

Development of English Reading Competence Support System and Measurement of its Effect

Dissertation

Kamal Baha

Tokyo Denki University

March 2023

Abstract

This research was a study on the development of the Word Level Classification Vocabulary Learning (WCVL) system and the measurement of the effectiveness of it intern of whether the potential of the system or the learners' improvement in learning English material through the WCVL system. There are many ways to improve reading comprehension for learners of English as a foreign language. Learning vocabulary is one of the ways to improve it. The more vocabulary learners apprehend, the deeper their understanding becomes when reading English texts. Therefore, it is suggested that the learners improve their reading comprehension if they understand unknown words before reading a text. The WCVL system was designed based on the constructivism education theory and the cognitive theory of multimedia learning. It was developed by using the Waterfall software development methodology. The Waterfall model consists of 5 Stages that are 1) Requirements analysis, 2) System Design, 3) Implementation, 4) Setup, and 5) Evaluation. In the Implementation Stages, we use the Model-View-Controller design pattern during the system programming.

The NLP-Compromise JavaScript library was used for morphological analysis to extract the words in an English text. The extracted vocabulary was also classified into 12 difficulty levels based on the SLV12000 vocabulary database. The system displays only the words whose levels are higher than the student's estimated vocabulary level and adds Japanese and Thai meanings.

The WCVL system provides six types of exercises that are 1) Spelling, 2) Dictation, 3) Multiple Choices, 4) True/False, 5) Matching, and 6) Flashcards for students to learn unknown words and collects learned vocabulary in the user's database. We employed responsive web design to provide the WCVL system available on any device, which adapts

to the user's device system environment depending on the screen sizes and the types of operating systems.

This study investigated a new approach to learning unknown words through various vocabulary practices using the WCVL system. In addition, the questionnaires were asked to collect Thai and Japanese students' reactions toward the proposed system and evaluate its efficacy.

Table of Contents

| | |
|--|----------|
| Abstract..... | i |
| Table of Contents..... | iii |
| List of Figures | viii |
| List of Tables..... | xii |
| List of Equations..... | xiii |
| List of Abbreviations | xiv |
| Chapter 1 Introduction | 1 |
| 1.1 Background | 1 |
| 1.2 Previous Tools and Problems..... | 5 |
| 1.3 Challenges..... | 7 |
| 1.4 Goals and structure of the thesis..... | 7 |
| 1.5 Dissertation Organization..... | 8 |
| Chapter 2 Literature Review and Related Work..... | 9 |
| 2.1 The Waterfall Methodologies Model..... | 9 |
| 2.2 Cognitive Theory of Multimedia Learning (CTML) | 10 |
| 2.3 The Vocabulary Database..... | 12 |
| 2.3.1 JACET..... | 12 |
| 2.3.2 SVL12000 | 12 |
| 2.3.3 BNC HFWL..... | 14 |
| 2.3.4 COCA..... | 14 |

| | |
|--|-----------|
| 2.4. Constructivism Education Theory | 15 |
| 2.4.1 The perspective of learning in Constructivism..... | 15 |
| 2.4.2 The perspective of teaching in Constructivism..... | 16 |
| 2.5. ICT-based Learning Model..... | 17 |
| 2.6. Related Work | 19 |
| Chapter 3 System Development | 20 |
| 3.1 Requirements Analysis..... | 21 |
| 3.1.1 Features of the System | 21 |
| 3.1.2 Use Case Diagram..... | 22 |
| 3.2 System Design | 25 |
| 3.2.1 The System Architecture..... | 25 |
| 3.2.2 User Interface Design Blueprint | 26 |
| 3.3 Implementation | 29 |
| 3.3.1 Model..... | 33 |
| 3.3.2 Controller..... | 37 |
| 3.3.3 View..... | 39 |
| 3.4 Setup..... | 46 |
| 3.5 Evaluation | 47 |
| Chapter 4 Experimental Section..... | 48 |
| 4.1 Participants..... | 48 |
| 4.2 Experiment Tools..... | 50 |
| 4.2.1 Pre-Test and Post-Test..... | 50 |

| | |
|--|-----------|
| 4.2.2 Design of Test for Thai Students..... | 50 |
| 4.2.3 Questionnaire | 56 |
| 4.3 Study Method..... | 57 |
| 4.3.1 Vocabulary Acquisition Procedure | 57 |
| 4.3.2. Learning Schedule | 61 |
| Chapter 5 Results and Discussion..... | 63 |
| 5.1 t-Test..... | 63 |
| 5.2 The Effectiveness Index | 64 |
| 5.3 The Result of the Pre-test and Post-test..... | 66 |
| 5.3.1 Thai Students..... | 66 |
| 5.3.2 Japanese Students | 70 |
| 5.4 The Result of Learning Time..... | 74 |
| 5.4.1 Relationship between Learning Time and Exercises..... | 74 |
| 5.4.2 Relationship between Learning Time and Increased Score | 74 |
| 5.5 The Result of the Questionnaire..... | 77 |
| 5.5.1 Students' Attitudes and Behavior Toward the Exercise Options | 77 |
| 5.5.2 Students' Attitudes and Behavior Toward the System | 79 |
| Chapter 6 Conclusions and Future works | 82 |
| 6.1 Summary of contributions | 82 |
| 6.2 Limitations | 85 |
| 6.3 Future works..... | 85 |
| List of Publications | 86 |

| | |
|---|-----------|
| 1. Publications..... | 86 |
| 2. Conferences | 86 |
| a. International Conferences..... | 86 |
| b. Domestic Conferences..... | 87 |
| References | 88 |
| Picture Reference | 94 |
| Acknowledgments..... | 95 |
| Appendixes..... | 97 |
| I. The Questions used in the Questionnaire..... | 97 |
| II. GAT Test for Thai Students..... | 101 |
| Pre-test..... | 101 |
| Post-test..... | 108 |
| III. Standard Vocabulary List (SVL12000)..... | 117 |
| Level 1 | 117 |
| Level 2 | 117 |
| Level 3 | 118 |
| Level 4 | 118 |
| Level 5 | 119 |
| Level 6 | 119 |
| Level 7 | 120 |
| Level 8 | 121 |
| Level 9 | 121 |

| | |
|--|-----|
| Level 10 | 122 |
| Level 11 | 123 |
| Level 12 | 123 |
| IV. The Usage of the WCVL System..... | 125 |
| 1. Creating of Account | 125 |
| 2. Morphological Analysis | 126 |
| 3. Accessing the Exercises..... | 127 |
| 4. Save Memorized Vocabulary | 128 |
| V. The Code Part of Dictation Exercise with JavaScript | 129 |

List of Figures

| | |
|--|----|
| Figure 1 General ICT Tools for Teaching and Learning | 1 |
| Figure 2 Analyzed Vocabulary from KH Coder Shows Part of Speech and Frequency | 6 |
| Figure 3 The Waterfall Methodology model | 9 |
| Figure 4 Multimedia Learning Process of Mayer Cognitive Theory..... | 11 |
| Figure 5 The Explanation of each Level of the SVL12000 Database..... | 13 |
| Figure 6 The Waterfall Methodology Model | 21 |
| Figure 7 The High-Level Use Case Diagram of the WCVL system..... | 24 |
| Figure 8 System Architecture of WCVL System..... | 25 |
| Figure 9 The Blueprint Layout of the Text Analyzer Page..... | 26 |
| Figure 10 The Blueprint Layout of my Memory Page | 27 |
| Figure 11 The Blueprint Layout of the System Setting Page..... | 27 |
| Figure 12 The Blueprint Layout of the Matching Game Page..... | 28 |
| Figure 13 The Blueprint Layout of the Multiple Choice Page..... | 28 |
| Figure 14 The Blueprint Layout of the Spelling Page | 29 |
| Figure 15 The WCVL System Displays the User Interface on Laptop Screen 13-inch Sizes | 30 |
| Figure 16 The WCVL System Displays the User Interface on Tablet 12.9-inch Sizes..... | 31 |
| Figure 17 The WCVL System Displays the User Interface on Smart Phone Screen Sizes. | 31 |
| Figure 18 The MVC Pattern..... | 32 |
| Figure 19 The SQL Command for Creating SVL12000 with Japanese and Thai Meaning Database | 33 |
| Figure 20 The SQL Command for Creating User-Learned Database | 33 |
| Figure 21 The SQL Command for Creating User Information Database..... | 34 |

| | |
|--|----|
| Figure 22 The SQL Command for Determining References Key and Foreign Key in user_vocab Database | 34 |
| Figure 23 The Entity Relationship Diagram of the WCVL System | 35 |
| Figure 24 The Part of SQL Command for Inserting SVL12000 database with Japanese and Thai Meaning Data..... | 35 |
| Figure 25 The Part of ‘alc_vocab’ Data Shows as Table in phpMyAdmin..... | 36 |
| Figure 26 The Part of PHP Controller Command for Creating JSON Data of Multiple-Choice Exercise | 37 |
| Figure 27 The Part of JSON Data of the Example of Questions and Answers of Multiple-Choice Exercise | 38 |
| Figure 28 The User-Interface of the Multiple-Choice Exercise which Creating by JavaScript and Using JSON data from PHP | 38 |
| Figure 29 Morphological Analysis Function was Divided into 5 Stages..... | 39 |
| Figure 30 The result display transformed words which analyze by our system..... | 40 |
| Figure 31 The Activity Diagram of Learning Unknown Vocabulary with the WCVL System..... | 41 |
| Figure 32 The User-Interface of Spelling Exercise Created from Five Vocabulary with JavaScript..... | 43 |
| Figure 33 The User-Interface of Dictation Exercise Created from Five Vocabulary with JavaScript..... | 43 |
| Figure 34 The User-Interface of Multiple-Choice Exercise Created from Five Vocabulary with JavaScript..... | 44 |
| Figure 35 The User-Interface of Matching Exercise Created from Five Vocabulary with JavaScript..... | 44 |
| Figure 36 The User-Interface of True/False Exercise Created from Five Vocabulary with JavaScript..... | 45 |

| | |
|--|----|
| Figure 37 The User-Interface of Flashcard Exercise Created from Five Vocabulary with JavaScript..... | 45 |
| Figure 38 The FileZilla Software Using for Transferring Files to Sever through Transfer Protocol (FTP) | 46 |
| Figure 39 The senior high-school participants in Thailand (Pre-Test)..... | 49 |
| Figure 40 The senior high-school participants in Thailand (Post-Test)..... | 49 |
| Figure 41 The Procedure of Designing Pre- & Post-Test for Thai Student Subjects..... | 50 |
| Figure 42 The Number and Percentage of Vocabulary in Pre-Test (a), The Number and Percentage of Vocabulary in Post-Test (b)..... | 54 |
| Figure 43 The Number and Percentage of Vocabulary in all Passage Questions (Pre-Test) Sorted by the SVL120000 Database..... | 55 |
| Figure 44 The Number and Percentage of Vocabulary in all Passage Questions (Post - Test) Sorted by the SVL120000 Database..... | 55 |
| Figure 45 The Example of the Passage from the Gat English Test..... | 57 |
| Figure 46 Morphological Analysis User Interface | 58 |
| Figure 47 The Unknown & Known words table showed the results of the Morphological Analysis..... | 59 |
| Figure 48 The Individual Learned Vocabulary Database (My Memory Page)..... | 60 |
| Figure 49 The Example of the E.I. in a Pre-Test/Post-Test for Thai Students' Scores..... | 65 |
| Figure 50 Vocabulary Score of Pre-&Post-Test for Thai Students | 66 |
| Figure 51 Reading Comprehension Score of Pre-&Post-Test for Thai Students | 67 |
| Figure 52 Total Score of Pre-&Post-Test for Thai Students..... | 67 |
| Figure 53 Scatter Plot between Pre-Test and Post-Test for Thai Students..... | 68 |
| Figure 54 The Listening Score of Pre-Post Test for Japanese Students | 70 |
| Figure 55 The Reading Score of Pre-Post Test for Japanese Students..... | 71 |
| Figure 56 The Total Score of Pre-Post Test for Japanese Students..... | 71 |
| Figure 57 Scatter Plot between Pre-Test and Post-Test for Japanese Students | 72 |

| | |
|---|----|
| Figure 58 The Relationship between Learning Time and Exercises for Thai Students.... | 75 |
| Figure 59 The Relationship between Learning Time and Exercises for Japanese Students | 75 |
| Figure 60 The Relationship between Study Time and Increased Scores for Thai Students | 76 |
| Figure 61 The Relationship between Study Time and Increased Scores for Japanese Students | 76 |
| Figure 62 Radar Chart of the Student's Attitudes and Behavior toward Exercises..... | 78 |
| Figure 63 Rader Chart of the Student's Attitudes and Behavior toward the System..... | 80 |
| Figure 64 The Thai Students' Answers to Items in the Questionnaire in Percentage Terms | 81 |
| Figure 65 The Japanese Students' Answers to Items in the Questionnaire in Percentage Terms | 81 |

