix output (e.g., to make sure that the numbers make sense) and also to interpret patterns of data. The extracted indices include those listed below. In the output for the current version of Coh-Metrix (Version 3.0) all of these indices are preceded by DES to designate that they are <i>descriptive</i> measures.
1	total number of paragraphs in the text	DESPC	This is the total number of paragraphs in the text. Paragraphs are simply delimited by a hard return.
2	Total number of sentences in the text	DESSC	This is the total number of sentences in the text. Sentences are identified by the Open NLP sentence splitter.
3	Total number of words in the text	DESWC	This is the total number of words in the text. Words are calculated using the output from the Charniak parser. For each sentence, the Charniak parser generates a parse tree with part of speech (POS) tags for clauses, phrases, words and punctuations. The elements on the leaves of a parse tree are tagged words or punctuations. In Coh-Metrix, words are taken from the leaves of the sentence parse trees.
4	Average number of sentences in each paragraph in the text	DESPL	This is the average number of sentences in each paragraph within the text. Longer paragraphs may be more difficult to process.
5	Standard deviation of number of sentences in each paragraph in the text	DESPLd	This is the standard deviation of the measure for the mean length of paragraphs within the text. In the output, <i>d</i> is used at the end of the name of the indices to designate that it is a standard deviation. A large standard deviation indicates that the text has large variation in terms of the lengths of its paragraphs, such that it may have some very short and some very long paragraphs. The presence of headers in a short text can increase values on this measure.
6	Average number of words in each sentence in the text (sentence length)	DESSL	This is the average number of words in each sentence within the text, where a word is anything that is tagged as a part-of-speech by the

			Charniak parser. Sentences with more words may have more complex syntax and may be more difficult to process. While this is a descriptive measure, this also provides one commonly used proxy for syntactic complexity. However, Coh-Metrix provides additional more precise measures of syntactic complexity discussed later in this chapter.
7	Standard deviation of words in each sentence in the text (sentence length)	DESSLd	This is the standard deviation of the measure for the mean length of sentences within the text. A large standard deviation indicates that the text has large variation in terms of the lengths of its sentences, such that it may have some very short and some very long sentences. The presence of headers in a short text may impact this measure. Narrative text may also have variations in sentence length as authors move from short character utterances to long descriptions of scenes.
8	Average number of syllables in all of the words in the text (word length)	DESWLsy	Coh-Metrix calculates the average number of syllables in all of the words in the text. Shorter words are easier to read and the estimate of word length serves as a common proxy for word frequency.
9	Standard deviation of syllables in all of the words in the text (word length)	DESWLsyd	This is the standard deviation of the measure for the mean number of syllables in the words within the text. A large standard deviation indicates that the text has large variation in terms of the lengths of its words, such that it may have both short and long words.
10	Average number of letters in all of the words in the text (word length)	DESWLlt	This is the average number of letters for all of the words in the text. Longer words tend to be lower in frequency or familiarity to a reader.
11	Standard deviation of letters in all of the words in the text (word length)	DESWLltd	This is the standard deviation of the measure for the mean number of letters in the words within the text. A large standard deviation indicates that the text has large variation in terms of the lengths of its words, such that it may have both short and long words.
2. Text Easability Principal Component Scores			Recent work has culminated in the development of the Coh-Metrix <i>Easability</i> components (Graesser, McNamara, & Kulikowich, 2011).

			These components provide a more complete picture of text ease (and difficulty) that emerge from the linguistic characteristics of texts. The Easability components provided by Coh-Metrix go beyond traditional readability measures by providing metrics of text characteristics on multiple levels of language and discourse. Moreover, they are well-aligned with theories of text and discourse comprehension (e.g., Graesser, Singer, & Trabasso, 1994; Graesser & McNamara, 2011; Kintsch, 1998; McNamara & Magliano, 2009).
12	Narrativity, z score	PCNARz	Narrative text tells a story, with characters, events, places, and things that are familiar to the reader. Narrative is closely affiliated with every day, oral conversation. This robust component is highly affiliated with word familiarity, world knowledge, and oral language. Non-narrative texts on less familiar topics lie at the opposite end of the continuum.
13	Narrativity, percentile	PCNARp	
14	Syntactic simplicity, z score	PCSYNz	This component reflects the degree to which the sentences in the text contain fewer words and use simpler, familiar syntactic structures, which are less challenging to process. At the opposite end of the continuum are texts that contain sentences with more words and use complex, unfamiliar syntactic structures.
15	Syntactic simplicity, percentile	PCSYNp	
16	Word concreteness, z score	PCCNCz	Texts that contain content words that are concrete, meaningful, and evoke mental images are easier to process and understand. Abstract words represent concepts that are difficult to represent visually. Texts that contain more abstract words are more challenging to understand.
17	Word concreteness, percentile	PCCNCp	
18	Referential cohesion, z score	PCREFz	A text with high referential cohesion contains words and ideas that overlap across sentences and the entire text, forming explicit threads that connect the text for the reader. Low cohesion text is typically more difficult to process because there are fewer connections that tie the ideas together for the reader.
19	Referential cohesion, percentile	PCREFp	
20	Deep cohesion, z score	PCDCz	This dimension reflects the degree to which the text contains causal and intentional connectives when there are causal and logical relationships
21	Deep cohesion, percentile	PCDCp	

			within the text. These connectives help the reader to form a more coherent and deeper understanding of the causal events, processes, and actions in the text. When a text contains many relationships but does not contain those connectives, then the reader must infer the relationships between the ideas in the text. If the text is high in deep cohesion, then those relationships and global cohesion are more explicit.
22	Verb cohesion, z score	PCVERBz	This component reflects the degree to which there are overlapping verbs in the text. When there are repeated verbs, the text likely includes a more coherent event structure that will facilitate and enhance situation model understanding. This component score is likely to be more relevant for texts intended for younger readers and for narrative texts (McNamara, Graessar, & Louwerse, 2012).
23	Verb cohesion, percentile	PCVERBp	
24	Connectivity, z score	PCCONNz	This component reflects the degree to which the text contains explicit adversative, additive, and comparative connectives to express relations in the text. This component reflects the number of logical relations in the text that are explicitly conveyed. This score is likely to be related to the reader's deeper understanding of the relations in the text.
25	Connectivity, percentile	PCCONNp	
26	Temporality, z score	PCTEMPz	Texts that contain more cues about temporality and that have more consistent temporality (i.e., tense, aspect) are easier to process and understand. In addition, temporal cohesion contributes to the reader's situation model level understanding of the events in the text.
27	Temporality, percentile	PCTEMPp	
3. Referential Cohesion			
28	Noun overlap, adjacent sentences, binary, mean	CRFNO1	These are measures of local and global overlap between sentences in terms of nouns. Adjacent noun overlap (CRFNO1) represents the average number of sentences in the text that have noun overlap from one sentence back to the previous sentence. Among the co-reference measures, it is the most strict, in the sense that the noun must match exactly, in form and plurality.

			Whereas local overlap considers only adjacent sentences, global overlap (CRFNOa) considers the overlap of each sentence with every other sentence.
29	Argument overlap, adjacent sentences, binary, mean	CRFAO1	These local and global overlap measures are similar to noun overlap measures, but include overlap between sentences in terms of nouns and pronouns. Argument overlap occurs when there is overlap between a noun in one sentence and the same noun (in singular or plural form) in another sentence; it also occurs when there are matching personal pronouns between two sentences (e.g., <i>he/he</i>). The term argument is used in a linguistic sense, where noun/pronoun arguments are contrasted with verb/adjective predicates (Kintsch & Van Dijk, 1978). Argument and stem overlap would also include overlap between pronouns, such as <i>it to it</i> , or <i>he to he</i> , which noun overlap does not include.
30	Stem overlap, adjacent sentences, binary, mean	CRFSO1	These two local and global overlap measures relax the noun constraint held by the noun and argument overlap measures. A noun in one sentence is matched with a content word (i.e., nouns, verbs, adjectives, adverbs) in a previous sentence that shares a common lemma (e.g., <i>tree/treed</i> ; <i>mouse/mousey</i> ; <i>price/priced</i>).
31	Noun overlap, all sentences, binary, mean	CRFNOa	same description as Noun overlap, adjacent sentences
32	Argument overlap, all sentences, binary, mean	CRFAOa	same description as Argument overlap, adjacent sentences
33	Stem overlap, all sentences, binary, mean	CRFSOa	same description as Stem overlap, adjacent sentences
34	Content word overlap, adjacent sentences, proportional, mean	CRFCWO1	This measure considers the proportion of explicit content words that overlap between pairs of sentences. For example, if a sentence pair has fewer words and two words overlap, the proportion is greater than if a pair has many words and two words overlap. This measure includes both local and global indices, and also includes their standard deviations. This measure may be particularly useful when the
35	Content word overlap, adjacent sentences, proportional, standard deviation	CRFCWO1d	
36	Content word overlap, all sentences, proportional, mean	CRFCWOa	
37	Content word overlap, all sentences,	CRFCWOad	

	proportional, standard deviation		lengths of the sentences in the text are a principal concern.
4. Latent Semantic Analysis			Latent Semantic Analysis (LSA; Landauer et al., 2007) provides measures of semantic overlap between sentences or between paragraphs. Coh-Metrix 3.0 provides eight LSA indices. Each of these measures varies from 0 (low cohesion) to 1 (high cohesion).
38	LSA overlap, adjacent sentences, mean	LSASS1	This index computes mean LSA cosines for adjacent, sentence-to-sentence (abbreviated as "ass") units. This measures how conceptually similar each sentence is to the next sentence.
39	LSA overlap, adjacent sentences, standard deviation	LSASS1d	This index computes standard deviation of LSA cosines for adjacent, sentence-to-sentence (abbreviated as "ass") units. This measures how consistent adjacent sentences are overlapped semantically.
40	LSA overlap, all sentences in paragraph, mean	LSASSp	Like LSA sentence adjacent (LSAassa), this index computes mean LSA cosines. However, for this index all sentence combinations are considered, not just adjacent sentences. LSAsssa computes how conceptually similar each sentence is to every other sentence in the text.
41	LSA overlap, all sentences in paragraph, standard deviation	LSASSpd	This index computes the standard deviation of LSA cosine of all sentence pairs within paragraphs.
42	LSA overlap, adjacent paragraphs, mean	LSAPP1	This index computes the mean of the LSA cosines between adjacent paragraphs.
43	LSA overlap, adjacent paragraphs, standard deviation	LSAPP1d	This index is the standard deviation of LSA cosines between adjacent paragraphs.
44	LSA given/new, sentences, mean	LSAGN	This is the average givenness of each sentence.
45	LSA given/new, sentences, standard deviation	LSAGNd	This is the standard deviation of givenness of each sentence
5. Lexical Diversity			Lexical diversity refers to the variety of unique words (<i>types</i>) that occur in a text in relation to the total number of words (<i>tokens</i>). When the number of word types is equal to the total number of words (tokens), then all of the words are different. In that case, lexical diversity is at a maximum, and the text is likely to be either very low in cohesion or very short. A high number of different

			words in a text indicate that new words need to be integrated into the discourse context. By contrast, lexical diversity is lower (and cohesion is higher) when more words are used multiple times across the text.
46	Lexical diversity, type-token ratio, content word lemmas	LDTTTRc	<p>Type-token ratio (TTR) (Templin, 1957) is the number of unique words (called types) divided by the number of tokens of these words. Each unique word in a text is considered a word type. Each instance of a particular word is a token. For example, if the word <i>dog</i> appears in the text 7 times, its type value is 1, whereas its token value is 7.</p> <p>When the type-token ratio approaches 1, each word occurs only once in the text; comprehension should be comparatively difficult because many unique words need to be decoded and integrated with the discourse context. As the type-token ratio decreases, words are repeated many times in the text, which should increase the ease and speed of text processing. Type-token ratios are computed for content words, but not function words. TTR scores are most valuable when texts of similar lengths are compared.</p>
47	Lexical diversity, type-token ratio, all words	LDTTTRa	
48	Lexical diversity, MTLTLD, all words	LDMTLTLD	MTLTLD lexical diversity measure for all words.
49	Lexical diversity, <i>vocd</i> , all words	LDVOCd	<i>vocd</i> lexical diversity measure for all words.
6. Connectives			<p>Connectives play an important role in the creation of cohesive links between ideas and clauses and provide clues about text organization (Cain & Nash, 2011; Crismore, Markkanen, & Steffensen, 1993; Longo, 1994; Sanders & Noordman, 2000; van de Kopple, 1985). Coh-Metrix provides an incidence score (occurrence per 1000 words) for all connectives (CNCAI) as well as different types of connectives. Indices are provided on five general classes of connectives (Halliday & Hasan, 1976; Louwarse, 2001): causal (CNCCaus; <i>because, so</i>), logical (CNCLogic; <i>and, or</i>), adversative/contrastive (CNCADC; <i>although, whereas</i>), temporal (CNCTemp,</p>