List of Tables

| | |
|--|----|
| Table 1 Requirements of The WCVL system | 23 |
| Table 2 Coefficient of Cronbach's Alpha and Reliability Level..... | 47 |
| Table 3 The breakdown of grade levels in the U.S and readability score..... | 52 |
| Table 4 Readability Indices of All Passage Questions in the Pre-Test of Thai Students.. | 53 |
| Table 5 Readability Indices of All Passage Questions in the Post-Test of Thai Students | 54 |
| Table 6 The Categories of the Questionnaire and the Numbers of Items..... | 56 |
| Table 7 Five-Point Likert-Type Scale with Five Corresponding | 56 |
| Table 8 Learning Schedule of Japanese Students..... | 61 |
| Table 9 Learning schedule of Thai students..... | 62 |
| Table 10 The Significance Level of P-Value and Specification | 64 |
| Table 11 The Difference between the Pre-and Post-Test of Efficiencies and the Pair-Sample t-Test Results for Thai Students..... | 69 |
| Table 12 The Effectiveness Index and the Difference between Pre- and Post-Test of the Pair-Sample t-Test Results for Japanese Students | 73 |
| Table 13 Results of the Student's Attitudes and Behavior toward the Exercises | 78 |
| Table 14 Results of the Student's Attitudes and Behavior toward the System | 79 |

List of Equations

| | |
|---|----|
| Equation 1 Cronbach's Alpha Coefficient..... | 47 |
| Equation 2 Coleman-Liau Index Equation..... | 51 |
| Equation 3 Automated Readability Equation | 52 |
| Equation 4 The Effectiveness Index..... | 65 |

List of Abbreviations

| | |
|----------|--|
| AECT | The Association for Educational Communication and Technology |
| ARI | Automated Readability Index |
| BNC HFWL | The British National Corpus High-Frequency Word List |
| COCA | The Corpus of Contemporary American English |
| CTML | Cognitive Theory of Multimedia Learning |
| EFL | English as a Foreign Language |
| E.I. | The Effectiveness Index |
| FTP | File Transfer Protocol |
| GAT | General Aptitude Test |
| ICT | Information and Communication Technologies |
| MVC | Model-View-Controller |
| NWLC | New Word Level Checker |
| SVL | Standard Vocabulary List |
| WCVL | Word-Level Classification and Vocabulary Learning System |
| WLC | Word Level Checker |

Chapter 1

Introduction

1.1 Background

Since the turn of the twenty-first century, students' use of information and communication technologies (ICT) has increased due to the development of high-tech devices such as computers, tablets, and smartphones (Figure 1). As a result, almost every aspect of ICT usage has increased, including possession, frequency, and usage rate. Moreover, numerous studies have shown that this trend exists not only in developed nations but globally (Katsumi & Tamura, 2021).

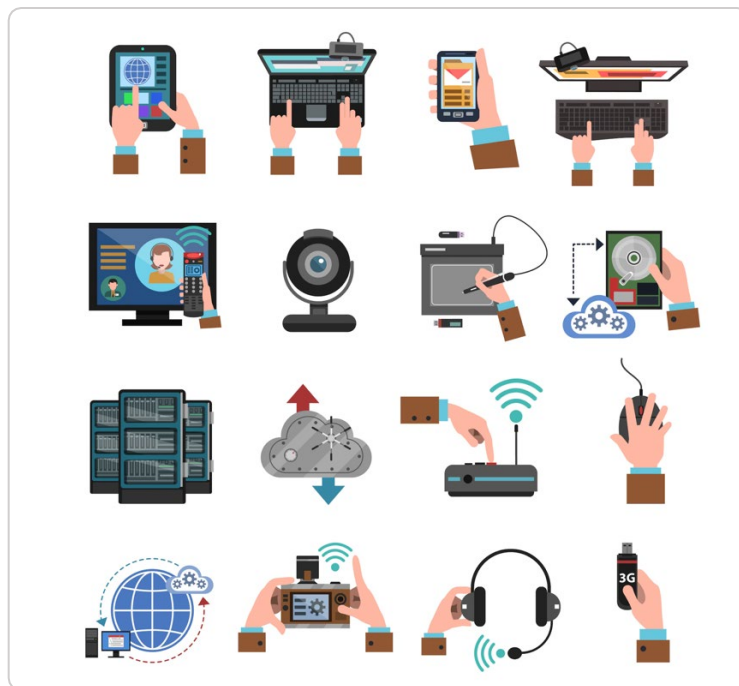


Figure 1 General ICT Tools for Teaching and Learning

The majority of educational experts (Huang et al., 2019; Lazar, 2015; Spector, 2015) defined educational technology as an effective way of using technologies as tools and media to transfer the learning material, improving performances and learning experiences. In addition, the Association for Educational Communication and Technology (AECT) defines educational technology as the theory and practice of designing, developing, managing, utilizing, and evaluating learning processes and resources (Bruckner, 2015).

In the aftermath of the COVID-19 pandemic, governments worldwide were compelled to suspend all activities involving interpersonal interaction, such as education and learning. Schools and colleges have implemented online teaching and learning options in response to these transitions. Consequently, ICT devices have assumed an increasingly important role in the lives of teachers and students worldwide.

Currently, the majority of countries' technological preferences are influenced by the trend in technology. However, countries face various challenges when implementing advanced technology, including economic development, national infrastructure, policies, and human resources. Consequently, each country has distinct technological preferences (devices and methods), particularly for educational purposes. There are numerous examples of educational technology preferences based on economic and infrastructure considerations. For example, in the United States, broadband internet costs approximately 1.1% of per capita income. In contrast, in Bangladesh, the annual cost of an Internet connection is sufficient to feed a family for an entire year. On the other hand, infrastructure support varies from country to country, such as in Europe, where schools have access to the internet. On the other hand, only 9.6% of the population in Africa can access the internet (Woolf et al., 2011).

Similar phenomena arise in the Southeast Asia Region (ASEAN), and development gaps such as economic growth, education context, human resources, infrastructure, and policies significantly impact technology preferences and educational technology

perspectives among Asia countries. Singapore, for example in the case, is more focused on the development of socioeconomic problems involving ICT in the future and on preparing its future workforce. On the other hand, other countries, such as Indonesia, Thailand, the Philippines, and Vietnam, may have slower ICT infrastructure expansion and development rates. However, the large populations of these countries indicated promising ICT market prospects (Machmud et al., 2021).

Since 2002, the Thai government has devoted at least 400 million baht per year to implementing ICT in education and improving teachers' and students' technological proficiency, demonstrating initiative over the last two decades. In 2017, the Thai government spent approximately 511 million baht on education through the Ministry of Education, according to the Bangkok Post. In addition, the Thai government supported the development of Educational Technology by announcing the ICT Master Plan, which consists of multiple phases and annual improvements. However, from a global perspective, Thailand's ICT development is average. Thailand's ICT indexes are ranked 73rd globally by the International Telecommunications Union and fourth in ASEAN after Singapore, Brunei, and Malaysia (Machmud et al., 2021).

English is the most widely used international language worldwide, and learning English has become necessary. The rise of English as an international language has significantly influenced young people seeking careers matching their educational certifications (Seneviratne, 2013). Improving vocabulary knowledge is crucial to ensure that students can better comprehend the meanings of English sentences and texts. (Harmon, 2002; Rupley et al., 1998). However, many students believe learning English vocabulary is complicated, especially unfamiliar, or infrequently utilized words. In recent years, numerous studies have examined English learning, with the majority emphasizing the crucial role of vocabulary acquisition in overall English learning (Decarrico, 2001).

Vocabulary is the most crucial aspect of learning a mother tongue or any other language. Language acquisition is impossible without knowing its vocabulary, which is

subject to many alterations in meaning due to several contextual variables (Yang & Dai, 2012). Along with phonetics/pronunciation and grammar, vocabulary is one of the essential aspects of foreign language acquisition (Pan & Xu, 2011). Moreover, vocabulary is the foundation of language abilities, including listening, speaking, reading, and writing. Without knowing the vocabulary, linguistic competency is impossible to acquire (Afzal, 2019). An extensive vocabulary enables language learners to comprehend English reading content more efficiently, thereby encouraging their learning. Additionally, it enables individuals to express their thoughts more efficiently.

According to numerous researchers, encountering entirely new and unfamiliar vocabulary in English texts is the most challenging aspect of learning English. The students should remember at least 2,000 typically utilized English words to read English texts effectively and fluently (Mezynski, 1983; Qian, 2002). Consequently, it is noticeable that vocabulary acquisition is crucial for English language acquisition, but limited classroom time poses a barrier to vocabulary expansion. Additionally, learning the English language involves multiple skills (listening, reading, writing, and speaking), so teachers should consider alternative strategies to assist students in learning English vocabulary outside of the classroom.

There are numerous strategies for enhancing reading comprehension for English language learners. Learning vocabulary is one of these methods. In English as a Foreign Language (EFL) classes, vocabulary instruction and acquisition are assigned a secondary or minor role. Beginners in English may need help acquiring unfamiliar words or vocabulary before reading text (Alghamdi, 2018; Linda & Shah, 2020). Research suggests that the more familiar readers are with English vocabulary, the better they are able to comprehend the material they read (Manihuruk, 2020; Nunan, 2003).

The simplest method for analyzing English text is to utilize humans with superior English language skills to read and separate vocabulary from texts. However, this requires managing the difficulty levels and comparing them to a vocabulary database. This

strategy is inconvenient for the people tasked with reading and separating vocabulary, and large quantities of text cannot be rapidly processed in this manner. Additionally, it leads to a high rate of inaccuracy.

1.2 Previous Tools and Problems

Among the numerous and widespread applications used for text analysis and vocabulary learning, Quizlet was a one-of-a-kind online vocabulary management system that ran on mobile devices/laptops as an application and a website and provided users with seven useful vocabulary learning tools for constructing a variety of vocabulary exercises. However, Quizlet could not analyze English vocabulary from English texts. The user must instead input the vocabulary and meaning of the word into the Quizlet system. This method is especially inconvenient when so many words must be entered.

Koichi Higuchi (Higuchi, 2016, 2017) explained that the KH Coder was initially designed for sociology and social research rather than linguistics. He modified the KH Coder settings to demonstrate the software's applicability to linguistics. Despite his efforts to customize the KH Coder's settings, it lacks many English vocabulary analysis functions. For example, the KH Coder is incapable of assessing the level of difficulty of vocabulary since the program does not include a preexisting database of vocabulary level difficulty. Additionally, it cannot translate the analyzed words into other languages (Figure 2).

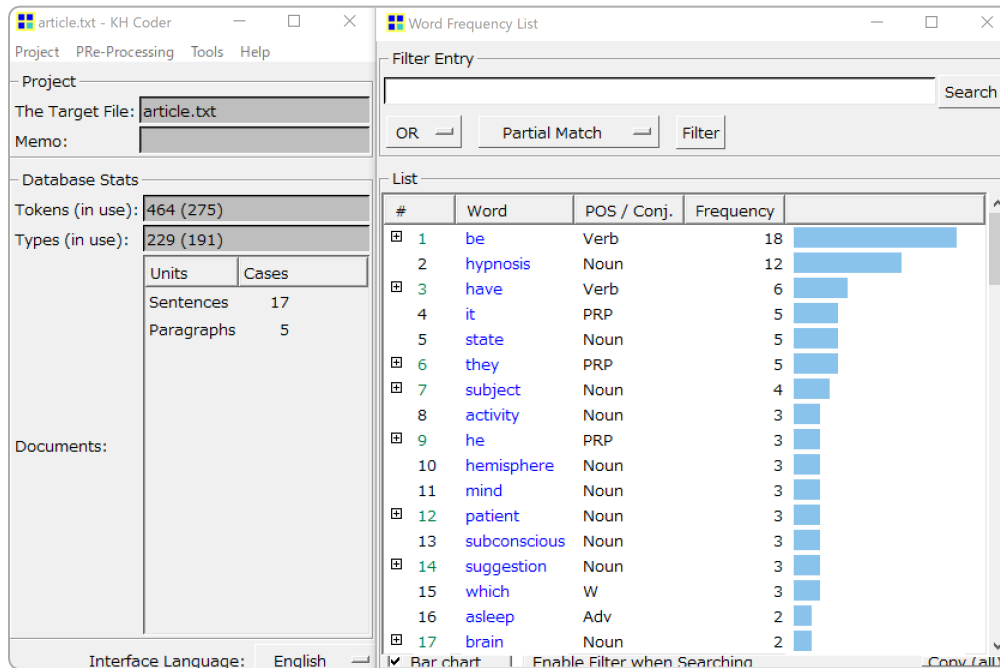


Figure 2 Analyzed Vocabulary from KH Coder Shows Part of Speech and Frequency

Semeya (Yasumasa, 2006) analyzed English texts and generated a graded vocabulary profile at the word level. Then, he determined readability indices using the ARI and Coleman–Liau formulas. Before processing, this system automatically lemmatizes all inflected words, with the exception of certain designated words, such as modal verbs. Numbers and figures are ignored if they are not part of a meaningful lexical item. The website analyzes vocabulary from English texts, evaluates vocabulary levels, and presents the frequency of word usage and readability index in a statistical format. In addition, the system is able to analyze English texts and graph percentages of vocabulary numbers in texts categorized by difficulty levels.

Moreover, New Word Level Checker (NWLC) (Mizumoto, 2021) is a web application for vocabulary profiling that analyzes user-submitted English words and generates vocabulary levels based on the selected word lists. Dr. Atsushi Mizumoto designed and programmed the NWLC system utilizing the concept of The Word Level Checker (WLC). However, the primary limitation of both systems is that they cannot display words as text

data. As a result, neither system was able to analyze some text data and incorporate the vocabulary meaning in other languages, including Thai and Japanese.

1.3 Challenges

The challenges of the research area to be addressed were:

1) Development of a multi-device Word-Level Classification and Vocabulary Learning (WCVL) system that automatically extracts English vocabulary from any English text Vocabulary Database, which includes Thai and Japanese Meanings.

2) Development of a system that can automatically generate various types of vocabulary learning exercise materials.

3) Development of a system that can separate the learner's Unknown and Known words by collecting data from the learner utilizing exercises in the developed system.

This study aims to investigate a new approach to learning unknown words through various vocabulary exercises using the WCVL system.

1.4 Goals and structure of the thesis

We attempt to improve the reading comprehension skill of the EFL students by learning unknown vocabulary in any English text before the ELF students are going to read the text. Therefore, it is essential to provide beginning English language learners with the assistance necessary to acquire unknown words or vocabulary before beginning to read a text (Alghamdi, 2018; Linda & Shah, 2020). Furthermore, it is generally accepted that the more readers know the English vocabulary, the more they understand what they read (Manihuruk, 2020; Nunan, 2003).

This study aimed to analyze English words or vocabulary from any English text using a new method via the web application. Also, we developed a system for analyzing vocabulary from any English text, comparing the difficulty levels with the vocabulary database, and automatically adding vocabulary meanings in Thai and Japanese.

We focused on developing an English vocabulary learning support system for senior high school students in Thailand and the undergraduate English classroom at Tokyo Denki University in Japan.

1.5 Dissertation Organization

The details of each chapter are shown as follows.

- Chapter 2 discusses related theories and research on the analysis of English words or vocabulary from any English text utilizing the web application.
- Chapter 3 provides all methods that we used throughout the research project.
- Chapter 4 describes the section on Pre- & Post-Test and students' attitudes and behavior toward the system questionnaire data acquisition, the experimental designs for Pre- & Pos-Test experiments, and the study of the method that was implemented throughout the research project.
- Chapter 5 discusses the results of the comparison of Pre-Test and Post-Test results and the results of a questionnaire on students' attitudes and behavior toward the proposed system to evaluate the improvement of students' vocabulary and reading comprehension after using the proposed WCVL system.
- Chapter 6 summarizes the contributions of the Doctoral project, limitations, future directions, and conclusions.

Chapter 2

Literature Review and Related Work

2.1 The Waterfall Methodologies Model

The Waterfall Methodology model is a systematic and logical model for developing information systems and was used as the system development methodology (Lucitasari et al., 2019). The first process model introduced was the Waterfall model. A linear-sequential life cycle model is another name for this model, which is often called the “Classic Life Cycle.” It is straightforward to comprehend and employ. In a waterfall model, each phase must be finished before the next can begin, and there is no overlap between phases (Suryan, 2013). In this study, the Waterfall Methodology model consists of 5 Stages that are 1) Requirements analysis, 2) System Design, 3) Implementation, 4) Setup, and 5) Testing (Figure 3).

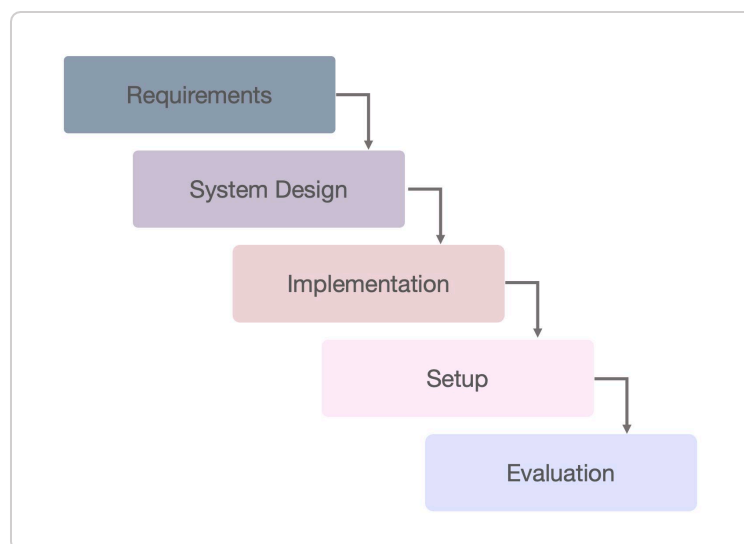


Figure 3 The Waterfall Methodology model

2.2 Cognitive Theory of Multimedia Learning (CTML)

Mayer proposed a theory of multimedia design that discusses the processes in the brain when learners view multimedia, the cognitive processes that occur when learners view multimedia, and the guidelines for developing multimedia that effectively facilitate learners' learning ability (Mayer, 2002).

CTML is a theory of multimedia design that discusses the processes that occur in the brain when learners view multimedia, the cognitive processes that occur when learners view multimedia, and the guidelines for developing multimedia that effectively facilitate learners' learning ability (Wang, 2017). The CTML refers to the transformation of sensory memory into working memory (Mayer, 2002). There are two possible ways: 1) from audio sounds to verbal representation and 2) from visual images to pictorial representation. The CTML and limited capacity share the same underlying assumptions, which refer to limited working memory (Mayer, 2002). In other words, the visual working memory can only store a limited number of images, and the auditory working memory can only store a limited number of sounds. In addition, the assumptions of the CTML are consistent with active treatment, such as active processing, selecting text and images, organizing text and images, and consolidating (Mayer & Moreno, 2003).

Mayer and Moreno (2003) show how memory works in instructional multimedia. There are two rows and five columns of boxes that are connected by arrows, "the two rows contain information-processing channels (first auditory/verbal and then visual/pictorial)." This model contains five columns that demonstrate the modes of knowledge presentation. The learners start by viewing an instructional multimedia presentation. The multimedia presentation includes text and/or audio as well as visuals. Physical representations consist of words and images. The learners then access the sensory representations using their ears and eyes. Then, the learners choose the text/auditory and visual elements to acquire in working memory (Figure 4).

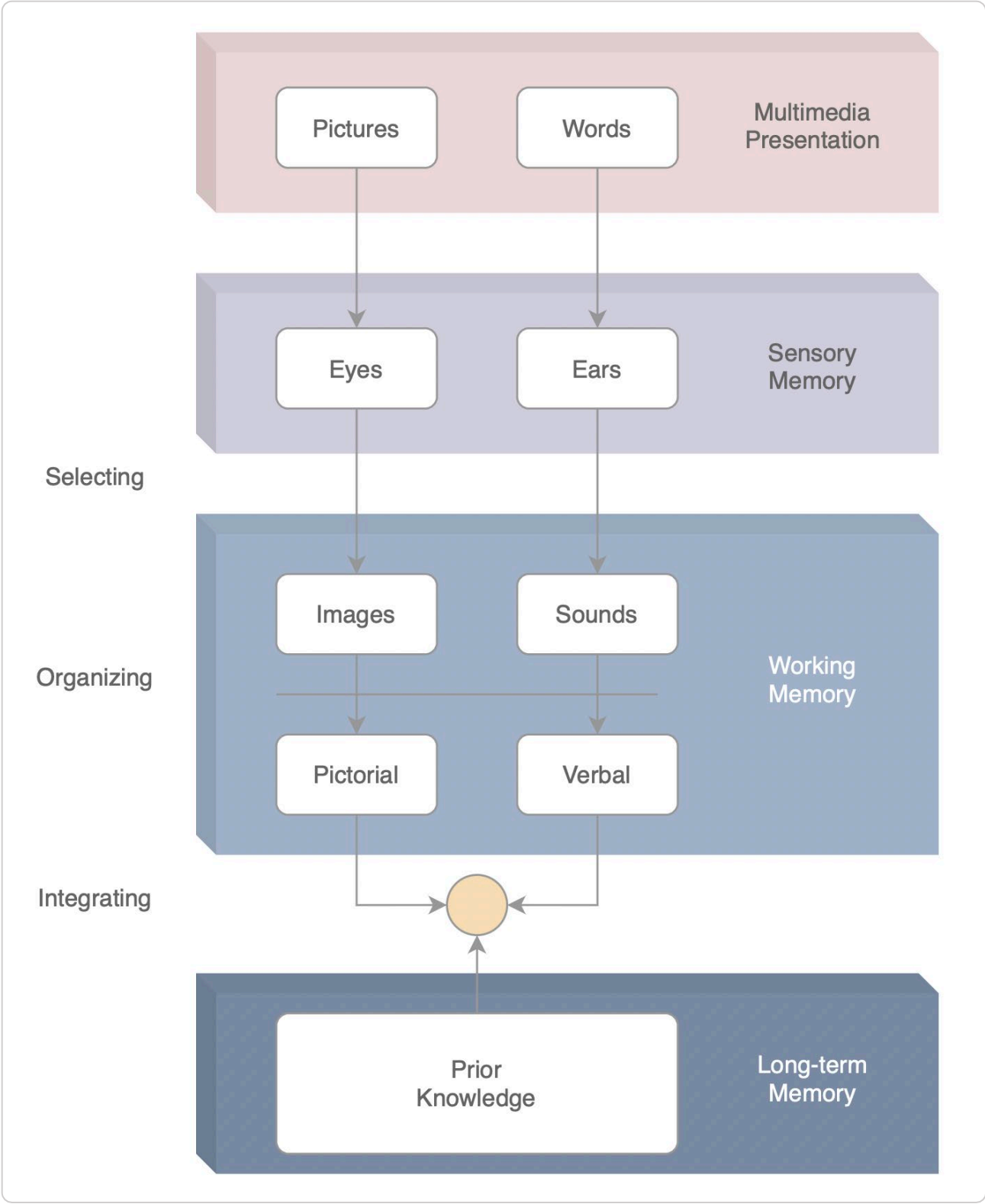


Figure 4 Multimedia Learning Process of Mayer Cognitive Theory

2.3 The Vocabulary Database

The JACET List of 8,000 Basic Words (JACET8000), the Standard Vocabulary List (SVL12000), the British National Corpus High-Frequency Word List (BNC HFWL), and the 5,000 most frequently used words in the Corpus of Contemporary American English (COCA) are four corpus-based high-frequency vocabulary lists generally used as core vocabulary sources for the second language (L2) learners in Japan (Chujo & Oghigian, 2015).