			CNCTempx; <i>first, until</i>), and additive (CNCAdd; <i>and, moreover</i>). In addition, there is a distinction between positive connectives (CNCPos; <i>also, moreover</i>) and negative connectives (CNCNeg; <i>however, but</i>).
50	All connectives incidence	CNCAll	This is the incidence score of all connectives.
51	Causal connectives incidence	CNCCaus	This is the incidence score of causal connectives. Among the various types of connectives, only causal connectives (CNCCaus) discriminated between the high and low cohesion texts, presumably because the researchers who created the texts primarily manipulated causal cohesion and not additive, temporal, or clarification connectives.
52	Logical connectives incidence	CNCLogic	This is the incidence score of logic connectives.
53	Adversative and contrastive connectives incidence	CNCADC	This is the incidence score of adversative/contrastive connectives.
54	Temporal connectives incidence	CNCTemp	This is the incidence score of temporal connectives.
55	Expanded temporal connectives incidence	CNCTempx	This is the incidence score of extended temporal connectives
56	Additive connectives incidence	CNCAdd	This is the incidence score of additive connectives.
57	Positive connectives incidence	CNCPos	This is the incidence score of positive connectives
58	Negative connectives incidence	CNCNeg	This is the incidence score of negative connectives.
7. Situation model			The expression <i>situation model</i> has been used by researchers in discourse processing and cognitive science to refer to the level of mental representation for a text that involves much more than the explicit words (Van Dijk & Kintsch, 1983; Graesser & McNamara, 2011; Graesser, Singer, & Trabasso, 1994; Kintsch, 1998; Zwaan & Radvansky, 1998). Some researchers have described the situational model in terms of the features that are present in the comprehender's mental representation when a given context is activated (e.g., Singer & Leon, 2007). For example, with episodes in narrative text, the situation model would include <i>the plot</i> . In an informational text about the circulatory system, the situation

			model might convey <i>the flow of the blood</i> .
59	Causal verb incidence	SMCAUSv	This is the incidence score of causal verbs.
60	Causal verbs and causal particles incidence	SMCAUSvp	This is the incidence of causal verbs and causal particles in text.
61	Intentional verbs incidence	SMINTEp	This is the incidence of intentional actions, events, and particles (per thousand words).
62	Ratio of casual particles to causal verbs	SMCAUSr	This is a ratio of causal particles (P) to causal verbs (V). The denominator is incremented by the value of 1 to handle the rare case when there are 0 causal verbs in the text. Cohesion suffers when the text has many causal verbs (signifying events and actions) but few causal particles that signal how the events and actions are connected.
63	Ratio of intentional particles to intentional verbs	SMINTER	This is the ratio of intentional particles to intentional actions/events.
64	LSA verb overlap	SMCAUSlsa	This is the LSA overlap between verbs.
65	WordNet verb overlap	SMCAUSwn	This is the WordNet overlap between verbs.
66	Temporal cohesion, tense and aspect repetition, mean	SMTEMP	This is the repetition score for tense and aspect. The repetition score for tense is averaged with the repetition score for aspect.
8. Syntactic Complexity			Theories of syntax assign words to part-of-speech categories (e.g., nouns, verbs, adjectives, conjunctions), group words into phrases or constituents (noun-phrases, verb-phrases, prepositional-phrases, clauses), and construct syntactic tree structures for sentences. For example, some sentences are short and have a simple syntax that follow an actor-action-object syntactic pattern, have few if any embedded clauses, and have an active rather than passive voice. Some sentences have complex, embedded syntax that potentially places heavier demands on working memory. The syntax in text tends to be easier to process when there are shorter sentences, few words before the main verb of the main clause, and few words per noun-phase.
67	Left embeddedness, words before main verb, mean	SYNLE	This is the mean number of words before the main verb of the main

			clause in sentences. This is a good index of working memory load.
68	Number of modifiers per noun phrase, mean	SYNNP	This is the mean number of modifiers per noun-phrase.
69	Minimal Edit Distance, part of speech	SYNMEDpos	This the minimum editorial distance scores for part of speech tags.
70	Minimal Edit Distance, all words	SYNMEDwrđ	This is the minimum editorial distance score for words.
71	Minimal Edit Distance, lemmas	SYNMEDlem	This is the minimum editorial distance score for lemmas.
72	Sentence syntax similarity, adjacent sentences, mean.	SYNSTRUTa	This is the proportion of intersection tree nodes between all adjacent sentences.
73	Sentence syntax similarity, all combinations, across paragraphs, mean	SYNSTRUTt	This is the proportion of intersection tree nodes between all sentences and across paragraphs.
9. Syntactic Pattern Density			Syntactic complexity is also informed by the density of particular syntactic patterns, word types, and phrase types. Coh-Metrix provides information on the incidence of noun phrases (DRNP, verb phrases (DRVP), adverbial phrases (DRAP), and prepositions (DRPP). The relative density of each of these can be expected to affect processing difficulty of text, particularly with respect to other features in a text. For example, if a text has a higher noun and verb phrase incidence, it is more likely to be informationally dense with complex syntax.
74	Noun phrase density, incidence	DRNP	This is the incidence score of noun phrases.
75	Verb phrase density, incidence	DRVP	This is the incidence score of verb phrases.
76	Adverbial phrase density, incidence	DRAP	This is the incidence score of adverbial phrases.
77	Preposition phrase density, incidence	DRPP	This is the incidence score of preposition phrases.
78	Agentless passive voice density, incidence	DRPVAL	This is the incidence score of agentless passive voice forms.
79	Negation density, incidence	DRNEG	This is the incidence score for negation expressions.
80	Gerund density, incidence	DRGERUND	This is the incidence score of gerunds.
81	Infinitive density, incidence	DRINF	This is the incidence score of infinitives.
10. Word Information			Word information refers to the idea that each word is assigned a syntactic part-of-speech category thus, syntactic categories are segregated into content words (e.g., nouns,

			verbs, adjectives, adverbs) and function words (e.g., prepositions, determiners, pronouns). Many words can be assigned to multiple syntactic categories. For example, the word “bank” can be a noun (“river bank”), a verb (“don’t bank on it”), or an adjective (“bank shot”). Coh-Metrix assigns only one part-of-speech category to each word on the basis of its syntactic context. In addition, Coh-Metrix computes word frequency scores and psychological ratings.
82	Noun incidence	WRDNOUN	This is the incidence score of nouns.
83	Verb incidence	WRDVERB	This is the incidence score of verbs.
84	Adjective incidence	WRDADJ	This is the incidence score of adjectives.
85	Adverb incidence	WRDADV	This is the incidence score of adverbs.
86	Pronoun incidence	WRDPRO	This is the number of personal pronouns per 1000 words. A high density of pronouns can create referential cohesion problems if the reader does not know what the pronouns refer to.
87	First person singular pronoun incidence	WRDPRP1s	This is the incidence score of pronouns, first person, single form.
88	First person plural pronoun incidence	WRDPRP1p	This is the incidence score of pronouns, first person, plural form.
89	Second person pronoun incidence	WRDPRP2	This is the incidence score of pronouns, second person.
90	Third person singular pronoun incidence	WRDPRP3s	This is the incidence score of pronouns, third person, single form.
91	Third person plural pronoun incidence	WRDPRP3p	This is the incidence score of pronouns, third person, plural form.
92	CELEX word frequency for content words, mean	WRDFRQc	This is the average word frequency for content words.
93	CELEX Log frequency for all words, mean	WRDFRQa	This is the average word frequency for all words.
94	CELEX Log minimum frequency for content words, mean	WRDFRQmc	This is the average minimum word frequency in sentences.

95	Age of acquisition for content words, mean	WRDAOAc	Coh-Metrix includes the age of acquisition norms from MRC which were compiled by Gilhooly and Logie (1980) for 1903 unique words. The <i>c</i> at the end of the index name indicates that it is calculated for the average ratings for content words in a text. Age of acquisition reflects the notion that some words appear in children's language earlier than others. Words such as <i>cortex</i> , <i>dogma</i> , and <i>matrix</i> (AOA=700) have higher age-of-acquisition scores than words such as <i>milk</i> , <i>smile</i> , and <i>pony</i> (AOA=202). Words with higher age-of-acquisition scores denote spoken words that are learned later by children.
96	Familiarity for content words, mean	WRDFAMc	This is a rating of how familiar a word seems to an adult. Sentences with more familiar words are words that are processed more quickly. MRC provides ratings for 3488 unique words. Coh-Metrix provides the average ratings for content words in a text. Raters for familiarity provided ratings using a 7-point scale, with 1 being assigned to words that they never had seen and 7 to words that they had seen very often (nearly every day). The ratings were multiplied by 100 and rounded to integers.
97	Concreteness for content words, mean	WRDCNCc	This is an index of how concrete or non-abstract a word is. Words that are more concrete are those things you can hear, taste, or touch. MRC provides ratings for 4293 unique words. Coh-Metrix provides the average ratings for content words in a text. Words that score low on the concreteness scale includes <i>protocol</i> (264) and <i>difference</i> (270) compared to <i>box</i> (597) and <i>ball</i> (615).
98	Imagability for content words, mean	WRDIMGc	An index of how easy it is to construct a mental image of the word is also provided in the merged ratings of the MRC, which provides ratings for 4825 words. Coh-Metrix provides the average ratings for content words in a text. Examples of low imagery

			<p>words are <i>reason</i>(285), <i>dogma</i> (327), and <i>overtone</i> (268) compared to words with high imagery such as <i>bracelet</i> (606) and <i>hammer</i> (618).</p>
99	<p>Meaningfulness, Colorado norms, content words, mean</p>	WRDMEAc	<p>These are the meaningfulness ratings from a corpus developed in Colorado by Toggia and Battig (1978). MRC provides ratings for 2627 words. Coh-Metrix provides the average ratings for content words in a text. An example of meaningful word is <i>people</i> (612) as compared to <i>abbess</i> (218). Words with higher meaningfulness scores are highly associated with other words (e.g., <i>people</i>), whereas a low meaningfulness score indicates that the word is weakly associated with other words.</p>
100	<p>Polysemy for content words, mean</p>	WRDPOLc	<p><i>Polysemy</i> refers to the number of senses (core meanings) of a word. For example, the word <i>bank</i> has at least two senses, one referring to a building or institution for depositing money and the other referring to the side of a river. Coh-Metrix provides average polysemy for content words in a text. Polysemy relations in WordNet are based on subsets (i.e., groups of related lexical items), which are used to represent similar concepts but distinguish between synonyms and word senses (Miller et al., 1990). These subsets allow for the differentiation of senses and provide a basis for examining the number of senses associated with a word. Coh-Metrix reports the mean WordNet polysemy values for all content words in a text. Word polysemy is considered to be indicative of text ambiguity because the more senses a word contains relates to the potential for a greater number of lexical interpretations. However, more frequent words also tend to have more meanings, and so higher values of polysemy in a text may be reflective of the presence of higher frequency words.</p>

101	Hypernymy for nouns, mean	WRDHYPn	Coh-Metrix also uses WordNet to report word hypernymy (i.e., word specificity). In WordNet, each word is located on a hierarchical scale allowing for the measurement of the number of subordinate words below and superordinate words above the target word. Thus, <i>entity</i> , as a possible hypernym for the noun <i>chair</i> , would be assigned the number 1. All other possible hyponyms of entity as it relates to the concept of a chair (e.g., <i>object</i> , <i>furniture</i> , <i>seat</i> , <i>chair</i> , <i>camp chair</i> , <i>folding chair</i>) would receive higher values. Similar values are assigned for verbs (e.g., <i>hightail</i> , <i>run</i> , and <i>travel</i>). As a result, a lower value reflects an overall use of less specific words, while a higher value reflects an overall use of more specific words.
102	Hypernymy for verbs, mean	WRDHYPv	
103	Hypernymy for nouns and verbs, mean	WRDHYPnv	
11. Readability			The traditional method of assessing texts on difficulty consists of various readability formulas. More than 40 readability formulas have been developed over the years (Klare, 1974-1975). The most common formulas are the Flesch Reading Ease Score and the Flesch Kincaid Grade Level.
104	Flesch Reading Ease	RDFRE	The output of the Flesch Reading Ease formula is a number from 0 to 100, with a higher score indicating easier reading. The average document has a Flesch Reading Ease score between 6 and 70.
105	Flesch-Kincaid Grade Level	RDFKGL	This more common Flesch-Kincaid Grade Level formula converts the Reading Ease Score to a U.S. grade-school level. The higher the number, the harder it is to read the text. The grade levels range from 0 to 12.
106	Coh-Metrix L2 Readability	RDL2	This is the second language readability score.

APPENDIX B
NORM OF LANGUAGE ARTS



	Grade level	K-1		G 2-3		G 4-5		G 6-8		G9-10		G 11-CCR		Interpretation
	Indices	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
	Descriptive													
1	DESPC	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	-
2	DESSC	34.640	6.792	26.820	5.573	20.935	4.940	15.923	4.509	13.875	3.871	13.203	3.670	lower value = easier
3	DESWC	284.760	23.162	290.700	22.346	283.850	23.070	286.330	25.575	289.760	24.249	295.907	26.446	lower value = easier
4	DESPL	34.640	6.792	26.820	5.573	20.935	4.940	15.923	4.509	13.875	3.871	13.203	3.670	higher value = easier
5	DESPLd	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-
6	DESSL	8.601	1.600	11.375	2.368	14.522	4.421	19.937	6.676	23.002	8.395	24.764	9.406	lower value = easier
7	DESSLd	4.785	1.443	6.516	2.075	8.584	6.329	11.405	5.380	13.674	12.062	13.143	8.233	lower value = easier
8	DESWLsy	1.205	0.061	1.270	0.055	1.320	0.068	1.378	0.068	1.435	0.063	1.546	0.092	lower value = easier
9	DESWLsyd	0.470	0.095	0.555	0.080	0.619	0.101	0.685	0.079	0.756	0.079	0.871	0.103	lower value = easier
10	DESWLlt	3.789	0.201	3.994	0.163	4.159	0.191	4.337	0.188	4.484	0.167	4.763	0.223	lower value = easier
12	DESWLtd	1.730	0.220	1.929	0.185	2.075	0.214	2.242	0.183	2.377	0.173	2.615	0.209	lower value = easier
	Text Easability Principle Component Scores													
12	PCNARz	1.368	0.574	1.164	0.618	0.745	0.773	0.446	0.714	0.250	0.632	-0.232	0.677	higher value = easier
13	PCNARp	88.175	10.284	83.843	13.577	72.196	21.756	64.119	22.022	58.457	21.305	41.649	21.476	higher value = easier
14	PCSYNz	1.625	0.670	0.891	0.634	0.297	0.755	-0.416	0.882	-0.720	0.848	-0.701	0.946	higher value = easier
15	PCSYNp	91.153	9.522	77.387	16.676	59.784	23.071	38.152	24.265	29.343	21.547	31.250	22.614	higher value = easier
16	PCCNCz	0.205	0.939	0.560	0.863	0.830	1.071	0.883	0.958	0.752	0.944	0.391	1.079	lower value = easier
17	PCCNCp	55.749	27.500	66.449	24.680	71.996	26.876	74.252	24.359	70.562	25.400	59.456	29.013	lower value = easier
18	PCREFz	0.044	0.959	-0.254	0.822	-0.390	0.816	-0.337	0.851	-0.378	0.793	-0.338	0.882	higher value = easier
19	PCREFp	48.809	26.453	41.112	24.837	37.331	24.426	38.894	25.089	37.872	25.042	38.669	26.079	higher value = easier
20	PCDCz	-0.007	0.922	0.075	0.762	0.073	0.968	0.171	0.914	0.254	0.969	0.286	1.012	lower value = easier
21	PCDCp	47.978	24.830	51.923	24.310	50.981	27.508	54.417	24.033	56.209	27.069	57.590	27.945	lower value = easier
22	PCVERBz	-0.024	0.854	-0.374	0.870	-0.089	0.938	-0.222	0.971	-0.294	0.956	-0.631	0.901	higher value = easier