2.3.1 JACET

The Japan Association of College English Teachers collected 8000 (JACET8000) vocabulary words in 2003, up from 4000 (JACET4000) in 2002. The average number of vocabulary words in English textbooks used by junior high school students in Japan is 1,499 words. Furthermore, there are 3299 words for senior high school students. It indicates that, on average, Japanese high school graduates have learned less than half of their vocabulary from the JACET8000 vocabulary list. In addition, other subject textbooks were written and studied in Japanese without employing English words directly, reducing the likelihood that English words would be used.

2.3.2 SVL12000

The SVL12000 is a list of 12,000 words proposed by ALC, which has supported English learners for many years through learning materials and books. SVL12000 has generally supported Japanese English learners based on numerous English text data and valuable selection materials. The list is divided into 12 levels, ranging from elementary to advanced, and contains 12,000 words that ALC has deemed useful for Japanese English learners.

The vocabulary in the SVL12000 was selected based on their frequency of use by native speakers and their utility and importance to Japanese language learners. The words are divided into 12 levels of 1,000 words each, based on the current state of English education in Japan, so that all English learners, from junior high school students to adults, can learn English efficiently and step by step (Figure 5)

SVL12000 includes not only the most important words that appear in any English text but also a large number of frequently used words by native English speakers that are frequently excluded or omitted from general word collections.

| | | |
|---------------------|----------|---|
| Superior | Level 12 | English Vocabulary for expanding the world further |
| | Level 11 | English Vocabulary for expanding the perspective |
| Advanced | Level 10 | English Vocabulary for enjoying English Magazines |
| | Level 9 | English Vocabulary for high TOEIC Scores |
| | Level 8 | English vocabulary for increasing confidence in reading |
| Intermediate | Level 7 | English vocabulary for enriching expression |
| | Level 6 | English vocabulary for challenging certification exams |
| | Level 5 | English vocabulary for applying for university entrance exams |
| Beginner | Level 4 | English vocabulary for improving the basis of reading comprehension |
| | Level 3 | English vocabulary for enjoying conversation |
| | Level 2 | English vocabulary for using in everyday life |
| Basic | Level 1 | English vocabulary for Essential Basic |

Figure 5 The Explanation of each Level of the SVL12000 Database

2.3.3 BNC HFWL

The BNC High-Frequency Word List is a list of 13,994 lemmatized words representing 86 million BNC words that occur at least 100 times (Chujo, 2004). The BNC High-Frequency Word List was developed by

1. Use the CLAWS7 tag set to extract all base forms.
2. lemmatizing by inflectional form.
3. deleting any low-frequency or unusual words (those appearing less than 100 times in this lemmatized list).
4. Identifying all proper nouns and numerals by their part of speech tags and manually eliminating them.

2.3.4 COCA

The Top 5,000 Lemmas in COCA is the most extensive corpus of American English available for free. It is organized into spoken, fiction, popular magazines, newspapers, and academic text registers and contains over 450 million words of text as of 2014. The corpus contains 20 million words annually from 1990 to 2012 and is regularly updated. In addition, the corpus generated A Frequency Dictionary of Contemporary American English (Davies & Gardner, 2010), from which the top 5,000 lemmas were selected based on frequency and dispersion.

To the best of our knowledge, Thailand has no national English vocabulary database. It is also noted that this study is the first example of generated English vocabulary which adds Thai meaning based on SVL12000 created by ALC.

2.4. Constructivism Education Theory

Cognitive constructivism, or psychological cognitive learning theories, is founded on Piaget's theory, which emphasizes the individual's active interaction within the context of learning. Piaget believed that the development of cognitive processes is neither an innate trait nor a direct consequence of experience but rather the result of the active cognitive construction of the learner (Piaget, 1952). Cognitive psychologists emphasize the role of psychological factors in acquiring conceptual knowledge, which is realized through the creation of conditions that induce cognitive dissonance (Flavell, 1963; Tomljenović & Tatalović Vorkapić, 2020).

Constructivism is a way of thinking about education that says students should be self-reliant and responsible for their learning (Patten et al., 2006). It is a way to describe how people learn and think. The word "constructivist" refers to a way of teaching that puts the student at the center of the learning process and focuses on how to get information across to students effectively (Mvududu & Thiel-Burgess, 2012). Constructivism says that learners' ideas about what they know come from how they interpret their experiences (Bauersfeld, 2012). We use constructivism theory to design how the students learn vocabulary and use the advantage of ICT devices by learning through them.

2.4.1 The perspective of learning in Constructivism

Because of the complexity and diversity of constructivist perspectives, Hoover (1996) proposes a set of operational principles for these perspectives (Hoover, 1996). Hoover defined two essential concepts that encompass the concept of constructed knowledge. The first concept is that students construct new comprehensions using their existing knowledge. In other words, the learners' prior knowledge influences their new learning. The second concept is that education is not passive. Instead, learning is an active process

in which learners negotiate their understanding in light of the new learning situation. If what learners encounter is inconsistent with their current knowledge, their current knowledge can be modified to accommodate new experiences. Therefore, learners cannot be passive and remain active throughout the process.

According to Christie, constructivism is a theory of learning in which learning is both an active process and an individual representation of the world. According to this theory, knowledge is derived from experience and altered by subsequent experience. This theory emphasizes problem resolution and comprehension. Authentic tasks, experiences, collaboration, and evaluation are also important in this view of learning (Christie, 2005).

Based on his perspective on children's psychological development, Piaget's constructivism insists that exploration is the fundamental basis of his theory. Piaget asserts that to comprehend is to rediscover or reconstruct through rediscovery. Piaget explains that children progress through stages in which they accept ideas that they may later reject or modify. Therefore, understanding is constructed progressively through active involvement and participation, and learners cannot be considered passive at any stage of development (Evans, 1973).

2.4.2 The perspective of teaching in Constructivism

Hoover (1996) argues that constructivism has important implications for teaching. First, teaching cannot be viewed as the transmission of knowledge from enlightened or known to unenlightened or unknown. Constructivist teachers are not monologuing teachers who just teach completely new lessons. Rather constructivist teachers have the role of guides for the students and provide their students with opportunities to test the adequacy of their current understandings (Hoover, 1996).

Second, constructivist teachers rely on students' prior knowledge and create learning environments that utilize inconsistencies between students' current knowledge and their

new experiences (Clements, 1997). The diversity of students poses a difficulty for teachers, as they cannot use the same method or materials when teaching these students.

Third, since constructivism emphasizes learner participation, teachers must engage students in learning and highlight their students' current understanding (Hoover, 1996). Constructivist teachers can ensure that learning experiences include problems that are significant to students, compared to problems that are only relevant to teachers and the educational system's needs and interests.

Fourth, Hoover emphasizes the requirement for sufficient time to actively construct new knowledge. During this time, students reflect on their new experiences and consider the relationship between these experiences and their previous ones in an effort to develop a more nuanced (not "correct") worldview (Hoover, 1996).

2.5. ICT-based Learning Model

Improving the quality of education through learning media is crucial to the learning process. Using instructional media can improve students' learning process, leading to improved learning outcomes. There are numerous reasons why learning media can improve student academic performance. According to experts, one of the benefits of learning media is creating the conditions for students to acquire knowledge, skills, or attitudes through tools that are physically used to convey teaching material (Gagne & Briggs, 1974; Grabowski & Branch, 2003). According to experts, learning media can be influential in the following ways: 1) teaching will attract more student attention, thereby fostering student motivation; 2) teaching materials will be more explicit in meaning so that they can be better understood by students and enable students to better master learning objectives; and 3) the learning method will be more diverse, not merely verbal communication through words spoken by the teacher, thereby stifling the teacher's monopoly over the learning process (Setuju et al., 2020).

Since the turn of the 21st century, students use of ICT has increased due to the development of high-tech devices such as computers, tablets, and smartphones. As a result, almost every aspect of ICT usage has increased, including possession, frequency of use, and rate of utilization. In addition, several studies have demonstrated that this trend exists in developed nations and worldwide. (Katsumi & Tamura, 2021). Following the outbreak of the COVID-19 pandemic, governments around the world were compelled to suspend all activities involving interpersonal interaction, such as education and learning. As a result, schools and colleges have implemented online teaching and learning options in response to these shifts. Consequently, ICT devices have assumed a significant role in the lives of educators and students worldwide.

ICT-based learning is a form of education that implements ICT to facilitate, optimize, enhance, and support knowledge acquisition (Al-Ansi et al., 2021). ICT-based learning has numerous advantages and components, including content quality, a supporting learning system, the system's interactivity, usability, and educational evaluation (Binyamin et al., 2019).

According to Al-Ansi et al., a systematic analysis of qualitative results revealed that Online learning, saving time and money, communication and motivation tool, use of social media, sharing and processing knowledge, and improving the quality of education were the high benefits of ICT-based learning (Al-Ansi et al., 2021).

2.6. Related Work

Among the numerous and widespread applications used for learning vocabulary, Quizlet was a one-of-a-kind online vocabulary management system that ran on mobile devices/laptops as an application and a website and provided users with seven useful vocabulary learning tools for constructing a variety of vocabulary exercises.

According to Rezaei et al. (Rezaei et al., 2014), smartphones are an appropriate medium for encouraging students to enjoy vocabulary study. There is evidence that students are more motivated to learn vocabulary when they have access to it through their smartphones. In addition, Quizlet is regarded as a valuable resource because the majority of students spend a significant amount of time outside of class using it for vocabulary learning, as students prefer to study vocabulary using this application. (Dizon & others, 2016). Notwithstanding this, Quizlet could not analyze English vocabulary from English texts. The user must instead input the vocabulary and meaning of the word into the Quizlet system. This method is especially inconvenient when so many words must be entered (Solhi Andarab, 2019).

Chapter 3

System Development

The Waterfall Model is a linear, sequential software development process used in software construction. It is also known as the "Classic Life Cycle Model" (Suryan, 2013) or the "Linear Sequential Model." The process in Waterfall Model is divided into five distinct stages: that are 1) Requirements analysis, 2) System Design, 3) Implementation, 4) Setup, and 5) Testing (Figure 6). Each stage must be completed before the next one can begin, and there is no overlap or iteration between stages (Lucitasari et al., 2019).

The model is best suited for projects where the requirements are well understood, and the technology is stable. It is not suitable for projects where requirements are expected to change frequently.

Advantages of this model include clearly defined phases, easier planning and budgeting, better control, more straightforward measurement of progress, better suited for certain types of projects, and better for projects with tight deadlines. However, the best reason this model worked for our project is that the requirements are well understood, the technology is stable, and it is unsuitable for projects where requirements are expected to change frequently.