23	PCVERBp	49.733	26.128	38.730	25.442	46.428	27.910	43.596	28.543	42.111	27.689	31.619	24.405	higher value = easier
24	PCCONNz	-1.458	1.303	-2.083	1.279	-2.239	1.268	-2.455	1.262	-2.503	1.333	-2.399	1.230	higher value = easier
25	PCCONNp	18.803	21.303	9.055	14.398	7.915	14.561	5.698	10.984	5.530	11.092	6.157	12.481	higher value = easier
26	PCTEMPz	0.066	0.654	0.011	0.800	-0.034	0.989	-0.073	1.064	-0.030	1.189	-0.032	1.118	higher value = easier
27	PCTEMPp	52.650	21.834	51.020	25.011	50.525	28.250	49.177	29.389	52.743	31.570	50.784	29.938	higher value = easier
	Referential Cohesion													
28	CRFNO1	0.149	0.134	0.162	0.133	0.182	0.151	0.225	0.172	0.246	0.165	0.303	0.201	lower value = easier
29	CRFAO1	0.349	0.157	0.143	0.171	0.171	0.184	0.524	0.199	0.537	0.210	0.552	0.223	lower value = easier
30	CRFSO1	0.168	0.143	0.191	0.143	0.143	0.170	0.289	0.198	0.328	0.198	0.414	0.230	lower value = easier
31	CRFNOa	0.127	0.090	0.131	0.089	0.089	0.099	0.180	0.126	0.199	0.122	0.243	0.147	lower value = easier
32	CRFAOa	0.275	0.116	0.339	0.142	0.142	0.149	0.427	0.180	0.443	0.183	0.456	0.204	lower value = easier
33	CRFSOa	0.148	0.103	0.156	0.099	0.099	0.116	0.232	0.146	0.269	0.153	0.344	0.176	lower value = easier
34	CRFCWO1	0.108	0.054	0.101	0.047	0.047	0.043	0.095	0.047	0.090	0.040	0.087	0.047	higher value = easier
35	CRFCWO1d	0.143	0.039	0.125	0.036	0.036	0.034	0.099	0.037	0.089	0.032	0.084	0.035	higher value = easier
36	CRFCWOa	0.083	0.035	0.077	0.032	0.032	0.030	0.072	0.033	0.068	0.290	0.067	0.037	higher value = easier
37	CRFCWOad	0.133	0.028	0.112	0.019	0.019	0.021	0.089	0.024	0.080	0.019	0.076	0.023	higher value = easier
	LSA													
38	LSASS1	0.220	0.091	0.232	0.083	0.250	0.092	0.302	0.099	0.334	0.117	0.379	0.100	lower value = easier
39	LSASS1d	0.192	0.045	0.184	0.040	0.171	0.047	0.170	0.047	0.167	0.049	0.167	0.048	higher value = easier
40	LSASSp	0.179	0.079	0.190	0.070	0.207	0.085	0.262	0.094	0.305	0.119	0.345	0.103	lower value = easier
41	LSASSpd	0.188	0.036	0.176	0.034	0.164	0.037	0.164	0.036	0.164	0.037	0.163	0.038	higher value = easier
42	LSAPP1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-
43	LSAPP1d	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-
44	LSAGN	0.380	0.060	0.352	0.042	0.343	0.053	0.348	0.050	0.050	0.056	0.374	0.049	higher value = easier
45	LSAGNd	0.154	0.025	0.141	0.024	0.139	0.026	0.144	0.027	0.027	0.029	0.158	0.028	lower value = easier

	Lexical Diversity													
46	LDTTRe	0.623	0.117	0.731	0.073	0.773	0.076	0.813	0.069	0.828	0.064	0.822	0.075	lower value = easier
47	LDTTRa	0.460	0.072	0.521	0.049	0.548	0.049	0.568	0.043	0.582	0.044	0.581	0.048	lower value = easier
48	LDMTLD	60.090	19.372	76.500	22.232	82.511	24.296	88.354	25.309	95.296	25.515	94.914	27.858	lower value = easier
49	LDVOCD	73.046	20.551	87.097	20.668	90.344	21.384	91.741	20.729	94.064	19.325	93.553	20.263	lower value = easier
	Connectives													
50	CNCAll	71.718	20.376	81.029	21.149	85.096	19.794	90.798	20.343	91.531	21.506	92.230	19.732	lower value = easier
51	CNCCaus	19.564	11.450	19.730	9.578	19.886	10.761	21.003	9.589	22.830	10.172	24.596	11.061	lower value = easier
52	CNCLogic	30.224	13.516	31.674	11.816	31.685	13.714	32.959	13.104	34.657	12.604	35.772	14.091	lower value = easier
53	CNCADC	9.961	7.049	13.531	8.346	14.391	8.677	15.676	9.045	17.494	9.472	17.710	9.147	lower value = easier
54	CNCTemp	19.152	11.858	20.625	10.014	20.647	11.790	21.766	9.687	20.100	9.705	19.467	9.656	lower value = easier
55	CNCTempx	15.043	10.243	16.112	10.605	17.994	10.557	17.122	10.341	17.245	10.234	16.028	9.761	lower value = easier
56	CNCAdd	37.158	15.511	43.945	14.980	45.453	15.327	49.345	14.983	50.120	15.974	49.906	14.787	lower value = easier
57	CNCPos	66.102	19.949	72.767	19.937	74.704	19.291	78.699	19.547	78.614	19.900	78.575	19.267	lower value = easier
58	CNCNeg	7.765	6.385	9.706	6.672	10.671	7.046	11.711	7.627	12.847	8.108	13.625	8.233	lower value = easier
	Situation Model													
59	SMCAUSv	52.750	18.394	44.199	13.131	36.328	12.953	27.130	11.755	22.740	10.847	23.172	9.161	higher value = easier
60	SMCAUSvp	61.127	19.923	53.469	13.750	44.633	13.791	36.104	12.926	32.486	12.063	32.783	10.589	higher value = easier
61	SMINTEp	56.429	18.098	41.033	13.971	30.114	12.533	21.366	10.013	17.901	9.464	16.464	8.398	higher value = easier
62	SMCAUSr	0.167	0.156	0.218	0.181	0.248	0.248	0.376	0.553	0.473	0.493	0.452	0.502	lower value = easier
63	SMINTEr	0.336	0.249	0.433	0.297	0.639	0.537	0.919	0.771	1.138	0.884	1.249	1.057	lower value = easier
64	SMCAUSlsa	0.082	0.024	0.071	0.023	0.077	0.034	0.080	0.032	0.083	0.036	0.087	0.037	lower value = easier
65	SMCAUSwn	0.602	0.088	0.566	0.090	0.577	0.095	0.572	0.093	0.569	0.084	0.537	0.093	higher value = easier
66	SMTEMP	0.851	0.061	0.841	0.077	0.833	0.097	0.821	0.106	0.825	0.115	0.820	0.111	higher value = easier
	Syntactic Complexity													

67	SYNLE	2.163	0.707	2.593	0.773	3.229	1.242	4.078	1.700	4.644	2.335	5.512	2.430	lower value = easier
68	SYNNP	0.565	0.144	0.623	0.137	0.730	0.166	0.821	0.149	0.877	0.160	0.936	0.164	lower value = easier
69	SYNMEDpos	0.703	0.057	0.698	0.048	0.680	0.047	0.668	0.047	0.665	0.050	0.643	0.148	higher value = easier
70	SYNMEDwrđ	0.906	0.047	0.913	0.035	0.906	0.032	0.902	0.029	0.900	0.026	0.891	0.028	higher value = easier
71	SYNMEDlem	0.882	0.052	0.889	0.041	0.885	0.035	0.882	0.032	0.882	0.028	0.873	0.031	higher value = easier
72	SYNSTRUTa	0.172	0.059	0.143	0.036	0.121	0.037	0.097	0.035	0.086	0.031	0.087	0.032	higher value = easier
73	SYNSTRUTt	0.159	0.045	0.134	0.032	0.114	0.029	0.089	0.027	0.083	0.024	0.081	0.024	higher value = easier
	Syntactic Pattern Density													
74	DRNP	353.241	25.341	352.136	25.748	352.915	29.344	355.756	31.572	363.273	31.000	366.610	32.600	lower value = easier
75	DRVP	264.580	29.825	252.577	31.921	229.998	35.829	214.462	35.386	199.327	32.115	191.868	38.489	higher value = easier
76	DRAP	40.308	16.165	42.571	15.109	37.937	14.678	36.662	13.863	35.631	13.605	31.178	12.754	higher value = easier
77	DRPP	74.397	19.640	85.912	18.751	100.214	21.102	109.790	22.740	115.670	20.955	123.168	21.929	lower value = easier
78	DRPVAL	0.874	1.638	1.862	2.442	2.563	3.498	3.242	3.092	2.969	2.607	4.479	3.438	lower value = easier
79	DRNEG	18.421	10.519	14.917	9.221	12.333	8.728	9.475	7.265	9.343	7.239	8.178	6.264	higher value = easier
80	DRGERUND	7.297	4.945	9.008	5.595	8.642	4.995	9.082	5.421	8.838	5.130	9.022	5.110	lower value = easier
81	DRINF	8.392	4.934	8.808	4.742	8.215	4.445	7.641	5.047	7.143	4.410	7.679	5.010	higher value = easier
	Word Information													
82	WRDNOUN	210.219	36.902	214.872	36.543	226.645	43.466	230.869	37.516	240.713	35.191	256.079	39.605	lower value = easier
83	WRDVERB	172.875	24.359	161.881	24.171	150.317	22.721	140.766	20.991	134.166	21.520	124.386	21.432	higher value = easier
84	WRDADJ	53.907	19.192	57.607	17.886	66.806	21.064	76.646	20.967	83.810	23.646	91.914	21.640	lower value = easier
85	WRDADV	69.431	23.138	68.531	22.846	62.670	21.274	59.978	19.873	58.900	19.306	54.634	18.949	higher value = easier
86	WRDPRO	131.679	34.332	126.184	31.796	105.848	35.768	91.207	33.823	83.173	29.407	64.285	29.125	higher value = easier
87	WRDPRP1s	35.083	28.790	29.780	28.337	18.946	25.020	15.573	22.917	10.791	18.383	5.478	13.913	higher value = easier
88	WRDPRP1p	8.493	12.401	8.126	14.481	4.954	8.650	4.640	10.894	4.526	9.046	4.873	11.016	higher value = easier
89	WRDPRP2	19.669	15.595	15.295	18.160	10.413	13.583	8.519	17.033	7.034	14.519	7.185	16.385	higher value = easier
90	WRDPRP3s	43.289	30.308	47.940	30.440	45.865	32.239	38.140	30.650	37.031	29.535	23.508	25.622	higher value = easier

91	WRDPRP3p	9.403	10.644	10.525	11.166	10.621	10.609	11.249	11.948	12.332	13.016	12.206	12.865	lower value = easier
92	WRDFRQc	2.522	0.153	2.398	0.153	2.339	0.168	2.235	0.159	2.208	0.139	2.114	0.143	higher value = easier
93	WRDFRQa	3.135	0.107	3.090	0.093	3.089	0.095	3.055	0.098	3.046	0.086	2.989	0.087	higher value = easier
94	WRDFRQmc	1.711	0.291	1.536	0.342	1.415	0.331	1.130	0.429	1.076	0.490	0.930	0.489	higher value = easier
95	WRDAOAc	256.837	26.219	273.226	24.087	288.266	27.708	309.533	29.478	325.367	30.105	356.050	34.868	lower value = easier
96	WRDFAMc	583.866	6.242	578.780	8.419	576.096	7.960	571.920	8.365	570.105	8.352	564.820	9.003	higher value = easier
97	WRDCNCc	400.119	26.115	401.601	25.872	404.363	31.319	399.461	29.030	393.433	28.040	384.911	32.791	higher value = easier
98	WRDIMGc	430.002	24.017	431.360	23.252	435.387	29.029	431.485	26.385	427.273	25.145	417.412	29.335	higher value = easier
99	WRDMEAc	432.977	13.939	432.909	12.050	435.929	14.786	432.973	14.200	433.259	13.704	429.408	15.955	higher value = easier
100	WRDPOLc	4.642	0.514	4.386	0.441	4.217	0.402	4.107	0.382	3.964	0.379	3.765	0.401	higher value = easier
101	WRDHYPn	6.179	0.850	6.264	0.789	6.314	0.682	6.378	0.622	6.266	0.615	6.373	0.602	lower value = easier
102	WRDHYPv	1.672	0.159	1.667	0.162	1.652	0.170	1.650	0.177	1.631	0.170	1.644	0.189	higher value = easier
103	WRDHYPnv	1.469	0.261	1.511	0.245	1.570	0.254	1.606	0.234	1.624	0.206	1.726	0.230	lower value = easier
	Readability													
104	RDFRE	95.495	3.854	87.917	3.890	80.502	5.292	70.209	5.873	62.299	7.797	51.092	9.258	higher value = easier
105	RDFKGL	1.941	0.838	3.796	0.775	5.610	1.494	8.381	2.233	10.242	30.120	12.240	3.315	lower value = easier
106	RDL2	27.133	6.216	22.239	4.978	19.238	4.755	15.467	5.032	13.397	4.103	11.808	5.045	higher value = easier