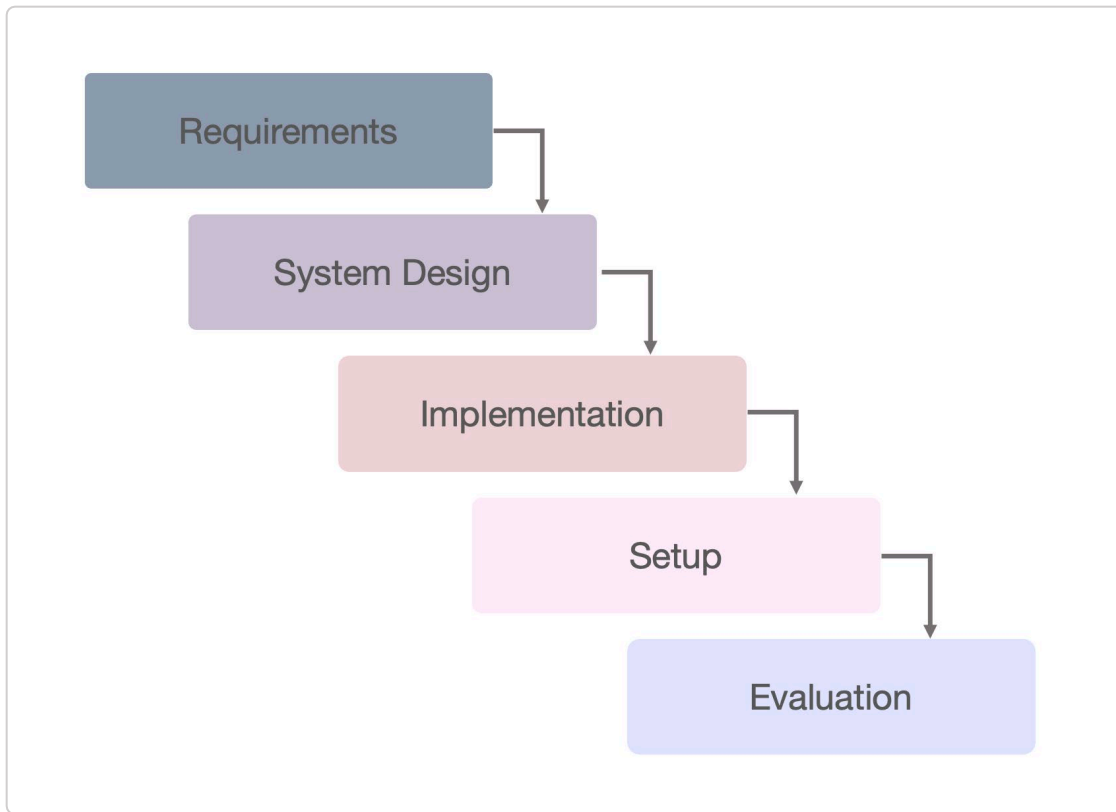


Figure 6 The Waterfall Methodology Model

3.1 Requirements Analysis

3.1.1 Features of the System

In the requirements analysis stage, we analyzed the shortfalls of features in previous works, including the KH coder (Higuchi, 2016), Word-Level Checker (Yasumasa, 2006), and Quizlet, to propose a new system with the following features. 1) The system can morphologically extract words from any English text and transform grammatically conditioned forms of words, e.g., plural nouns or past tense forms, into base forms. 2) The extracted words are classified according to their difficulty levels in accordance with the SVL12000 standard vocabulary level database, which contains 12,000 English words and

is divided into 12 difficulty levels. 3) The system can automatically add meanings of English words in Thai (English–Thai Cambridge Dictionary) and Japanese (ALC Education). 4) The system can create various learning vocabulary materials automatically. 5) The system can be offered on a website. The learners (users) can access this learning system with smartphones, tablet devices, or laptops.

In developing the Word-level Classification and Vocabulary Learning System (WCVL), the system requires several functional and non-functional requirements, as shown in Table I.

3.1.2 Use Case Diagram

The analysis of the WCVL system’s functional and operational requirements is modeled using UML (Unified Modeling Language) diagrams to generate use case diagrams.

A high-level use case diagram is shown in Figure 7, which consists of all scenarios mentioned in the requirements analysis section, besides the main actors, including Student, Admin (Administrative User), System, and Database.

The diagram also shows the following actions: Register (student), Log-in (student), Setting (student), Text Analysis (student), Learn Vocabulary (student), Save Remembered Vocabulary (student, system), Database Log-in (admin), Add/Edit/Remove User’s Accounts (admin) and Add/Edit/Remove Vocabulary Database (admin).

In the case of the recommendation of items, the interesting feature in this diagram is the system’s action of Text Analysis and Learning Vocabulary. This is further explored on the next page.

Table 1 Requirements of The WCVL system

| Requirements | Details | |
|----------------|------------------|---|
| | Item | Description |
| Functional | Account List | Input email, username, password, first name, last name, language, and level |
| | Login | Input username and password |
| | Input Data | An English text for morphological analysis |
| | Output Data | List of unknown words, known words, and Outside SLV12000 words classification by 12 levels |
| | Practices | Enabling student practices via: Spelling, Dictation, Multiple Choices, Matching, True/False and Flashcard |
| | Save Data | Save the learned vocabulary to the user database |
| Non-Functional | Astah UML | Designer of the UML chart and functional planning |
| | Adobe XD | User interface designer |
| | VS Code | Tools for implementation or coding with HTML, CSS, JavaScript, PHP, and SQL language |
| | Bootstrap 5 | An open-source CSS framework for a responsive web design |
| | PhpMyAdmin | Tools to handle the administration of MySQL over the website |
| | MAMP | Tools to create a local server environment |
| | Compromise.cool | Tools for natural language processing on the client side |
| | Responsive voice | Text-to-speech library to create pronunciation voices |



Figure 7 The High-Level Use Case Diagram of the WCVL system

3.2 System Design

3.2.1 The System Architecture

We used three Databases in the WCVL system, in which the data types and collection objectives were different: the User Account Database, English Vocabulary and Meaning Database, and the User Portfolio Database (Figure 8). Firstly, the user account database was created by using "users" as the name during the development of the system, which stored data for logging in, morphological analysis, and making the English vocabulary learning materials. The field of the "users" table was created by collecting the data such as id, email, password, first name, last name, language, and vocabulary level of the user. Then, the English vocabulary and meaning database was created using "alc_vocab" as the table's name. It was used to store the SVL12000 standard vocabulary level database and their meaning in Thai and Japanese languages, which contained 12,000 English words and was divided into 12 difficulty levels. Finally, the user portfolio database was created using "user_vocab" as the table's name. It was used to store the user's memorized words. The field of the "user_vocab" table collected only the user's id "userId: int (11)" and vocabulary's id "vocabId: int (11)".

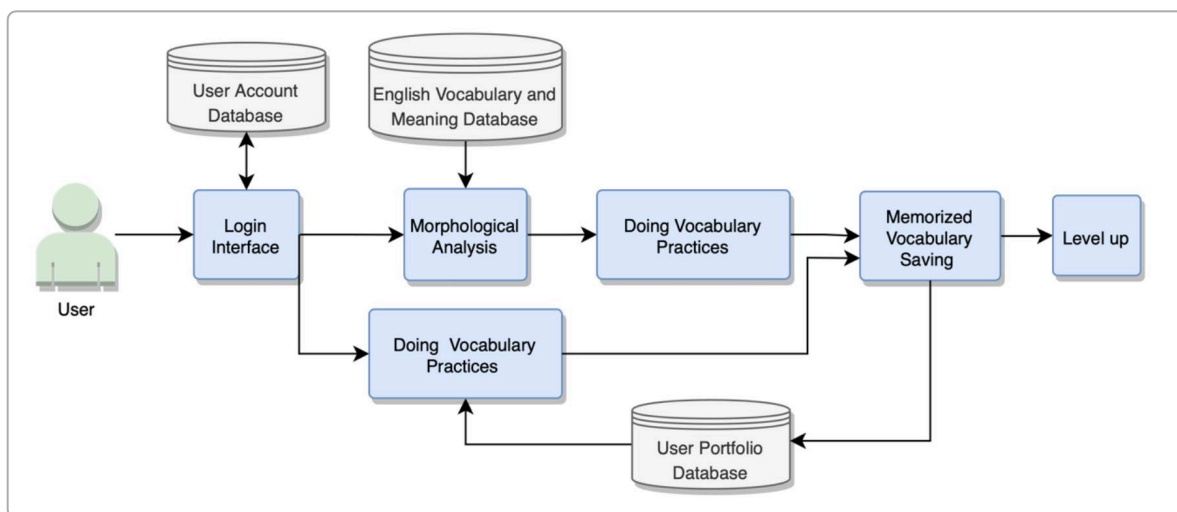


Figure 8 System Architecture of WCVL System

3.2.2 User Interface Design Blueprint

Adobe XD was utilized for the creation of all elements of the user interface design for the WCVL system (Figure 9 - Figure 14).

We designed a user interface to display the same content on all devices using a web-based technology system. We utilized the concept of responsive design to ensure that the layout of a user interface adapts to the user's preferences and the device they are using.

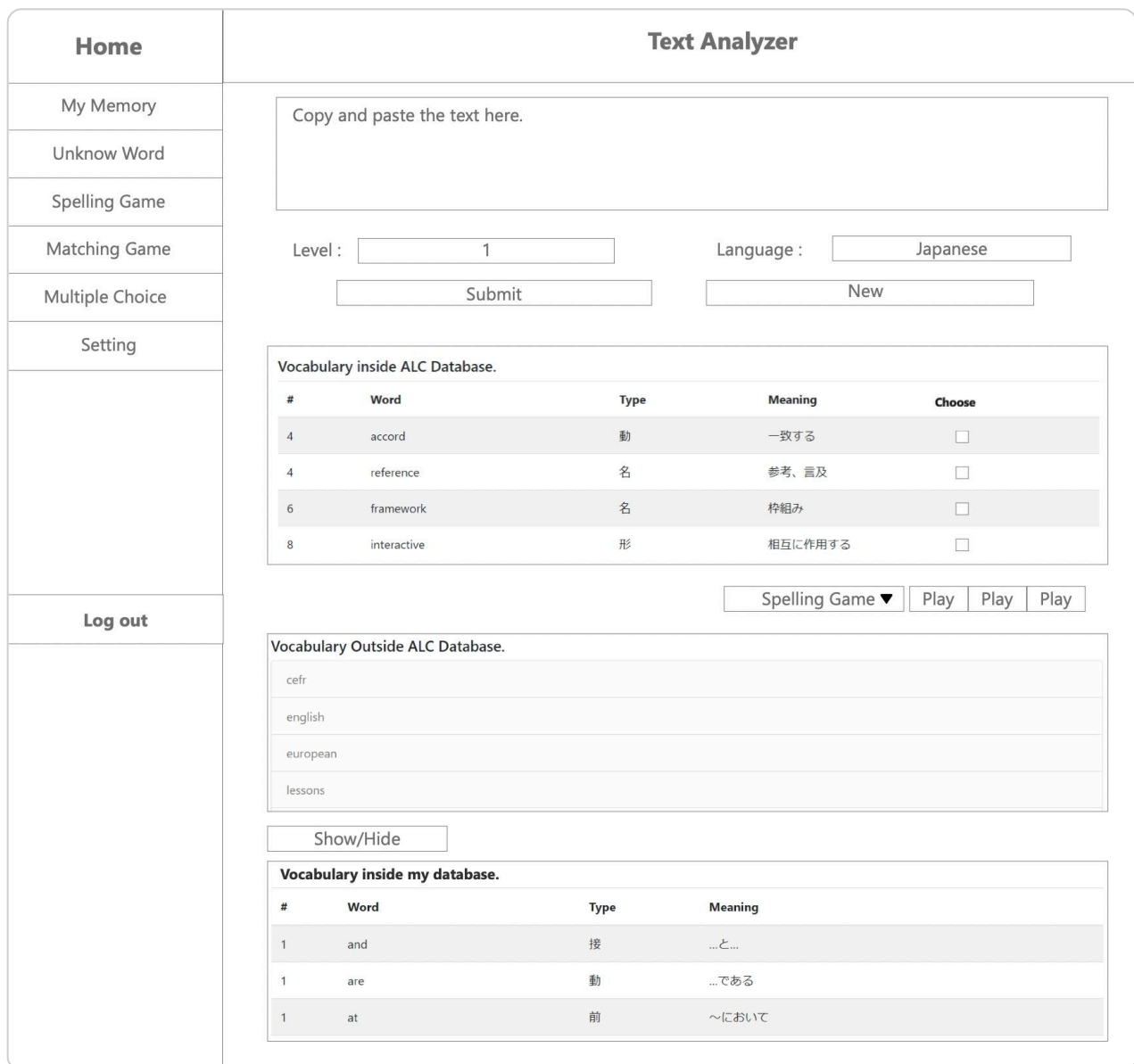


Figure 9 The Blueprint Layout of the Text Analyzer Page

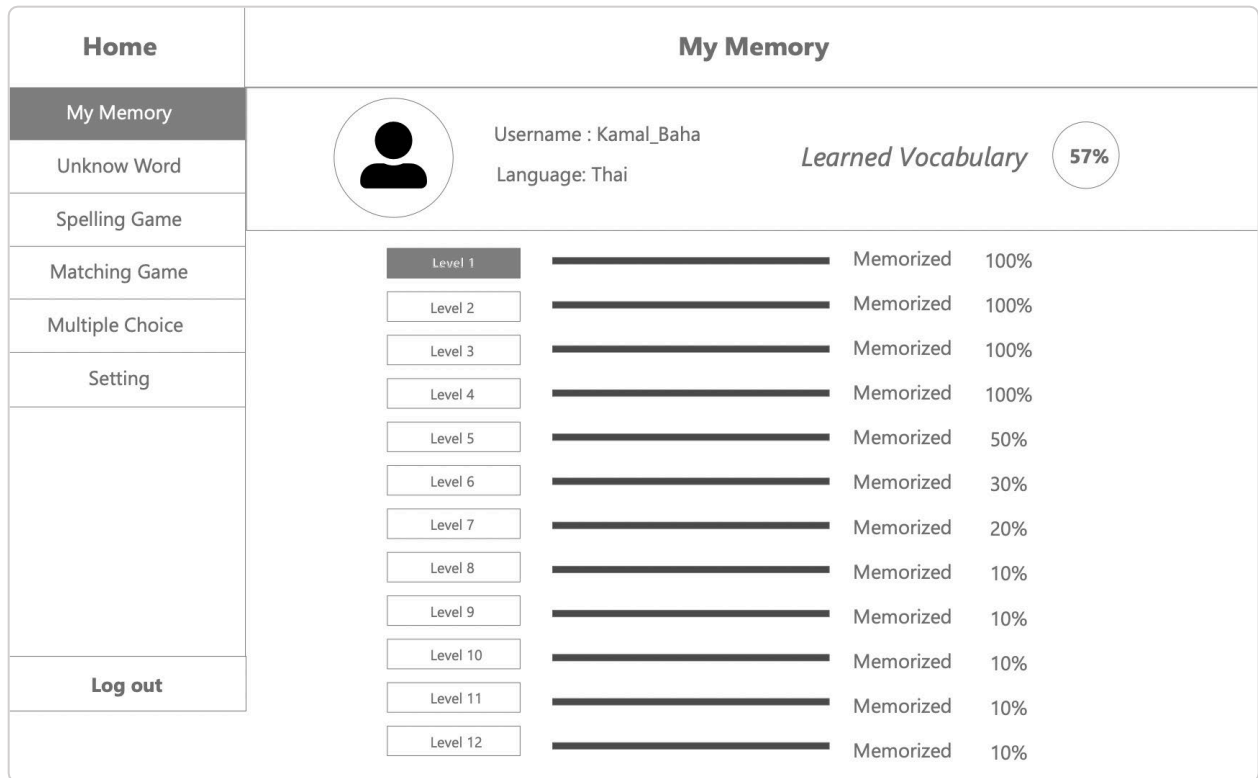


Figure 10 The Blueprint Layout of my Memory Page

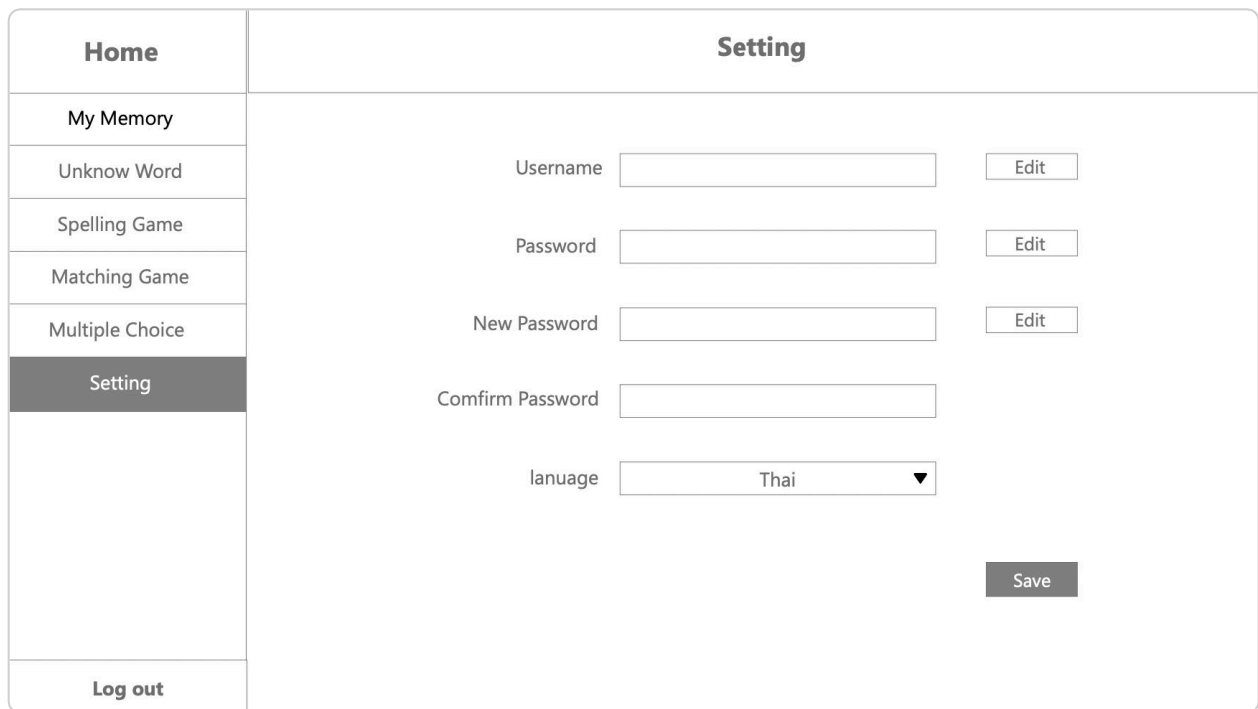


Figure 11 The Blueprint Layout of the System Setting Page

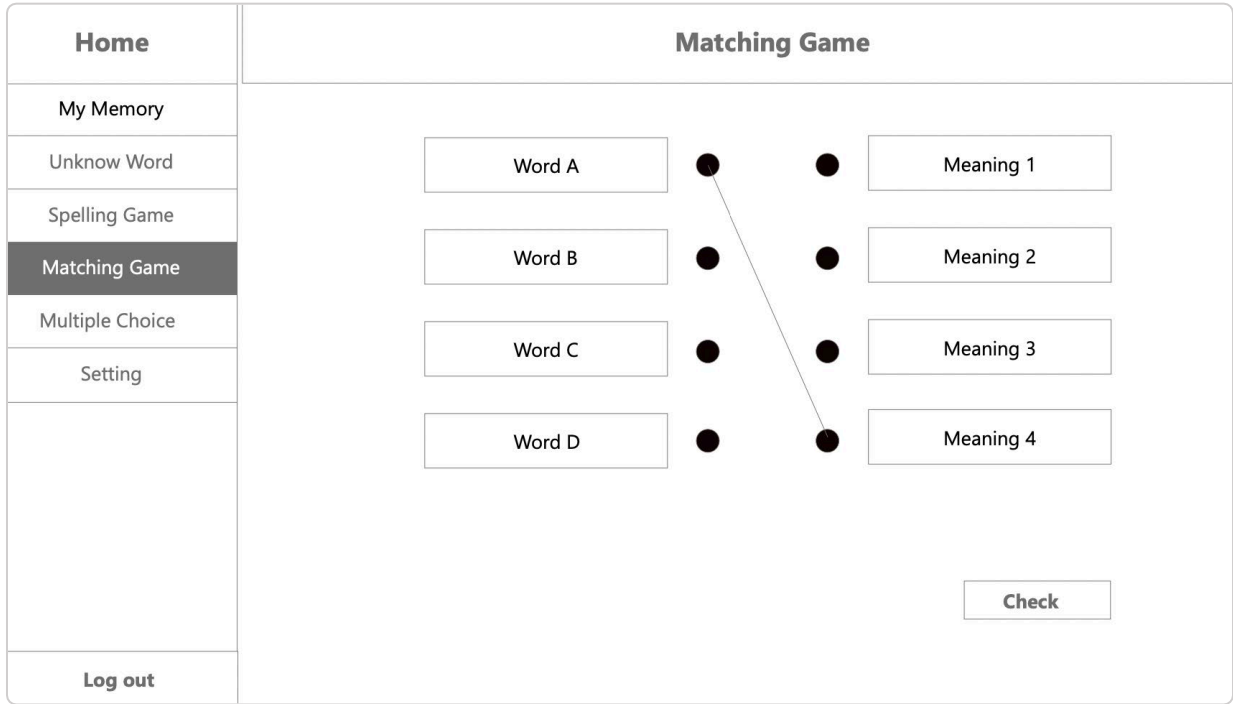


Figure 12 The Blueprint Layout of the Matching Game Page

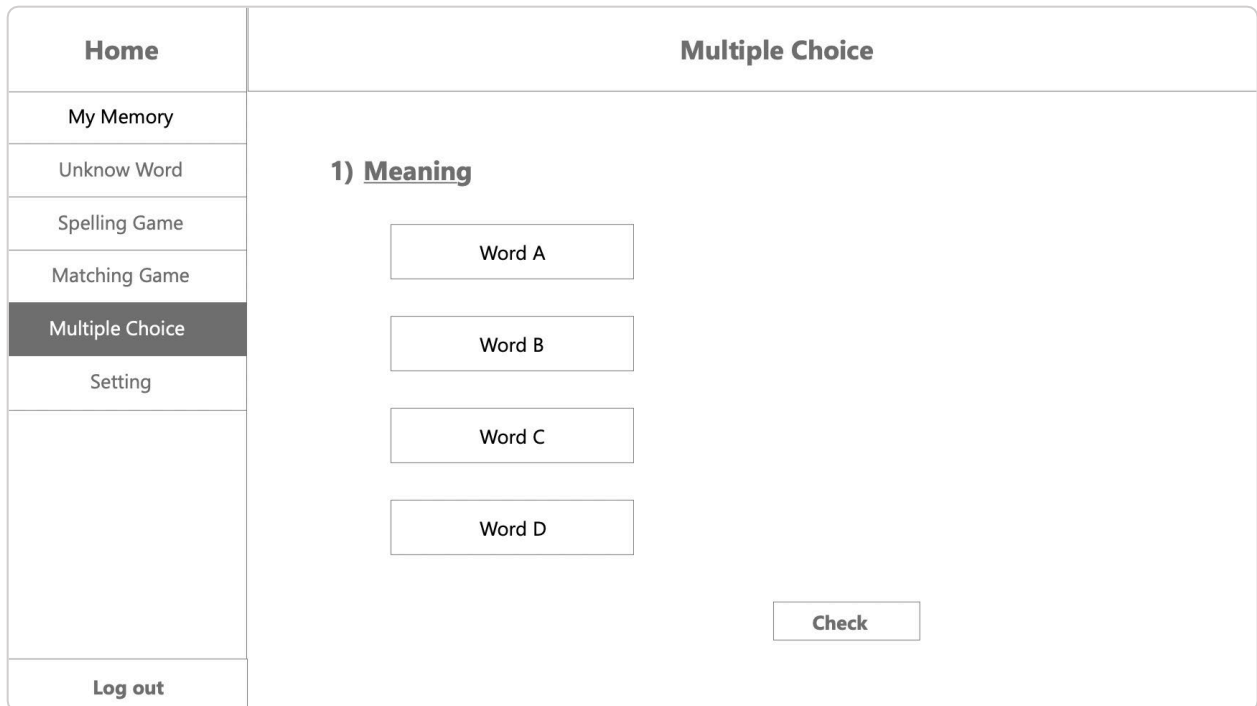


Figure 13 The Blueprint Layout of the Multiple Choice Page

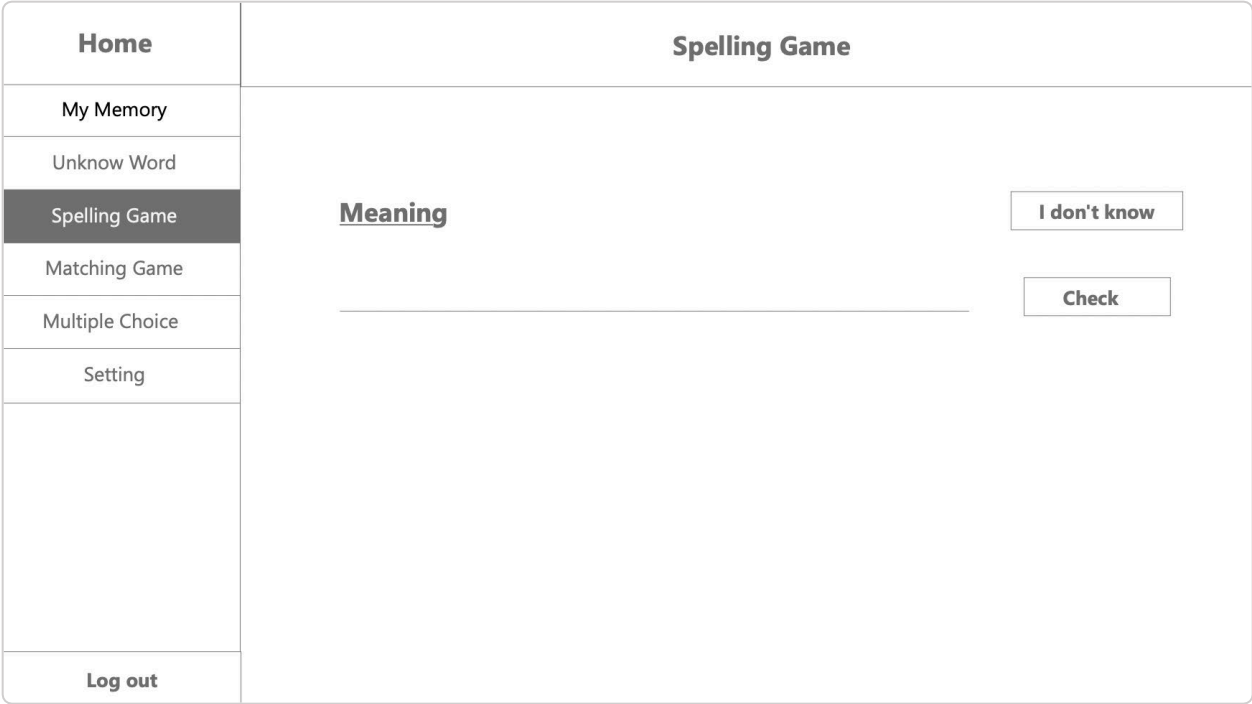


Figure 14 The Blueprint Layout of the Spelling Page

3.3 Implementation

The majority of modern web frameworks written in JS adhere to the MVC design pattern, which encourages developers to write code that is organized and readable. It gives the developers the ability to take advantage of all the advantages of modularity while also incorporating a structure that can accommodate numerous developers working on the same project at the same time.

The Model-View-Controller (MVC) paradigm has quickly become one of the most popular and widely used design patterns for developing online applications. Let's dig a little further and figure out why it's garnering such acclaim and popularity in the field of web design (Figure 18). MVC stands for:

- 1) Model (M): This component deals with the data (database)
- 2) View (V): Manages what the user is seen on their screen (HTML, CSS, JavaScript).

Our system utilizes responsive web technology to display the user interface; this allows