Yellow = the mean values from the lowest and the highest grade levels

APPENDIX C
FRONT COVER AND SCOPE OF THE PRESCRIBED ENGLISH
TEXTBOOKS



Contents

Unit	Reading Link	Vocabulary Link	Grammar Link
1 Smart Housing page 5	Smartest Housing Readings	phrasal verbs, phrasal verb	• taking about the present
2 The Making World page 13	10 Day's World multiple choice	employment-related words, professions, job-related verbs	• taking about the past • would used to, might used to
3 Followers of Faith page 21	Faithful College of Faith's essay sections	faith-related words, and primary phrasal verb	• taking about the future
4 There's Entertainment page 28	Background information on the Oscars multiple matching	entertainment, entertainment-related words, professions	• review of lesson 1
Review 1 page 37			
5 Where on earth? page 36	The Business Guide to Adventure Tourism summary sentences	travel words, place-related words	• modals (ability, obligation and necessity)
6 On Your Marks page 41	Clips to watch and multiple choice	goal formation, made up, made coincide from, football-related words	• passive (verb objects)
7 Wheels, Wings, and Other Things page 52	On taking motorbike helmets	adverbs, adverb – but	• using a time and condition • prefer ... to ... / would rather ... than
8 The World Around Us page 59	The year of the Hurricane multiple matching and multiple choice	verb formation, linking words	• passive II (present and past passive structure) • verb with two objects
Review 2 page 71			
9 In a New Jerusalem page 79	Dear Oliver! Readings	18th-century words, professions	• questions (questions tags, subject-based questions, linked questions, negative questions)
10 The Things They Go For Us page 87	The Mink & Wolf Foundation multiple choice	phrasal verbs, verb phrases	• reported speech • reporting verbs
11 The Power of Nature page 95	Go where the Wind really blows!	expressions without and after phrasal verbs, verb forms	• relative clauses I (relative pronouns)
12 What you were here page 107	There it Good Vacation! multiple matching	adjectives, adverb, related words, verb phrases	• relative clauses II (relative and non-defining)
Review 3 page 115			
13 Fighting Fit page 120	Clara's diary summary sentence	phrasal verbs, phrasal verb	• pronouns I (I, we, she, they) • pronouns II (object, subject, possessive, reflexive)
14 Food, Obesity Food page 125	Food food to eat or not? multiple choice	expressions of quantity, restaurant-related words, adjectives	• adverbs, adverb • determiners (some, neither, nor, ... all, both, either, ... or ...)
15 Lessons to Learn page 132	A Day's Life essay paragraphs	phrasal verb, phrasal verb, phrasal verb, phrasal verb	• modals II (possibility and certainty)
16 In the Name of Progress page 139	Where's the end of the line? multiple matching and multiple choice	phrasal verb, phrasal verb, phrasal verb, phrasal verb	• auxiliary
Review 4 page 151			
Grammar Reference page 154			
Irregular Verbs page 158			

Listening Link	Speaking Link	Writing Link
multiple choice (understanding gist)	giving personal information	• informal, semi-formal letter (personal needs)
note-taking and brainstorming	photo-essay (giving personal information)	• transactional letter (job application)
multiple matching	exchanging and justifying opinions (discussing)	• article (general interest)
multiple choice	exchanging and expressing opinions	• descriptive composition (event)
Review 5 page 163		
multiple choice (short content)	giving personal information	• descriptive composition (place)
note-taking and brainstorming	photo-essay (giving personal information)	• transactional letter (request)
multiple matching	exchanging and justifying opinions (discussing)	• formal report
multiple choice	exchanging and expressing opinions	• descriptive composition (giving evidence to a problem)
Review 6 page 171		
multiple choice (short and attitude)	giving personal information	• descriptive composition (giving your opinion)
note-taking and brainstorming	photo-essay (giving your opinion)	• descriptive composition (event)
multiple matching	exchanging and justifying opinions (discussing)	• note (begin or end with words given)
yes/no	exchanging and expressing opinions	• transactional letter (giving and asking for information)
Review 7 page 179		
multiple choice (function, habit, role and real world)	giving personal information	• transactional letter (suggesting and recommending)
note-taking and brainstorming	photo-essay (giving personal information)	• formal report (suggesting and recommending)
multiple matching	exchanging and justifying opinions (discussing)	• note (file given)
classifying systems	exchanging and expressing opinions	• informal, semi-formal letter (biology)
Review 8 page 187		
Review 9 page 195		

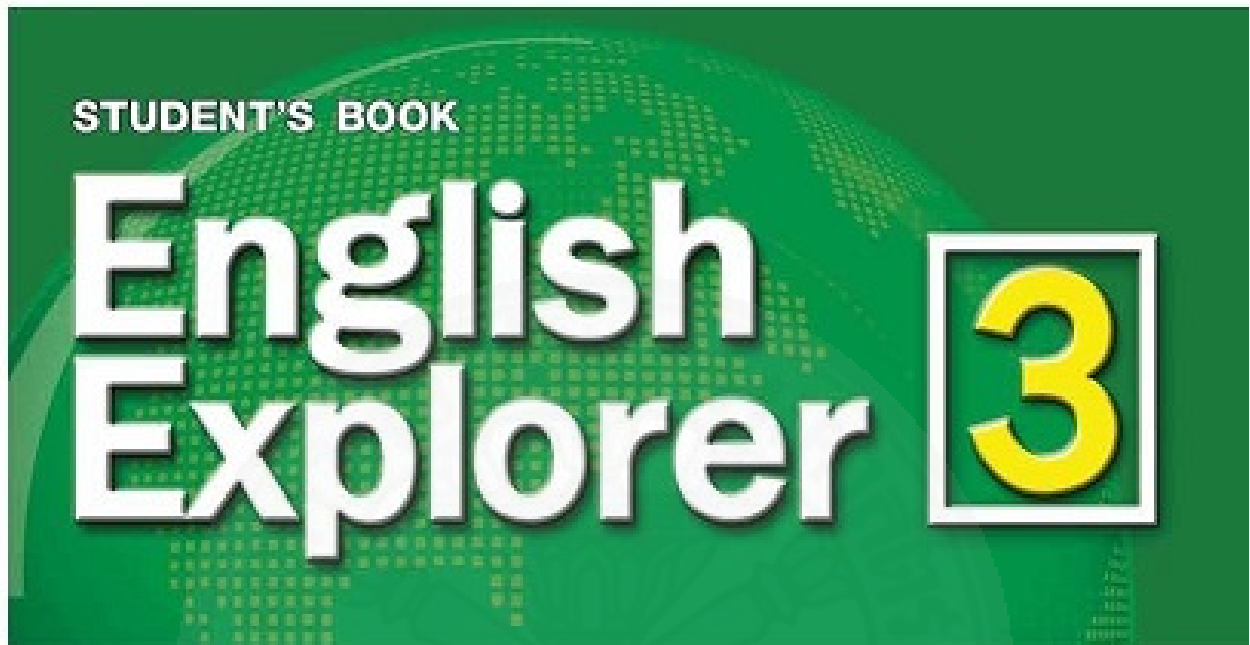


Contents

Unit	Grammar	Vocabulary	Useful expressions	Speaking and Writing	Listening and Reading	Task
01 My life Page 6	<ul style="list-style-type: none"> Present simple: all forms and persons Adverbs of frequency Present simple vs present continuous Stative verbs 	<ul style="list-style-type: none"> Free-time activities Verb + noun collocations related to the music industry 	<ul style="list-style-type: none"> Conversational language 	<ul style="list-style-type: none"> Discuss personality Write and complete a questionnaire Conduct a survey Role-play a celebrity interview Write a profile of a student 	<ul style="list-style-type: none"> Listen to a radio interview Listen for question forms and conversational interjections Read a quiz 	<ul style="list-style-type: none"> Conduct an interview
02 American dreams Page 12	<ul style="list-style-type: none"> Past simple: all forms and persons Used to: all forms and persons 	<ul style="list-style-type: none"> Synonyms and antonyms to describe living conditions Adjective-noun pairs related to personality characteristics 	<ul style="list-style-type: none"> Phrases to use in informal letters 	<ul style="list-style-type: none"> Discuss immigration Role-play a dialog Describe personality characteristics Talk about things you used to do 	<ul style="list-style-type: none"> Identify pronunciation of -ed endings Listen to a conversation in a DVD rental store Read an extract about American immigration Read an informal letter 	<ul style="list-style-type: none"> Write a letter to a long-lost friend or relative
Review 01 Page 18	<ul style="list-style-type: none"> Present simple for facts and habits Present simple vs present continuous Present simple vs past simple Used to Past simple questions 	<ul style="list-style-type: none"> Free-time activities The music industry Word building: adjectives and nouns 	<ul style="list-style-type: none"> Asking about a vacation 	<ul style="list-style-type: none"> Describe lifestyle 	<ul style="list-style-type: none"> Listen to a conversation about lifestyle changes 	
03 Eyewitness Page 20	<ul style="list-style-type: none"> Can and could Past continuous: all forms and persons 	<ul style="list-style-type: none"> Words related to the law Collocations describing physical features Words to describe appearance 	<ul style="list-style-type: none"> Talking about appearance 	<ul style="list-style-type: none"> Discuss capital punishment Conduct a survey of life skills Summarize an article Describe an important person in your life Describe a scene from the past Write a newspaper report 	<ul style="list-style-type: none"> Identify stressed and unstressed words Listen to a tall story Listen to a police interview Read an article about eyewitness testimonies in U.S. courts 	<ul style="list-style-type: none"> Role-play an eyewitness account of a crime
04 A year off Page 26	<ul style="list-style-type: none"> Present perfect simple vs past simple Time expressions with present perfect simple and past simple Present perfect simple vs continuous 	<ul style="list-style-type: none"> Transitive and intransitive phrasal verbs Verb + noun collocations related to travel 	<ul style="list-style-type: none"> Linkers 	<ul style="list-style-type: none"> Conduct a survey about travel experiences Talk about life experiences Tell a travel anecdote 	<ul style="list-style-type: none"> Read a magazine article about a year off Listen to a conversation between two hitchhikers Read a travel journal Listen to a travel journal 	<ul style="list-style-type: none"> Write a travel anecdote
Review 02 Page 32	<ul style="list-style-type: none"> Countable and uncountable nouns Can, can't, could, couldn't Past simple vs past continuous Present perfect simple and present perfect continuous 	<ul style="list-style-type: none"> Words related to the law Travel-related activities Phrasal verbs 		<ul style="list-style-type: none"> Describe someone's appearance Discuss aspects of law Discuss travel experiences 	<ul style="list-style-type: none"> Listen to identify a person from a physical description 	
05 Part-time Page 34	<ul style="list-style-type: none"> Must, mustn't, don't need to Future with going to and present continuous Future time expressions 	<ul style="list-style-type: none"> Adjectives related to personal characteristics Expressions related to work and domestic arrangements 	<ul style="list-style-type: none"> Phrases for checking information 	<ul style="list-style-type: none"> Discuss characteristics required for jobs Write a job advertisement Express opinions about job duties Describe future arrangements and intentions 	<ul style="list-style-type: none"> Identify elided letters Read job advertisements Listen to a conversation between work colleagues Listen to job interviews Read résumés 	<ul style="list-style-type: none"> Role-play a job interview
06 Food for thought Page 40	<ul style="list-style-type: none"> Comparatives and superlatives Modifiers with comparatives and superlatives Quantity expressions 	<ul style="list-style-type: none"> Antonyms related to food Food items Verbs related to cooking 	<ul style="list-style-type: none"> Expressing quantity 	<ul style="list-style-type: none"> Write a food quiz Discuss restaurant food Write a description of a restaurant and its food Discuss cooking 	<ul style="list-style-type: none"> Read an article about fast food Identify the /s/ sound Listen to a conversation in a restaurant Read a recipe 	<ul style="list-style-type: none"> Invent a recipe for a competition
Review 03 Page 46	<ul style="list-style-type: none"> Going to vs present continuous Must, mustn't, don't need to Comparative adjectives and modifiers Time expressions 	<ul style="list-style-type: none"> Adjectives to describe personality Phrases related to work Adjectives and nouns related to food 		<ul style="list-style-type: none"> Discuss work responsibilities Discuss diets Write exam rules 		
07 Talking issues Page 48	<ul style="list-style-type: none"> Future with will, going to and may/might Adverbs of possibility The first conditional 	<ul style="list-style-type: none"> Words related to environmental problems Phrasal verbs related to campaigning 	<ul style="list-style-type: none"> Expressing opinions 	<ul style="list-style-type: none"> Discuss global warming Write about the planet's future Discuss solutions to environmental problems Write a slogan and notes for a speech 	<ul style="list-style-type: none"> Read an article about global warming Identify the words 'll and will Listen to a conversation between a father and daughter Listen to a discussion about social problems Read a speech for a campaign meeting 	<ul style="list-style-type: none"> Prepare and give a speech
08 City creatures Page 54	<ul style="list-style-type: none"> Can, have to, should Comparative structures 	<ul style="list-style-type: none"> Compound nouns related to the city Adjectives to describe locations and lifestyles 	<ul style="list-style-type: none"> Describing places 	<ul style="list-style-type: none"> Discuss laws and customs in different countries Write a description of customs in different countries Express preferences about city and country life Write comparisons about different places 	<ul style="list-style-type: none"> Read a guidebook extract Listen to a discussion about city and country life Listen and identify strong and weak forms Read a tourist information leaflet 	<ul style="list-style-type: none"> Write a tourist information leaflet
Review 04 Page 60	<ul style="list-style-type: none"> The first conditional Comparatives phrases Can, should, have to 	<ul style="list-style-type: none"> Compound nouns related to global warming and the environment Phrasal verbs in context Adjectives related to ambience 		<ul style="list-style-type: none"> Make and discuss predictions about the environment Write about cultural rules 	<ul style="list-style-type: none"> Listen to a conversation about environmental problems 	