our system to adapt to a variety of screen sizes (i.e. Laptop, Tablet, and Smart Phone) while displaying the user interface (Figure 15 - Figure 17).

3) Controller (C): This component acts as a go-between for the view and the model (PHP, JavaScript).

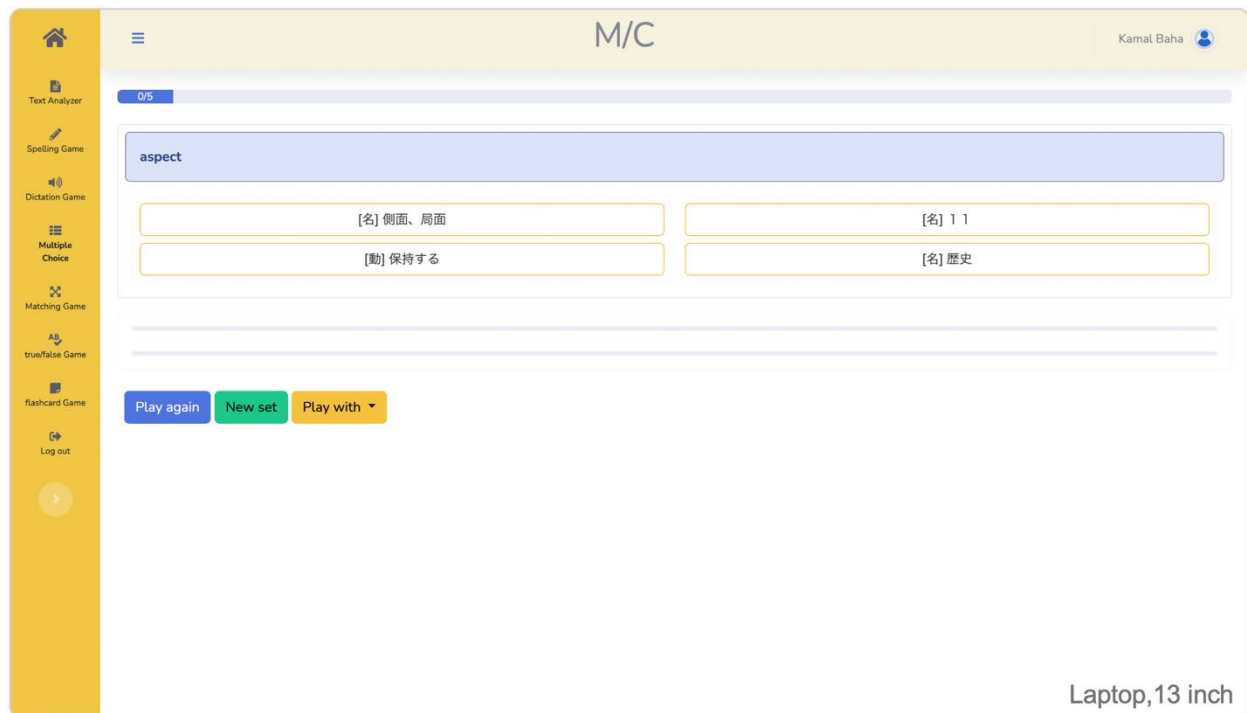


Figure 15 The WCVL System Displays the User Interface on Laptop Screen 13-inch Sizes

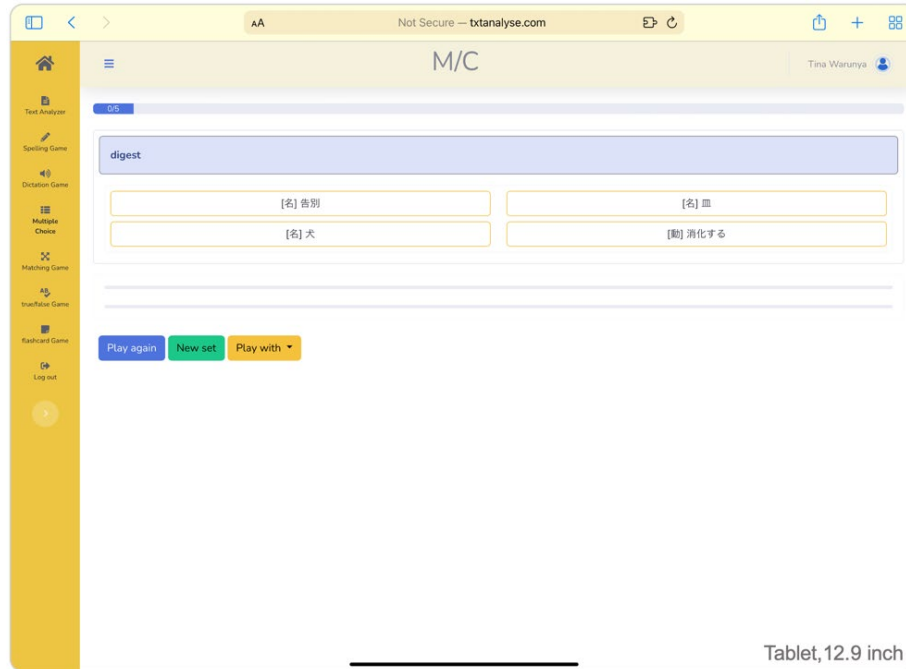


Figure 16 The WCVL System Displays the User Interface on Tablet 12.9-inch Sizes



iPhone 12 mini 5.4 inch



Android Phone 6.44 inch

Figure 17 The WCVL System Displays the User Interface on Smart Phone Screen Sizes

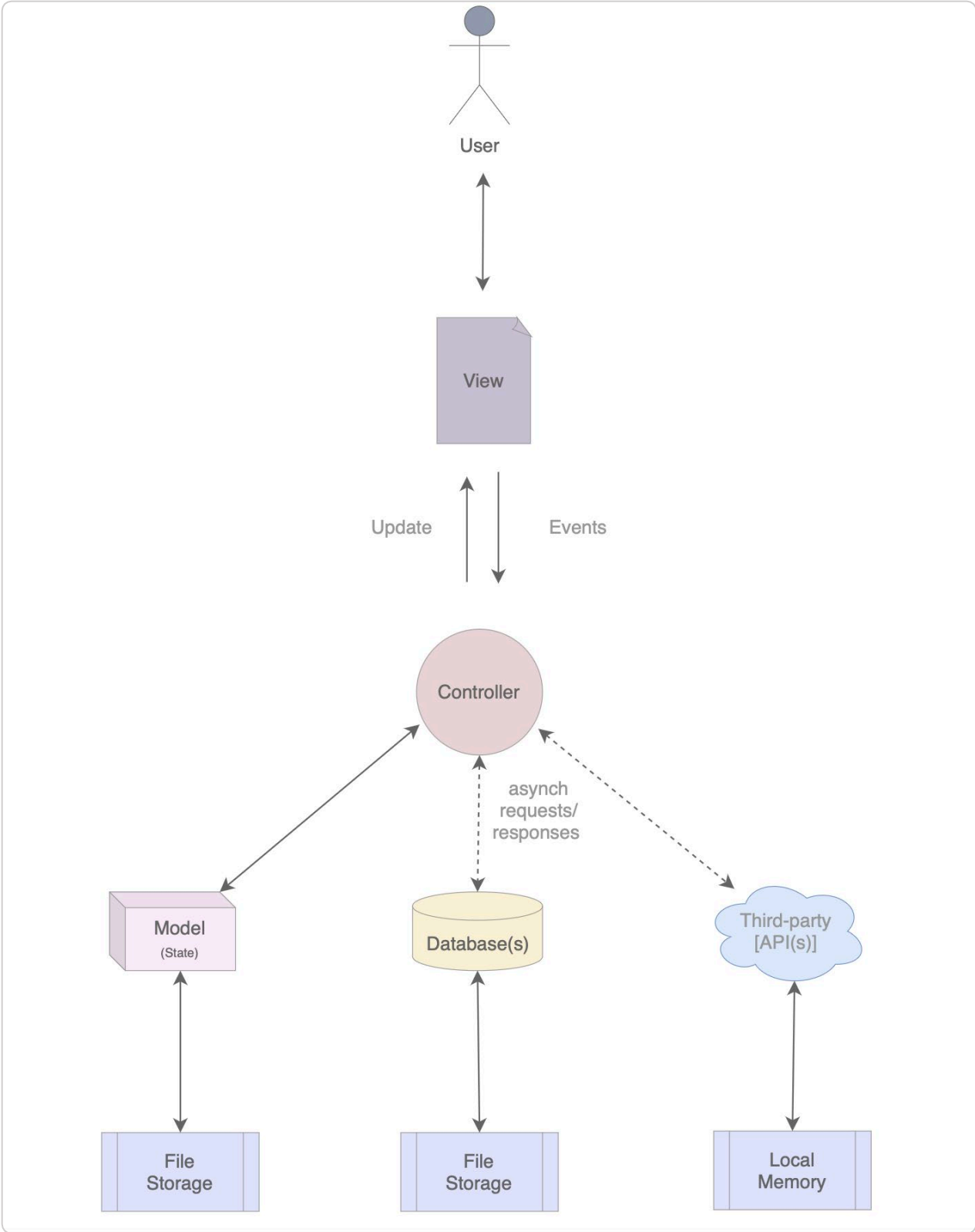


Figure 18 The MVC Pattern

3.3.1 Model

The following Figure 19 creates a table called "alc_vocab" that contains seven columns: id, level, word, japaneseType, japanesesMeanin, thaiType, and thaiMeaning.

```
CREATE TABLE `alc_vocab` (  
  `id` int(11) NOT NULL,  
  `level` int(11) NOT NULL,  
  `word` text NOT NULL,  
  `japaneseType` text NOT NULL,  
  `japaneseMeaning` text NOT NULL,  
  `thaiType` text NOT NULL,  
  `thaiMeaning` text NOT NULL  
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

Figure 19 The SQL Command for Creating SVL12000 with Japanese and Thai Meaning Database

The "id" and "level" columns are of type int and will hold an integer.

The "word", "japaneseType", "japaneseMeaning", "thaiType", and "thaiMeaning" columns are of type text and will hold a string, and it was impossible to create empty values for all the columns (NOT NULL).

The following Figure 20 creates a table called "user_vocab" that contains only two columns: "userId" and "vocabId":