Unit	Grammar	Vocabulary	Useful expressions	Speaking and Writing	Listening and Reading	Task	
09 Fashion victims Page 62	<ul style="list-style-type: none"> The second conditional Expressing wishes 	<ul style="list-style-type: none"> Words related to make-up, clothes and jewelry Adjectives related to physical appearance 	<ul style="list-style-type: none"> Agreeing and disagreeing 	<ul style="list-style-type: none"> Discuss clothes and fashion Discuss cosmetic surgery Discuss hypothetical situations Write a wish list 	<ul style="list-style-type: none"> Read an article about fashion Listen and identify contracted forms Read an ad about cosmetic surgery Listen to a discussion about cosmetic surgery Read a fashion questionnaire Listen to a discussion about fashion 	<ul style="list-style-type: none"> Discuss ethical fashion 	
10 Modern romance Page 63	<ul style="list-style-type: none"> Verb patterns: gerunds and infinitives Giving advice 	<ul style="list-style-type: none"> Phrasal verbs related to relationships Meanings of the verb to get 	<ul style="list-style-type: none"> Linking words 	<ul style="list-style-type: none"> Discuss relationships and speed dating Write an informal letter to a friend Give advice about personal problems Write dialogs using get Discuss marriage 	<ul style="list-style-type: none"> Read an article about speed dating Read emails on an advice column web page Listen to an advice columnist's radio show Listen and identify elided letters Read a for-and-against essay 	<ul style="list-style-type: none"> Write a for-and-against essay 	
Review 05 Page 74	<ul style="list-style-type: none"> The second conditional Gerunds and infinitives Gerund as subject Giving advice 	<ul style="list-style-type: none"> Clothing and accessories Adjectives for describing looks Phrasal verbs related to relationships Meanings of the verb to get 	<ul style="list-style-type: none"> Phrases for expressing wishes 	<ul style="list-style-type: none"> Discuss fashion sense 	<ul style="list-style-type: none"> Listen to short dialogs 		
11 Buy It! Page 76	<ul style="list-style-type: none"> The present passive The past passive and uses of the passive 	<ul style="list-style-type: none"> Verbs and nouns related to gadgets Adjectives for describing size, color, shape and material Words related to MP3 players 	<ul style="list-style-type: none"> Shopping 	<ul style="list-style-type: none"> Describe gadgets Write a description of a gadget Describe an object Write a quiz about great inventions 	<ul style="list-style-type: none"> Read a consumer review about a gadget Listen to a radio show about inventors Listen to a conversation in a store 	<ul style="list-style-type: none"> Shop for an MP3 player 	
12 Fantastic! Page 82	<ul style="list-style-type: none"> Foot perfect Narrative verb forms Linkers 	<ul style="list-style-type: none"> Gradable and non-gradable adjectives Verb + a verb-combinations related to movement 	<ul style="list-style-type: none"> Finding out details 	<ul style="list-style-type: none"> Describe comic book characters Write about an invented superhero Write an ending to a story Discuss a person's biography Write notes about a person's biography 	<ul style="list-style-type: none"> Read a magazine article about a comic book writer Listen and identify topics Listen to a copy shop story Read a magazine interview with Matt Greening Listen and identify intonation patterns 	<ul style="list-style-type: none"> Prepare a biography 	
Review 06 Page 83	<ul style="list-style-type: none"> The present passive The past passive Word order of adjectives Narrative verb forms Linkers 	<ul style="list-style-type: none"> Verbs related to technical description Adjectives for describing materials Gradable and non-gradable adjectives Verb and adverb collocations 		<ul style="list-style-type: none"> Discuss local news 	<ul style="list-style-type: none"> Listen to a news report 		
13 Read out Page 90	<ul style="list-style-type: none"> Defining relative clauses Non-defining relative clauses 	<ul style="list-style-type: none"> Book genres Adjectives ending in -ed or -ing Nouns related to books 	<ul style="list-style-type: none"> Discussing books 	<ul style="list-style-type: none"> Discuss reading habits and experiences Discuss the book/movie of the week Write a book quiz Write book recommendations 	<ul style="list-style-type: none"> Read a book synopsis Listen to a discussion about a term paper Listen for pauses in non-defining relative clauses Read a notice about a book club Listen to a discussion at a book club 	<ul style="list-style-type: none"> Choose a book for a friend 	
14 The box Page 95	<ul style="list-style-type: none"> Reported statements Reported questions 	<ul style="list-style-type: none"> Nouns and verbs related to the movie industry Reporting verbs 	<ul style="list-style-type: none"> Reporting survey results 	<ul style="list-style-type: none"> Discuss soap operas Report statements Write reported sentences that people may say 	<ul style="list-style-type: none"> Read a newspaper article about an incident Read an extract from a TV guide Listen to an extract from a TV show Listen to identify stressed syllables Read a survey and report about TV watching habits 	<ul style="list-style-type: none"> Write a survey report 	
Review 07 Page 102	<ul style="list-style-type: none"> Relative pronouns Defining & non-defining relative clauses Reported speech Reporting verbs 	<ul style="list-style-type: none"> Literary genres Nouns related to books Nouns related to movies 		<ul style="list-style-type: none"> Discuss a plot summary 	<ul style="list-style-type: none"> Listen to a conversation about a soap opera 		
15 A place to live Page 104	<ul style="list-style-type: none"> Use of articles Causatives Reflexive pronouns 	<ul style="list-style-type: none"> Real estate Words related to household chores Bad habits 	<ul style="list-style-type: none"> Interviewing and discussing people 	<ul style="list-style-type: none"> Discuss types of houses Write an advertisement for a house Describe a house Discuss living arrangements Write about services provided in businesses Discuss bad habits 	<ul style="list-style-type: none"> Read real estate advertisements Listen and identify the indefinite article Listen to two newsletters about living arrangements Read personal profiles Listen to discussions about new roommates 	<ul style="list-style-type: none"> Choose a roommate 	
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หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ
กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ



ชั้นมัธยมศึกษาปีที่ 6

ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน พุทธศักราช 2551

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วันทนา นิลนพคุณ



Australia • Brazil • Japan • Korea • Mexico • Singapore • Spain • United Kingdom • United States

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หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ ชั้นมัธยมศึกษาปีที่ 6

English in Mind

Herbert Puchta, Jeff Stranks &
Peter Lewis-Jones

Student's Book 6

ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน พุทธศักราช 2551
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CHECK YOUR PROGRESS								
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4 Is it sport?	Could, was/were able to, managed to	Success and failure Vocabulary bank: Success and failure		Talking about behaviour and attitudes in sports	Conversation about cheating in sports Song: Race for the Prize	Sport in the news	Description of an event (magazine)	
CHECK YOUR PROGRESS								
5 Advertising	Position of adverbs Adjective order	Advertising Vocabulary bank: Advertising		Designing and presenting a marketing campaign for a product of your choice	An expert talks about advertising	Wearing brand logos Culture in mind: Advertising techniques	Covering letter of application	
6 Animal instincts	Past perfect tenses review	Animal sounds Vocabulary bank: Expressions with animals	Stress in phrases	Animal heroes Telling a story	Radio show about Paul the Octopus Video activities: Honest!	Animals know before	Magazine article	
CHECK YOUR PROGRESS								
7 Double lives	Reporting verb patterns review	Crime War and peace Vocabulary bank: War and peace		Talking about a crime story Giving a short talk based on a photo	Two women spies	Conoe Man Literature in mind: <i>Call for the Dead</i>	A biography	
8 Going it alone	Mixed conditionals review Alternatives to if	More time expressions Vocabulary bank: Expressions with time		Talking about living alone for a month Discussing which activities to do alone	Teenagers talk about being on their own Song: Message in a Bottle	My year of moneyless living	A leaflet	
CHECK YOUR PROGRESS								
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10 Inspiration and creation	Casative have review Modal passives (present and past)	Metaphors to describe emotions Vocabulary bank: Emotion metaphors	Stress and intonation	Discussing preferences	An interview about metaphors Video activities: The photographer	What implies the inspirational?	A poem with metaphors and similes	
CHECK YOUR PROGRESS								
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หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ ชั้นมัธยมศึกษาปีที่ 6

Eyes Open **3**

STUDENT'S BOOK

ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน พุทธศักราช 2551
กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ

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Starter Unit	Vocabulary	Reading	Language focus	Listening and vocabulary	Language focus 2	Discover Culture (Video and Reading)	Speaking	Writing	Extras
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Unit	Vocabulary	Reading	Language focus 1	Listening and vocabulary	Language focus 2	Discover Culture (Video and Reading)	Speaking	Writing	Extras
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2 A helping hand	p19 Personal qualities	p20 A magazine article Explore word building	p21 Reflexive pronouns and each other Get it right! reflexive pronouns O Bam to die	p22 A news report Phrasal verbs (arming and socialising)	p23 Present perfect simple Present perfect continuous Present perfect simple vs. present perfect continuous p26 Say it right! Stress and intonation in questions with /how long?	p24 O A very fancy wedding p25 A blog post Explore words in context	p26 O Real talk! How have you helped a friend through a difficult situation? Showing concern	p27 A personal email Useful language: Expressing how we feel	p16 CLIL: Technology – The changing classroom O The house of the future p100 Grammar reference p108 Vocabulary bank
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หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ
Luke Prodrromou with Penelope Prodrromou

FLASH on English

UPPER INTERMEDIATE
STUDENT'S BOOK

ชั้นมัธยมศึกษาปีที่ 6

กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ

ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน พุทธศักราช 2551



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หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ
กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ



STUDENT BOOK
ICON **3**

ชั้นมัธยมศึกษาปีที่ 6

ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน พุทธศักราช 2551

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UNIT	LISTENING	CONVERSATION STRATEGY	LANGUAGE FOCUS 1 AND 2	PRONUNCIATION	READERS' FORUM	VOCABULARY EXPANSION	WRITING WORKSHOP
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หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ

MEGA

GOAL 6

ชั้นมัธยมศึกษาปีที่ 6

กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ

ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน พุทธศักราช 2551

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McGraw-Hill
ELT

Scope and Sequence

	Unit Title	Functions	Grammar
1	A Perfect Match Pages 2–9	Talk about famous couples in history Discuss how pairs can help each other Negotiate	<i>Other, others, and another</i> Emphatic <i>do</i>
2	Rags to Riches Pages 10–17	Talk about fame and fortune Discuss options	<i>Used to</i> versus <i>be used to</i> <i>Would</i> for repeated action in the past versus <i>used to</i> <i>Was/Were going to</i> (future in the past)
3	What Will They Think of Next? Pages 18–25	Discuss technology invented over the last one hundred years Discuss technology of the future Make predictions about life in the year 2100 Persuade	Future perfect Future perfect progressive The future with dependent time clauses
EXPANSION Units 1–3 Pages 26–31		Language Review Reading: Is Anybody Out There? Language Plus: Idioms with <i>work</i>	
4	At the Movies Pages 32–39	Talk about movies Identify movie genres Agree and disagree with opinions	<i>Both... and, not only... but also, either... or, neither... nor</i> Independent clauses with <i>and, but, or, so, and yet</i>
5	Do You Really Need It? Pages 40–47	Evaluate and discuss the influence of advertising Create an advertisement for a product Advise someone against something	Adverb clauses <i>Because, because of, since and now that (in order) to and so (that)</i> <i>If, even if, in case, only if, and unless</i> <i>Where, wherever, and everywhere</i>
6	The Gender Divide Pages 48–55	Talk about gender differences and similarities Discuss stereotypes Ask for and give directions	Verbs + infinitives or gerunds with different meanings Passive forms of infinitives and gerunds Auxiliary verbs after <i>but</i> and <i>and</i>
EXPANSION Units 4–6 Pages 56–61		Language Review Reading: Superstitions Language Plus: Superstition-related idioms	

Listening	Pronunciation	Reading	Writing
Listen for sequence of events in Shakespeare's <i>Romeo and Juliet</i>	The English /t/	Animal Partners	Write an essay about a perfect couple
Listen for sequence in a lecture about the history of money	Past tense endings: /t/, /d/, and /ɪd/	The Beatles: A Rags to Riches Story	Write a biographical essay about a person's rise to fame or fortune
Listen for specific information in a talk about the future of newspapers	Consonant clusters	An Out-Of-This-World Vacation	Write an essay about a future change or discovery and its impact on you and on society
Tools for Writing: Commonly confused words Writing: Write an expository essay about the history of a common device or technology and how it will change in the future			
Listen for specific information in movie reviews	Linking vowel sounds	The Name's Bond: James Bond	Write an expository essay about the formula of a movie genre
Listen for specific details in a lecture on advertising techniques	<i>To</i> before consonants and vowels	Ads Everywhere: Do You "Buy" It?	Write a persuasive essay for or against advertising in schools
Listen for specific details in a discussion about men and women drivers	Rising and falling intonation on tag questions	Do Men and Women Speak the Same Language?	Write an essay about the communication approaches of a man and a woman
Tools for Writing: Run-on sentences Writing: Write an essay about superstitions in your culture			

Scope and Sequence

	Unit Title	Functions	Grammar
7	Everyone Makes Mistakes Pages 62–69	Talk about famous mistakes in history Discuss personal mistakes Apologize Respond to an apology	Modals in the past: <i>may have/might have, could have, must have, should have, was/were supposed to</i> Passive modals in the past
8	Against the Odds Pages 70–77	Discuss coincidences Express surprise	<i>Such... that/so... that</i> Reducing adverb clauses
9	Beauty Is Only Skin Deep Pages 78–85	Discuss beauty products and practices throughout history Talk about the importance of beauty products Make a complaint Respond to a complaint	Noun clauses beginning with <i>that</i> Noun clauses after verbs Noun clauses after adjectives Noun clauses as subjects of sentences
EXPANSION Units 7–9 Pages 86–91		Language Review Reading: Phobias: Nothing to Fear Language Plus: Idioms about fear	
10	He Said, She Said Pages 92–99	Discuss gossip and rumors Tell a secret Promise to keep a secret	Noun clauses as reported speech versus quoted speech Rules and exceptions to the sequence of tenses Noun clauses beginning with <i>whether</i> or <i>if</i>
11	Express Yourself Pages 100–107	Discuss world languages Talk about the English language Ask someone to repeat something	Adjective clauses and relative pronouns Relative pronouns as subjects of adjective clauses Relative pronouns as objects of adjective clauses
12	Lost and Found Pages 108–115	Conduct an interview Express regret Express understanding	Using <i>where</i> and <i>when</i> in adjective clauses Using <i>whose</i> in adjective clauses
EXPANSION Units 10–12 Pages 116–121		Language Review Reading: It's a Mystery Language Plus: Idioms about mysteries	

Listening	Pronunciation	Reading	Writing
Listen for specific information in stories about mistakes	Reductions of modals + <i>have: could have, should have, might have, must have</i>	Happy Accidents	Write an essay about a mistake or accident
Listen for specific details in a news story about identical twins who were separated at birth	Dropped final consonants	Survival Against the Odds	Write a <i>how-to</i> guide for surviving a natural disaster
Listen for specific information in a lecture about fad diets	Stress on affirmative and negative auxiliary verbs	The Changing Face of Beauty	Write a persuasive essay about the importance of beauty
Tools for Writing: Sentence fragments Writing: Write an informational essay about a condition or disorder that involves the human mind			
Listen for specific details in a rumor as it is spread	Question intonation	Psst, Pass It On: (Why We Gossip)	Write a persuasive essay about the effects of reading about and discussing celebrity gossip
Listen for specific details in stories about people making mistakes in English	Emphasizing different words in a sentence to convey different meanings	Invented Languages	Write an essay comparing English with your first language
Listen for specific details in stories about lost and found items	The dropped <i>h</i> sound at the beginning of pronouns and auxiliary verbs	Look What I Found!	Write an essay about something important that you have lost and/or found
Tools for Writing: Using the definite article with geographical nouns Writing: Write an essay about an unexplained mystery			

หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ
ชั้นมัธยมศึกษาปีที่ 6

กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ
ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน
พุทธศักราช 2551

New World

Student Book

6

ผู้เรียบเรียง
Manuel dos Santos

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Scope & Sequence

Unit	Link	Functions	Grammar
1	The Changing World	To discuss people's lifestyles and habits	Preposition + gerund Verb + preposition Be used to / Get used to
2	Making Choices	To talk about preferences To discuss choices To discuss wishes To talk about volunteer work and organizations	Verb with (- past simple) Would rather (s) Adjectives ending in -ing or -ed
3	You Can't Live without It!	To talk about things that are essential to everyday life To discuss the reasons for doing things	Verb + infinitive Expressing purpose (infinitive, in order to, so that) Whatever, Wherever, Whoever
Review 1			
4	Don't Ever Give Up!	To talk about dangers and difficulties To recount and discuss survival stories	Verb + preposition Phrasal verbs Phrasal verbs and objects
5	Do it Yourself	To talk about things that need to be done To discuss household tasks and repairs	Have + something + past participle Have + person + verb Need + gerund or passive infinitive
6	Achievements and Regrets	To talk about things you used to do To discuss accomplishments To talk about things that you didn't do but wish you had done	Used / Used to Should have + past participle To be able to + verb
Review 2			
7	In Style	To talk about fashion To discuss changes in fashion To discuss what is in fashion	Present perfect simple Present perfect progressive Present perfect progressive vs. present perfect simple
8	Oops! I Forgot.	To talk about remembering and forgetting things To talk about memory tips	Verb + infinitive or gerund Try to do / doing Remember to do / doing Either ... or / Neither ... nor
9	Natural Resources and Energy	To speculate about the future To discuss technology of the future To talk about energy To make predictions about one's future	Future progressive Future perfect
Review 3			
10	If Only I'd Known	To talk about regrets and missed opportunities To discuss quotes about regrets	Wish + past perfect Third conditional
11	Natural Phenomena	To talk about natural phenomena like tornadoes To discuss unusual natural phenomena	Adverbs Phrases with -ing Phrases with past participles Relative clauses
12	As the Saying Goes	To discuss proverbs and sayings To discuss personal ideas about proverbs	Adverb clauses Prepositions
Review 4			

Language	Vocabulary	Pronunciation	Reading	Writing
Would you be interested in teaching me? We talked about moving to another city. He's getting used to living in Japan.	Vocabulary related to lifestyles and technology	Be used to and get used to	ICT: Bridging the Gap Curriculum connection: Technology/Education	Write how communication technology is changing the way of life in your country.
I would rather play an outdoor sport than work out at a gym. I wish I could decide where to go on vacation. Mark's job is boring. / I'm bored with his job.	Vocabulary related to volunteer work Adjectives ending in -ing or -ed	Rising and falling intonation in choices	The World Wildlife Fund Curriculum connection: Ecology	Write a letter to volunteer with an organization.
I refuse to leave home without my cell phone. I use my credit card to purchase everything. Whatever you do, you need English to survive nowadays.	Vocabulary related to technology and its uses	Vowel sound in caught, walk, etc.	Modern Miracle or Bored? Curriculum connection: Technology/Life skills	Write about your priorities in life.
Optical/Illusion Curriculum connection: Science/Biology				
He believed it himself. The mountain climber went on despite the difficulty. He was leading me on.	Phrasal verbs Vocabulary to talk about problems Vocabulary in survival stories	Stress on the particle in phrasal verbs	Survival in the Jungle Curriculum connection: Life skills	Write about a difficult or dangerous situation that you need about, or saw in the movies.
Unhappy didn't have the car repaired at the garage. The owners had a planter for the sink. The kitchen needs cleaning. / The kitchen needs to be cleaned.	Household items Vocabulary for repairs	Stress on content words	Roommate Wanted! Curriculum connection: Life Skills/Values	Write a letter of advice to someone who is planning to share an apartment.
I used to study really hard. I would do all kinds of odd jobs. I should have learned how to cook from my mom. I was able to get good grades in college.	Vocabulary related to achievements Vocabulary related to music	Reduction of proclitics and to in infinitive	Let's Party! Curriculum connection: Music/Biology	Write about your accomplishments.
Flying High Curriculum connection: Science/Technology				
Jeans have become popular around the world. Since the 1960s, people have been wearing jeans almost everywhere. I've been knitting a sweater. / I've knitted a sweater.	Clothing items Vocabulary related to the fashion world	Pronunciations for the letters th	The All-American Fashion: The T-Shirt Curriculum connection: Social studies	Write about clothing styles that have become popular.
I started saving. / I started to save. I remember to lock the door. / I remember locking the door. By leaving an agenda, I failed to keep an agenda, but I forgot to look at it. Either get to work on time or you'll lose your job. I have neither paper nor pencil.	Words related to memory and memory tips	Stress on compound words	Amnesia Curriculum connection: Science/Medicine	Write memory tips.
Cars will be running on hydrogen. The world will have run out of petroleum by then.	Vocabulary related to forms of energy	Stressed and unstressed that	Water for Life: A Use of Nanotechnology Curriculum connection: Science/Technology	Write about a world energy problem that will be solved.
Globalization Curriculum connection: Technology/Economics				
I wish I had studied harder. If I had studied harder, I would have passed my exam.	Vocabulary related to regrets	Reduction of have after could, should, and would	On Life's Regrets Curriculum connection: Literature/Life Skills	Write about the biggest regret you have in life.
The tsunami moved steadily across the countryside. The people of charity underground were safe. The destruction caused by the tsunami was massive. The tsunami that they survived was very powerful.	Vocabulary related to nature and natural phenomena	-ly ending	Unusual/Natural Phenomena Curriculum connection: Science	Write about an experience you had with nature that made an impression on you.
Since Luke had forgotten his girlfriend's birthday, he sent her flowers the next day. Despite the bad traffic, we arrived on time.	Idioms	Intonation in adverb clauses	Where and How They Came About Curriculum connection: Language	Write situations in which idioms can be used.
Cappadocia: If Rocks Could Talk Curriculum connection: Geology/History				

หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ

intermediate

real life

STUDENTS' BOOK

ชั้นมัธยมศึกษาปีที่ 6

กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ

ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน พุทธศักราช 2551

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บรรณาธิการ

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นางสาวสุนาลี นิลตะจินลา

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Longman

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หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ
 กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ
 ตามหลักสูตรแกนกลางการศึกษาขั้นพื้นฐาน พุทธศักราช 2551

SUCCESS 3

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Students' Book

ชั้นมัธยมศึกษาปีที่ 6

ผลิตและจัดจำหน่ายโดย บริษัท สำนักพิมพ์วัฒนาพานิช จำกัด

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	The dangers of the Internet: Learning to use computers	Speak Out : Giving instructions	
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A newspaper report about a drink driving accident	Radio discussion programme: A furious justice, who arrested 0 999?	Speak Out : Agreeing and disagreeing: Expressing opinions	
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	How girls and boys are treated differently	Speak Out : Asking for and refusing permission	
A letterhead for and against essay about single sex schools			A balanced for and against essay
Part of a film script	Extracts from a disaster movie	Making predictions	
Article: How the world might end		Discussing the future of mankind	
	A New Year's Eve party	Planning a party: Talking about New Year's resolutions	
	A student speaking giving a presentation	Speak Out : Giving presentations	
Article: First uses of humans		Talking about which animals make the best pets	
Article: The internet			
	A lecture about African elephants: A dog show	Speak Out : Expressing probability	
An opinion essay about race			An opinion essay
Article: Comedian's success story			
A girl's narrative: An extract from a novel			
	Extracts from a story: A poster giving an opinion	Talking about a successful person	Writing about being successful
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A school report about Edmond		Speak Out : Describing activities	A description of a place
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	An interview with a stream guidelines show	Following a career guidance interview	A report of a career guidance interview
	A speaking exam: discussing visual material	Speak Out : Discussing visual material	
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	People talking about modern art	Speak Out : Forecasting in conversations	
	Film review: <i>Culture of the New Hobbit</i>	Talking about films	A film review
Computer games review			A computer game review
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	Debate: making and responding to offers	Speak Out : Making and responding to offers	
	Radio adverts about food products	Discussing advertising	
Three letters in the editor		Presenting a book	
	Buy Nothing Day	Speak Out : Making and responding to complaints	
		Following requesting compensation	A letter of complaint
Two letters of complaint			

หนังสือเรียน รายวิชาพื้นฐาน ภาษาอังกฤษ

Upstream 6

Student's Book



ชั้นมัธยมศึกษาปีที่ 6

กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ
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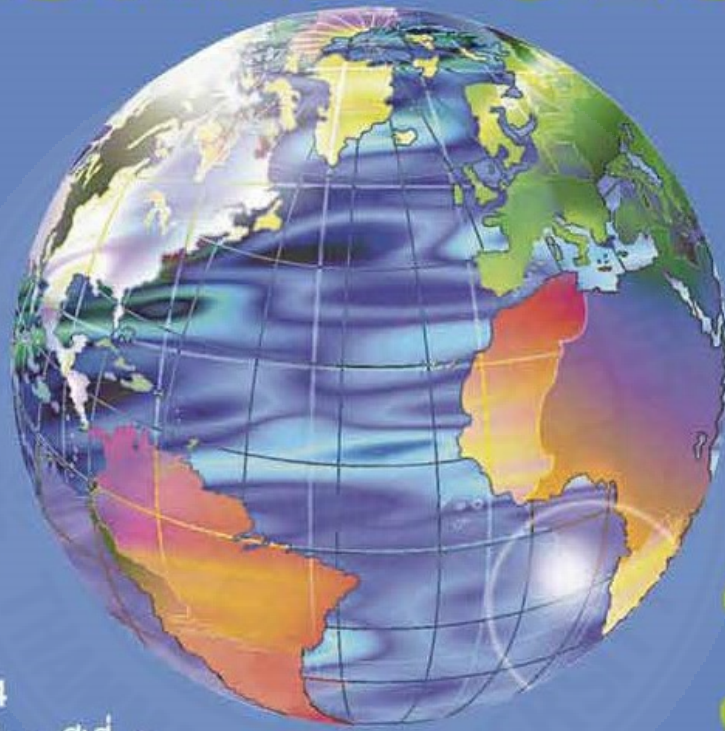
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Grammar	Listening	Speaking	Writing
present tenses; adverbs of frequency; stative verbs Phrasal verbs: BREAK, BRING	matching speakers to statements	renting a house; expressing sympathy; requesting services; intonation (express sympathy)	- an advertisement - an informal letter/email describing a house for rent
past tenses; used to/would Phrasal verbs: CARRY, COME	matching speakers to statements	spreading the news; describing people; introducing people; intonation (contrastive stress)	- famous people's profiles - a narrative
future tenses; type 0 & 1 conditionals; the definite article Phrasal verbs: CUT, DO	note-taking	holiday experiences; accepting/refusing invitations; cancelling a hotel reservation; intonation (short answers)	- a semi-formal transactional letter/email
comparisons; too/enough; -ing form/infinite Phrasal verbs: FALL, GET	note-taking	complaining; offering solutions to problems; expressing hesitation; intonation (key word stress)	- a set of rules - a short article about global warming - an essay providing solutions to problems
-ing/-ed participles; modal verbs; making deductions; question tags Phrasal verbs: GIVE, GO	multiple choice	making an appointment; describing symptoms; pronunciation (words with Greek and Latin roots)	- a for and against essay - a set of school rules
order of adjectives; the passive; relatives; relative clauses Phrasal verbs: HOLD, KEEP	note-taking	reporting a theft; giving instructions; intonation (stress in list of adjectives)	- an inventor's short biography - an opinion essay
causative form; reported speech (statements, questions, orders) Phrasal verbs: LET, LOOK	multiple choice	buying clothes; expressing opinions; intonation (questions)	- a description of clothes for a fashion magazine - an article describing a visit to a place
quantifiers (some, any, no, (a) little, (a) few); countable/uncountable nouns; reported speech (special introductory verbs) Phrasal verbs: MAKE, PUT	T/F statements	accepting/refusing invitations; doing your shopping; ordering a meal/fast food; intonation (exclamations)	- a recipe - an assessment report
type 2 & 3 conditionals; wishes; would rather Phrasal verbs: RUN, SEE, SET	multiple choice	asking for permission & polite requests; taking a phone message; intonation (regrets)	- a letter to the editor
future perfect; linkers & quantifiers (either/neither, although, both, all, none) Phrasal verbs: STAND, TAKE, TURN	note-taking	gossip; making arrangements; making excuses; intonation (word stress)	- a news report - a formal transactional letter/email
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หนังสือเรียนสาระการเรียนรู้พื้นฐานภาษาอังกฤษ
กลุ่มสาระการเรียนรู้ภาษาต่างประเทศ หลักสูตรการศึกษาขั้นพื้นฐาน พุทธศักราช 2544

WORLD CLUB



ช่วงชั้นที่ 4
ชั้นมัธยมศึกษาปีที่ 6

3

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Summary of course content

Students' Book

Module 0: Learning to Learn page 4

Getting to know the course
 Reviewing language learning vocabulary
 Reviewing grammatical terms and structures
 Listening and speaking strategies
 Reading strategies and writing a note

Module 1: Fashion page 9

READING: a magazine article; a poem; a fashion report
LISTENING: a dialogue; a radio interview; a story
SPEAKING: clothes; clothes shopping; being a model; appearance
WRITING: notes for a description; a fashion report
GRAMMAR: review of verb tenses; auxiliary verbs
VOCABULARY: clothes; fashion; adjectives; materials; wordbuilding
PRONUNCIATION: unstressed vowels

Module 2: Music page 23

READING: a glossary of pop music; extracts from a music magazine; a biography
LISTENING: different types of music; teenagers talking; an interview; a song
SPEAKING: music and musicians; your opinions; going to a concert; body language
WRITING: a profile of a rock group
GRAMMAR: past simple and past continuous tenses contrasted; conditional sentences (types 1 and 2)
VOCABULARY: types of music; instruments; adverbs; wordbuilding
PRONUNCIATION: word stress, initial consonants

Module 3: Holidays page 37

READING: a tourist brochure; a magazine article; a leaflet; a letter
LISTENING: at a travel agent's; a radio interview; a treasure hunt
SPEAKING: holidays; health; giving advice
WRITING: description of a place; notes; a formal letter
GRAMMAR: relative clauses; review of prepositions; quantity
VOCABULARY: types of holidays; adjectives; activities; health; advice; wordbuilding
PRONUNCIATION: sentence stress; pronunciation problems

Activity Book

Module 0: Learning to Learn page 2

Review of basic grammar; personal information; strategies for listening, vocabulary building, speaking and writing; Test Yourself

Module 1: Fashion page 7

READING: a description; Time to Read – *The Body Shop*; a party
LISTENING: a conversation about clothes; a description; a conversation in a clothes shop
WRITING: opinions
GRAMMAR: opinions; tense review; comparatives and superlatives; auxiliary verbs; negatives; Test Yourself
VOCABULARY: clothes; plurals/singular; descriptions; materials; punctuation – capital letters
PRONUNCIATION: /s/ or /z/

Module 2: Music page 16

READING: an interview; two magazine articles; Time to Read – *Paul McCartney*
LISTENING: the pop music charts; a musician's schedule
GRAMMAR: likes/dislikes; preferences; past simple and past continuous contrasted; past questions; suggestions; conditional sentences; advice; Test Yourself
VOCABULARY: music; musical instruments; adverbs; word formation
PRONUNCIATION: word stress

Module 3: Holidays page 37

READING: a letter to Brazil; diary of a holiday; Time to Read – *The New Jumbo*
LISTENING: a radio programme
WRITING: a postcard
GRAMMAR: relative clauses; *how* questions; prepositions; advice; agreeing; quantity; (un)countables; Test Yourself
VOCABULARY: holidays; adjectives; food

Students' Book

Module 4: Science page 51

READING: a scientific article; two magazine articles
LISTENING: a science quiz; at the doctor's; a TV programme
SPEAKING: scientific inventions and discoveries; computers; medicine
WRITING: definitions; a process; a science project report
GRAMMAR: passives; *yet, already* and *still*
VOCABULARY: inventions and discoveries; computers; uses of objects; illnesses; phrasal verbs; wordbuilding
PRONUNCIATION: word stress

Module 5: Crime page 65

READING: newspaper crime reports; an extract from a crime novel; statements to the police
LISTENING: two stories; police interviews
SPEAKING: crimes; famous detectives; detective work; a judging game
WRITING: a list of laws; notes; a crime story
GRAMMAR: the past perfect tense; modals for speculation
VOCABULARY: crimes; phrasal verbs; relationships; rooms
PRONUNCIATION: intonation for expressing uncertainty; vowel sounds

Module 6: Cinema page 79

READING: a magazine article; film reviews; making a film; an interview
LISTENING: film scenes; a film programme; a film summary
SPEAKING: films and film stars; asking for and giving permission; a film scene
WRITING: notes; a film review
GRAMMAR: conditional sentences (type 3); reported requests/orders, indefinite pronouns
VOCABULARY: types of films; adjectives; film actors; film-making
PRONUNCIATION: intonation to show mood; consonant clusters

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Activity Book

Module 4: Science page 34

READING: Levi Strauss; Time to Read – *The End of Paper?*
LISTENING: inventions; the story of Frankenstein; at the doctor's
GRAMMAR: passives; *still, yet, already; used to*; Test Yourself
VOCABULARY: transport; entertainment; communication; computers; sequence words; *some, any, no, every*

Module 5: Crime page 65

READING: a mystery; police statements; a burglar's story; Time to Read – *Bonnie and Clyde*
LISTENING: a crime; a police statement
GRAMMAR: prohibition; past simple; past perfect; past participles; modal verbs; question tags; Test Yourself
VOCABULARY: crime; furniture; phrasal verbs; punctuation – capitals, apostrophes, commas, full stops
PRONUNCIATION: elision

Module 6: Cinema page 51

READING: Charlie Chaplin; a biography; a TV guide; Time to Read – *Moving Pictures*
LISTENING: film reviews
GRAMMAR: conditional (3); pronouns; question words; reported requests/orders; permission; uses of *can*; reported statements; *although/however*
VOCABULARY: films; adjectives; phrasal verbs; punctuation – capital letters and full stops

APPENDIX D

PILOT STUDY

In order to pilot the use of the instrument, Coh-Metrix, a pilot study was conducted with two passages selected from two different levels of the Cambridge test: the Cambridge English: Key (KET) and the Cambridge English: Proficiency (CPE). Passage A was selected from KET, which could be compared to A2 level of the common European framework, and passage B was from CPE, which is equivalent to the C2 level. The data obtained were analyzed quantitatively and interpreted as follows.

Part 1: The average readability levels

In this part, the indices from category 11 (indices 104-106) of Coh-Metrix were used as the criterion for measuring the readability levels and exploring the linguistic characteristics of the two piloted passages. Each reading passage was analyzed to find out the readability level by using three different readability formulas: Flesch Reading Ease (index 104), Flesch-Kincaid Grade Level (index 105), and Coh-Metrix L2 Readability (index 106). Then, the reading passages were calculated to find the Coh-Metrix values. The obtained values from these readability formulas from both passages were compared in order to see the levels of difficulty of the passages. Table 1 presents the results from the data analysis of category 11 of Coh-Metrix.

Table 1

Results of category 11: Readability (a pilot study)

		Passage A	Passage B	Interpretation	Results
		Mean	Mean		CPET easier CONET easier
Category 11: Readability					
104	Flesch Reading Ease	69.535	49.865	higher value = easier	✓
105	Flesch-Kincaid Grade Level	6.023	11.386	lower value = easier	✓

106	Coh-Metrix L2 Readability	29.64	6.381	higher value = easier	✓
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For the first readability formula, “Flesch Reading Ease”, the higher value represents a lower level of difficulty. In this pilot study, the value of passage A was higher than that of passage B (index 104: 69.535 > 49.865). This is congruent with the second readability formula “Flesch-Kincaid Grade Level,”, which analyzed the difficulty level of passage A to be easier to comprehend than passage B. The Flesch-Kincaid Readability formula assigns the grade level of the passage A as lower than that of passage B (index 105: 6.023 < 11.386). The values from the Coh-Metrix L2 Readability formula also support the results from these two readability formulas. It can be seen that the value of passage A is higher than that of passage B (index 106: 29.64 > 6.381), and it can be interpreted based on the norm ‘Language Arts’ that the readability level of passage A is lower than that of passage B.

According to the values stated in Table 1, it can be seen that passage A generally has a lower readability level than passage B based on the results gained from all three readability formulas. That means that passage A is easier to understand than passage B.

Part 2: The linguistic characteristics

The results from categories 1 to 10 are shown in Tables 2 - 11 below.

Table 2

Results of category 1: Descriptive (a pilot study)

		Passage A	Passage B	Interpretation	Results
		Mean	Mean		CPET easier CONET easier
Category 1: Descriptive					
1	Paragraph count, number of paragraphs	6	9	-	✓
2	Sentence count, number of sentences	23	35	lower value = easier	✓

3	Word count, number of words	228	716	lower value = easier	✓
4	Paragraph length, number of sentences in a paragraph, mean	3.833	3.889	higher value = easier	✓
6	Sentence length, number of words, mean	9.913	20.457	lower value = easier	✓
8	Word length, number of syllables, mean	1.504	1.61	lower value = easier	✓
10	Word length, number of letters, mean	4.377	4.788	lower value = easier	✓

In category 1, as shown in Table 2, the obtained values show the descriptive linguistic characteristics of the piloted passages. Based on the table, it can be seen that passage A has lower values in terms of the number of words (index 3: 228 < 716), sentences (index 2: 23 < 35), and paragraphs (index 1: 6 < 9). This indicates that passage A is shorter than passage B. Moreover, the number of sentences per paragraph and the number of words per sentence shows that passage A consists of shorter sentences and paragraphs than passage B (index 4: 3.833 < 3.889; index 6: 9.913 < 20.457). This indicates that passage A is less complex in terms of syntactic complexity than passage B because it is shorter. Further, the average values of syllable and letters per word in passage A are lower than those found in passage B (index 8: 1.504 < 1.61; index 10: $M = 4.377 < 4.788$). This shows that passage A consists of shorter words than passage B. Therefore, it can be interpreted that passage A is likely to be easier to comprehend than passage B in terms of descriptive data.

Table 3

Results of category 2: Text easability principle component scores (a pilot study)

		Passage A	Passage B	Interpretation	Results
		Mean	Mean		CPET easier CONET easier
Category 2: Text easability principle component scores					
12	Text Easability PC Narrativity, z score	1.129	-0.723	higher value = easier	✓
13	Text Easability PC Narrativity, percentile	86.86	23.58	higher value = easier	✓
14	Text Easability PC Syntactic simplicity, z score	0.629	-0.465	higher value = easier	✓
15	Text Easability PC Syntactic simplicity, percentile	73.24	32.28	higher value = easier	✓
16	Text Easability PC Word concreteness, z score	0.662	1.012	lower value = easier	✓
17	Text Easability PC Word concreteness, percentile	74.54	84.38	lower value = easier	✓
18	Text Easability PC Referential cohesion, z score	0.281	-1.364	higher value = easier	✓
19	Text Easability PC Referential cohesion, percentile	61.03	8.69	higher value = easier	✓
20	Text Easability PC Deep cohesion, z score	-0.232	0.221	lower value = easier	✓
21	Text Easability PC Deep cohesion, percentile	40.9	58.71	lower value = easier	✓
22	Text Easability PC Verb cohesion, z score	1.144	0.036	higher value = easier	✓
23	Text Easability PC Verb cohesion, percentile	87.29	51.2	higher value = easier	✓
24	Text Easability PC Connectivity, z score	-1.762	-3.28	higher value = easier	✓
25	Text Easability PC Connectivity, percentile	3.92	0.05	higher value = easier	✓

26	Text Easability PC Temporality, z score	0.377	-0.522	higher value = easier	✓
27	Text Easability PC Temporality, percentile	64.43	30.15	higher value = easier	✓

In category 2, Coh-Metrix prescribes eight principles that can show the easability level of a passage. According to the norm “Language Arts”, passage A has higher percentile values of narrativity than those of passage B (indices 12-13: $1.129 > -0.723$, $86.86 > 23.58$), where it can be interpreted that passage A, which has more narrative features, is easier to comprehend than passage B. Passage A also yielded higher values in the index of syntactic simplicity (indices 14-15: $0.629 > -0.465$, $73.24 > 32.28$). This shows that passage A is less complex in terms of sentence structure than passage B. In terms of word concreteness, passage A also received lower values than passage B ($0.622 < 1.012$, $74.54 < 84.38$). This is evidence that passage B has more concrete words, and this might make the passage more difficult to understand than passage A. In terms of the index of referential cohesion, passage A also has higher values than passage B ($0.281 > -1.364$, $61.03 > 8.69$), where it can be interpreted that passage A contains more referential cohesion than passage B. In the index of deep cohesion, passage A also has lower values than passage B ($40.9 < 58.71$). This is indicated by the norm that easier passages normally have lower values for deep cohesion. In terms of verb cohesion, passage A also received higher values ($-0.232 < 0.221$, $87.29 > 51.2$) than passage B. This shows that passage A has more verb cohesion than passage B. For the last two indices, connectivity and temporality, passage A also has higher values than passage B ($-1.722 > -3.28$, $3.92 > 0.05$, $0.377 > 0.522$, $64.43 > 30.15$).

As seen from Table 3, the percentile values achieved from all eight principles show that passage A has more features found in easier passages than passage B. This could be interpreted based on the norm that passage A is easier to comprehend than passage B.

Table 4*Results of category 3: Referential cohesion (a pilot study)*

		Passage A	Passage B	Interpretation	Results	
		Mean	Mean		CPET easier	CONET easier
Category 3: Referential cohesion						
28	Noun overlap, adjacent sentences, binary, mean	0.364	0.324	lower value = easier		✓
29	Argument overlap, adjacent sentences, binary, mean	0.5	0.353	lower value = easier		✓
30	Stem overlap, adjacent sentences, binary, mean	0.364	0.441	lower value = easier	✓	
31	Noun overlap, all sentences, binary, mean	0.371	0.315	lower value = easier		✓
32	Argument overlap, all sentences, binary, mean	0.451	0.363	lower value = easier		✓
33	Stem overlap, all sentences, binary, mean	0.371	0.383	lower value = easier	✓	
34	Content word overlap, adjacent sentences, proportional, mean	0.132	0.057	higher value = easier	✓	
36	Content word overlap, all sentences, proportional, mean	0.105	0.046	higher value = easier	✓	

Table 4 presents the results from Category 3. Among all of the indices, passage A has more stem overlap in adjacent sentences (index 30: $0.364 < 0.441$) and all sentences (index 33: $0.371 < 0.383$) than passage B. Additionally, passage A also has more content word overlap in adjacent sentences (index 34: $0.132 > 0.057$) and all sentences (index 36: $0.105 > 0.046$) than passage B. For passage B, there is more overlapping of nouns in adjacent sentences (index 28: $0.364 > 0.324$) and all sentences (index 31: $0.371 > 0.315$). Additionally, there are more argument overlaps in both adjacent sentences (index 29: $0.5 > 0.353$) and all sentences as well (index 32: $0.451 > 0.363$). It can be interpreted then that passage A has more indices that indicate easier linguistic characteristics in terms of referential cohesion than passage B.

Table 5

Results of category 4: Latent semantic analysis (a pilot study)

		Passage A	Passage B	Interpretation	Results	
		Mean	Mean		CPET easier	CONET easier
Category 4: Latent semantic analysis						
38	LSA overlap, adjacent sentences, mean	0.163	0.11	lower value = easier		✓
40	LSA overlap, all sentences in paragraph, mean	0.151	0.116	lower value = easier		✓
42	LSA overlap, adjacent paragraphs, mean	0.524	0.326	-		
44	LSA given/new, sentences, mean	0.364	0.269	higher value = easier	✓	

As seen in Table 5, category 4, Latent semantic analysis (LSA) is the measure of semantic overlap between sentences and paragraphs. It considers both explicit and implicit words that are similar or related in meaning. This analysis is related to the degree of cohesion in the target passage. Based on the norm, passage A has higher values of LSA overlap of given and new than passage B (index 44: $0.364 > 0.269$). Passage B shows the values of having high cohesion in terms of having more overlapping of LSA in adjacent sentences (index 38: $0.11 > 0.163$), all sentences in the paragraph (index 40: $0.116 > 0.151$), and adjacent paragraphs (index 42: $0.326 > 0.524$). This might be because passage B has more paragraphs than passage A.

It can be interpreted from the data obtained in category 4 that passage A has more overlapping in terms of semantic concepts (given and new) in adjacent sentences than passage B; thus, passage A might be easier to comprehend since there are more repeated ideas among the sentences, which can lead to a more cohesive text.

Table 6*Results of category 5: Lexical diversity (a pilot study)*

		Passage A	Passage B	Interpretation	Results
		Mean	Mean		CPET easier CONET easier
Category 5: Lexical diversity					
46	Lexical diversity, type-token ratio, content word lemmas	0.583	0.76	lower value = easier	✓
47	Lexical diversity, type-token ratio, all words	0.48	0.501	lower value = easier	✓
48	Lexical diversity, MTLTD, all words	58.257	100.211	lower value = easier	✓
49	Lexical diversity, <i>vocd</i> , all words	65.124	89.548	lower value = easier	✓

As seen in Table 6, based on the norm, the results achieved from all indices in category 5 show that passage A has lower lexical diversity in all four indices than passage B (index 46: $0.583 < 0.76$, index 47: $0.48 < 0.501$, index 48: $58.257 < 100.211$, and index 59: $65.124 < 89.548$). It can be said that passage A is easier than passage B in terms of lexical diversity.

Table 7*Results of category 6: Connectives (a pilot study)*

		Passage A	Passage B	Interpretation	Results
		Mean	Mean		CPET easier CONET easier
Category 6: Connectives					
50	All connectives incidence	78.947	111.732	lower value = easier	✓
51	Causal connectives incidence	8.772	23.743	lower value = easier	✓

52	Logical connectives incidence	21.93	27.933	lower value = easier	✓
53	Adversative and contrastive connectives incidence	13.158	9.777	lower value = easier	✓
54	Temporal connectives incidence	35.088	22.346	lower value = easier	✓
55	Expanded temporal connectives incidence	17.544	9.777	lower value = easier	✓
56	Additive connectives incidence	43.86	69.832	lower value = easier	✓

As presented in Table 7, category 6 focuses on the use of connectives in the target passage. Coh-Metrix analyzes all connectives and then groups the connectives into eight sub-groups: causal, logical, adversative and contrastive, temporal, expanded temporal connective, additive, positive, and negative connectives. However, two types of connectives (positive and negative connectives) did not have the analyzed values, meaning that the two passages did not have these characteristics. For the overall uses of connectives, it was found that passage A had more uses of all connectives than passage B (index 50: $78.947 < 111.732$). When categorizing the connectives into sub-categories, three types of connectives were used more in passage A (index 51: $8.772 < 27.933$, index 52: $21.93 < 27.933$, and index 56: $43.86 < 69.832$). The uses of adversative and contrastive connective (index 53: $9.777 < 13.158$, index 54: $22.346 < 35.088$) and index 55: $9.777 < 17.544$, however, were found to be used more in passage B.

It can be interpreted that the different types of connectives might be the result of the different text organizations of the two passages. However, when considering the overall uses of connectives in the two passages, passage A is likely to be easier to read than passage B since it has more values of all connective incidences. More uses of connectives promote the cohesion of the passage; a more cohesive passage is easier to read and understand than a less cohesive one.

Table 8*Results of category 7: Situation model (a pilot study)*

		Passage A	Passage B	Interpretation	Results	
		Mean	Mean		CPET easier	CONET easier
Category 7: Situation model						
59	Causal verb incidence	35.088	20.95	higher value = easier	✓	
60	Causal verbs and causal particles incidence	39.474	32.123	higher value = easier	✓	
61	Intentional verbs incidence	30.702	19.553	higher value = easier	✓	
62	Ratio of casual particles to causal verbs	0.111	0.5	lower value = easier	✓	
63	Ratio of intentional particles to intentional verbs	0.25	1	lower value = easier	✓	
64	LSA verb overlap	0.08	0.058	lower value = easier		
65	WordNet verb overlap	0.714	0.488	higher value = easier	✓	✓
66	Temporal cohesion, tense and aspect repetition, mean	0.909	0.794	higher value = easier	✓	

Table 8 presents the results of category 7, the situation model, which refers to the mental representation via the identification of causal and intentional verbs as well as their particles. After these verbs are identified, Coh-Metrix uses WordNet and LSA to analyze the overlapping of these two types of verbs in order to ascertain their cohesion within the passage. The use of temporal cohesion is also added so as to find the tense repetitions within the passage. In this pilot study, it was found that passage A had more uses of almost all the indices: causal verb incidence (index 59: 35.088 > 20.95), causal verb and causal particles incidence (index 60: 39.474 > 32.123), intentional verb incidence (index 61: 30.702 > 19.553), ratio of causal particles to causal verbs (index 62: 0.111 < 0.5), ratio of intentional particles to intentional verbs

(index 63: $0.25 < 1$), WordNet verb overlap (index 65: $0.714 > 0.488$), and temporal cohesion, tense, and aspect repetition (index 66: $0.909 > 0.794$), where it can be interpreted that passage A has the better forming of the situation model understanding. However, the results show that passage B has lower values of LSA verb overlap, which shows that there is greater evidence of LSA verb overlap (index 64: $0.058 < 0.08$) in passage B.

The results indicate that passage A is easier for the reader to create a mental representation from the reading passage since there is more evidence of causal and intentional verbs that could be linked to the forming of the situation model and that would lead to the understanding of the passage.

Table 9

Results of category 8: Syntactic complexity (a pilot study)

		Passage A	Passage B	Interpretation	Results
		Mean	Mean		CPET easier
					CONET easier
Category 8: Syntactic complexity					
67	Left embeddedness, words before main verb, mean	2.304	3.6	lower value = easier	✓
68	Number of modifiers per noun phrase, mean	0.549	1.06	lower value = easier	✓
69	Minimal Edit Distance, part of speech	0.762	0.747	higher value = easier	✓
70	Minimal Edit Distance, all words	0.92	0.911	higher value = easier	✓
71	Minimal Edit Distance, lemmas	0.896	0.897	higher value = easier	✓
72	Sentence syntax similarity, adjacent sentences, mean	0.122	0.061	higher value = easier	✓
73	Sentence syntax similarity, all combinations, across paragraphs, mean	0.133	0.051	higher value = easier	✓

Category 8, as seen in Table 9, presents the syntactic complexity of the target passages by analyzing the number of words before the main verb, the number of noun modifiers, the minimal edit distance, and the syntax similarity between adjacent sentences and across the paragraphs. According to the norm, it can be seen that passage A has more values, which indicates easier features in almost all indices: left embeddedness (index 67: $2.304 < 3.6$), number of modifiers per noun phrase (index 68: $0.549 < 1.06$), minimal edit distance of parts of speech (index 69: $0.762 < 0.747$), minimal edit distance of all words (index 70: $0.92 > 0.911$), sentence syntax similarity of adjacent sentences (index 72: $0.122 > 0.061$), and sentence syntax similarity of all combinations across paragraphs (index 73: $0.133 > 0.051$). Passage B, however, has more value of minimal edit distance of the lemmas (index 71: $0.897 > 0.896$) than passage A. Although passage B has a higher value of minimal edit distance of lemma, the values of the two passages are very close in number, and they might not show much difference (index 71: 0.896 and 0.897). This indicates that based on the norm, passage A has less complexity in terms of sentence structure.

Table 10

Results of category 9: Syntactic pattern density (a pilot study)

		Passage A	Passage B	Interpretation	Results	
		Mean	Mean		CPET easier	CONET easier
Category 9: Syntactic pattern density						
74	Noun phrase density, incidence	412.281	391.061	lower value = easier		✓
75	Verb phrase density, incidence	228.07	162.011	higher value = easier	✓	
76	Adverbial phrase density, incidence	26.316	22.346	higher value = easier	✓	
77	Preposition phrase density, incidence	78.947	128.492	lower value = easier	✓	
78	Agentless passive voice density, incidence	4.386	11.173	lower value = easier	✓	

79	Negation density, incidence	13.158	2.793	higher value = easier	✓
80	Gerund density, incidence	13.158	18.156	lower value = easier	✓
81	Infinitive density, incidence	17.544	9.777	higher value = easier	✓

As seen in Table 10, the relative density of these syntactic patterns is another possible factor that affects how easy or difficult the reading passages are processed. In category 10, eight syntactic patterns were identified (noun phrase density, verb phrase density, adverbial phrase density, preposition phrase density, agentless passive voice density, negation density, gerund density, and infinitive density). According to the analysis, the values from passage A show that it has a density of syntactic patterns—verb phrase (index 75: 228.07 > 162.011), adverbial phrase density (index 76: 26.316 > 22.346), preposition phrase (index 77: 78.947 < 128.492), agentless passive voice (index 78: 4.386 > 11.173), negation (index 79: 13.158 > 2.793), gerund (index 80: 13.158 < 18.156), infinitive (index 81: 17.544 > 9.777)—to a greater extent than that of passage B. There was only one index, noun phrase density (index 74: 391.061 < 412.281), that was found more in passage B, suggesting that passage A contains less syntactic pattern density than passage B. This evidence supports the notion of the ease of passage comprehension.

Table 11

Results of category 10: Word information (a pilot study)

		Passage A	Passage B	Interpretation	Results	
		Mean	Mean		CPET easier	CONET easier
Category 10: Word information						
82	Noun incidence	285.088	318.436	lower value = easier	✓	
83	Verb incidence	166.667	115.921	higher value = easier	✓	

84	Adjective incidence	48.246	87.989	lower value = easier	✓
85	Adverb incidence	43.86	36.313	higher value = easier	✓
86	Pronoun incidence	127.193	41.899	higher value = easier	✓
87	First person singular pronoun incidence	13.158	0	higher value = easier	✓
88	First person plural pronoun incidence	0	0	higher value = easier	
89	Second person pronoun incidence	17.544	0	higher value = easier	✓
90	Third person singular pronoun incidence	74.561	22.346	higher value = easier	✓
91	Third person plural pronoun incidence	13.158	15.363	lower value = easier	✓
92	CELEX word frequency for content words, mean	2.716	2.013	higher value = easier	✓
93	CELEX Log frequency for all words, mean	3.238	3.001	higher value = easier	✓
94	CELEX Log minimum frequency for content words, mean	1.876	1.102	higher value = easier	✓
95	Age of acquisition for content words, mean	288.769	357.353	lower value = easier	✓
96	Familiarity for content words, mean	596.827	560.757	higher value = easier	✓
97	Concreteness for content words, mean	395.042	375.989	higher value = easier	✓
98	Imagability for content words, mean	435.2	420.417	higher value = easier	✓
99	Meaningfulness, Colorado norms, content words, mean	443.97	448.057	higher value = easier	✓
100	Polysemy for content words, mean	3.978	3.427	higher value = easier	✓
101	Hypernymy for nouns, mean	3.708	5.162	lower value = easier	✓

102	Hypernymy for verbs, mean	1.7	1.606	higher value = easier	✓
103	Hypernymy for nouns and verbs, mean	1.232	1.728	lower value = easier	✓

Table 11 presents category 10: word information of the target reading passages. Indices 82 to 86 are the descriptive information of parts of speech (nouns, verbs, adjectives, adverbs, and pronouns). Coh-Metrix also identifies the pronoun into first, second, and third person pronouns in indices 87 to 91. Since these indices indicate descriptive information that might not affect the difficulty in the comprehending process, they are not presented in detail.

Apart from assigning the parts of speech, this category also presents the analysis of word frequency by using CELEX. The high frequency words are more familiar and can be processed more quickly. In the table, it can be seen that passage A consists of more high frequency words and content words than passage B. The CELEX word frequency for content words, the CELEX log frequency for all words, and the CELEX log minimum frequency for content words are found more in passage A (index 92: $2.716 > 2.013$, index 93: $3.238 > 3.001$, and index 94: $1.876 > 1.102$ respectively). It can be concluded that passage A contains more frequently-used words than passage B.

Besides word frequency, all of the words in the target passages were also analyzed by using psychological rating based on the MRC Psycholinguistic Database and WordNet (Indices 95-103). From this rating, it was found that passage A had values that are likely to be found in the group of easier passages in the eight indices. All of the content words that were assigned to age of acquisition (index 95: $288.769 < 357.353$), familiarity (index 96: $596.827 > 560.757$), concreteness index 97: ($395.042 > 375.989$), imagability (index 98: $435.2 > 420.417$), and polysemy (index 100: $3.978 > 3.427$) were less difficult than those found in passage B. When considering the values of hypernymy for nouns (index 100: $3.708 < 5.162$), and verbs (index 101: $1.7 > 1.606$), and nouns and verbs (index 103: $1.232 < 1.728$), passage A also demonstrated values indicating that the words in passage A were easier to process than those in passage B. However, there was only one psychological rating,

meaningfulness of content words (index 99: $448.057 > 443.97$), that indicated that passage B is likely to be easier than passage A.

To sum up, it can be concluded that passage A has more linguistic characteristics, which indicate easier features based on the norm "Language Arts" than passage B. From all 103 indices, there 73 indicated that passage A had easier linguistic characteristics than passage B. Ten indices did not show how easy or difficulty the text was, and two indices exhibited no results for interpretation. Consequently, 14 indices indicated that passage B was easier to read than passage A.



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