```
CREATE TABLE `user_vocab` (  
  `userId` int(11) NOT NULL,  
  `vocabId` int(11) NOT NULL  
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

Figure 20 The SQL Command for Creating User-Learned Database

The following Figure 21 creates a table called “users” that contains seven columns: id, email, password, firstName, lastName, language, and level:

The “language” column is of type int and will hold an integer. There are three patterns to show the meaning in our system 1) show as a Japanese language table 2) show as a Thai language table 3) show as both language tables.

```
CREATE TABLE `users` (  
  `id` int(11) NOT NULL,  
  `email` text NOT NULL,  
  `password` text NOT NULL,  
  `firstName` text NOT NULL,  
  `lastName` text NOT NULL,  
  `language` int(11) NOT NULL,  
  `level` int(11) NOT NULL  
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

Figure 21 The SQL Command for Creating User Information Database

Each record in a table is uniquely identified by the PRIMARY KEY constraint. Primary keys must have UNIQUE values and may not have NULL values. A table can only have ONE primary key, and this primary key can be made up of single or multiple columns (fields). In our database, we declared “user_id” as a foreign key and also declared “userId” as a reference.

```
ALTER TABLE `user_vocab`  
  ADD CONSTRAINT `user-id` FOREIGN KEY (`userId`) REFERENCES `users`  
  (`id`) ON DELETE CASCADE ON UPDATE CASCADE;  
COMMIT;
```

Figure 22 The SQL Command for Determining References Key and Foreign Key in user_vocab Database

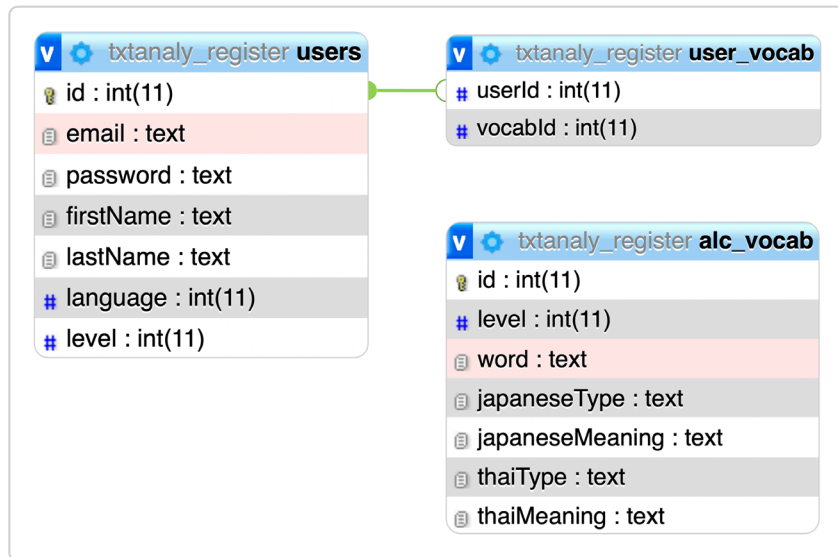


Figure 23 The Entity Relationship Diagram of the WCVL System

```

INSERT INTO `alc_vocab` (`id`, `level`, `word`, `japaneseType`,
`japaneseMeaning`, `thaiType`, `thaiMeaning`) VALUES
(1, 1, 'a', '冠', '1つの', 'n', ' ...ใด...หนึ่ง'),
(2, 1, 'able', '形', '~できる', 'adj', 'สามารถ'),
(3, 1, 'about', '前', '~について', 'prep', 'เกี่ยวกับ'),
(4, 1, 'above', '前', '~の上', 'prep', 'เหนือ'),
(5, 1, 'across', '前', '~を横切って', 'prep', 'ตรงข้าม'),
(6, 1, 'act', '名', '行為、言動', 'v', 'ปฏิบัติ,แสดง'),
(7, 1, 'afraid', '形', '恐れて、怖がって', 'adj', 'กลัว,กังวลว่า'),
(8, 1, 'after', '前', '~の後', 'prep', 'หลังจาก'),
(9, 1, 'afternoon', '名', '午後', 'n', 'ตอนบ่าย'),
(10, 1, 'again', '副', 'また、もう一度', 'adv', 'อีก,อีกแล้ว'),
(11, 1, 'against', '前', '反対して、逆らって', 'prep', 'ต่อต้าน'),
(12, 1, 'age', '名', '年齢', 'n', 'อายุ'),
(13, 1, 'ago', '副', '~前に', 'adv', 'ที่แล้ว'),
(14, 1, 'air', '名', '空気', 'n', 'อากาศ'),
(15, 1, 'airplane', '名', '飛行機', 'n', 'เครื่องบิน'),
(16, 1, 'airport', '名', '空港', 'n', 'สนามบิน'),
(17, 1, 'album', '名', 'アルバム', 'n', 'สมุดเพลงสำหรับใส่รูป'),
(18, 1, 'all', '形', '全て、全部', 'adj', 'ทั้งหมด'),
(19, 1, 'almost', '副', 'ほとんど', 'adv', 'เกือบจะ'),
(20, 1, 'alone', '形', 'ただひとり、単独で', 'adj', 'โดยลำพัง'),
... } 11,978 Lines
(11998, 12, 'zenith', '名', '頂点、絶頂', 'n', 'จุดสูงสุด'),
(11999, 12, 'zest', '名', '熱意', 'n', 'ความสนุกสนาน,(เต็ม)รสชาติ'),
(12000, 12, 'zodiac', '名', '十二宮図', 'n', 'จักรราศี');

```

Figure 24 The Part of SQL Command for Inserting SVL12000 database with Japanese and Thai Meaning Data

| | | | id | level | word | japaneseType | japaneseMeaning | thaiType | thaiMeaning |
|------|--|--|----|-------|-----------|--------------|-----------------|----------|-----------------------|
| Edit | | | 1 | 1 | a | 冠 | 1つの | n | ...ใด...หนึ่ง |
| Edit | | | 2 | 1 | able | 形 | ~できる | adj | สามารถ |
| Edit | | | 3 | 1 | about | 前 | ~について | prep | เกี่ยวกับ |
| Edit | | | 4 | 1 | above | 前 | ~の上 | prep | เหนือ |
| Edit | | | 5 | 1 | across | 前 | ~を横切って | prep | ตรงข้าม |
| Edit | | | 6 | 1 | act | 名 | 行為、言動 | v | ปฏิบัติ,แสดง |
| Edit | | | 7 | 1 | afraid | 形 | 恐れて、怖がって | adj | กลัว,กังวลว่า |
| Edit | | | 8 | 1 | after | 前 | ~の後 | prep | หลังจาก |
| Edit | | | 9 | 1 | afternoon | 名 | 午後 | n | ตอนบ่าย |
| Edit | | | 10 | 1 | again | 副 | また、もう一度 | adv | อีก,อีกแล้ว |
| Edit | | | 11 | 1 | against | 前 | 反对して、逆らって | prep | ต่อต้าน |
| Edit | | | 12 | 1 | age | 名 | 年齢 | n | อายุ |
| Edit | | | 13 | 1 | ago | 副 | ~前に | adv | ที่แล้ว |
| Edit | | | 14 | 1 | air | 名 | 空気 | n | อากาศ |
| Edit | | | 15 | 1 | airplane | 名 | 飛行機 | n | เครื่องบิน |
| Edit | | | 16 | 1 | airport | 名 | 空港 | n | สนามบิน |
| Edit | | | 17 | 1 | album | 名 | アルバム | n | สมุดเปล่าสำหรับใส่รูป |
| Edit | | | 18 | 1 | all | 形 | 全て、全部 | adj | ทั้งหมด |
| Edit | | | 19 | 1 | almost | 副 | ほとんど | adv | เกือบจะ |
| Edit | | | 20 | 1 | alone | 形 | ただひとり、単独で | adj | โดยลำพัง |
| Edit | | | 21 | 1 | along | 前 | ~に沿って | prep | ตาม(ถนน) |
| Edit | | | 22 | 1 | already | 副 | 既に、もう | adv | แล้ว |
| Edit | | | 23 | 1 | also | 副 | ~もまた、さらに | adv | เช่นกัน |
| Edit | | | 24 | 1 | always | 副 | いつも | adv | เสมอ |
| Edit | | | 25 | 1 | am | 動 | ...である | v | เป็น,อยู่,คือ |

Figure 25 The Part of 'alc_vocab' Data Shows as Table in phpMyAdmin

The Figure 24 SQL statement inserts a new record in the "alc_vocab" table. We inserted the SVL12000 database by adding Thai and Japanese meaning data. After, inserting the SVL12000 data, PhpMyAdmin will be generated automatically when a new record is inserted into the table.

3.3.2 Controller

The controller includes the logic responsible for updating the model and/or view in response to user input. In our system, we created the controller with PHP and JavaScript programming. The PHP code created the logic for creating the exercise questions with JSON data (Figure 26, Figure 27). After that, we, use JavaScript to create the exercise user interface control DOM and CSS script with the exercise logic (Figure 28).

```
for($i = 0; $i < $questionsSize; $i++){
    $question = array();

    $question['question'] = $questionsData[$i]['word'];
    $question['answer1'] = "[".$otherAnswerData[(($i*3)+ 0)]['japaneseType']."]
".$otherAnswerData[(($i*3)+ 0)]['japaneseMeaning'];
    $question['answer2'] = "[".$otherAnswerData[(($i*3)+ 1)]['japaneseType']."]
".$otherAnswerData[(($i*3)+ 1)]['japaneseMeaning'];
    $question['answer3'] = "[".$otherAnswerData[(($i*3)+ 2)]['japaneseType']."]
".$otherAnswerData[(($i*3)+ 2)]['japaneseMeaning'];
    $question['answer4'] = "[".$questionsData[$i]['japaneseType']."]
".$questionsData[$i]['japaneseMeaning'];

    array_push($allQuestions, $question);
}
echo json_encode($allQuestions, JSON_UNESCAPED_UNICODE);
```

Figure 26 The Part of PHP Controller Command for Creating JSON Data of Multiple-Choice Exercise


```
[
  {
    "question": "hedge",
    "answer1": "[形] 確かな、確信している",
    "answer2": "[名] 男友達",
    "answer3": "[動] 隠す、隠れる",
    "answer4": "[名] 生け垣、垣根"
  },
  {
    "question": "objective",
    "answer1": "[名] 温度",
    "answer2": "[形] 醜い",
    "answer3": "[形] めまいがして",
    "answer4": "[名] 目標"
  }
]
```

Figure 27 The Part of JSON Data of the Example of Questions and Answers of Multiple-Choice Exercise



Figure 28 The User-Interface of the Multiple-Choice Exercise which Creating by JavaScript and Using JSON data from PHP

3.3.3 View

3.3.2.1 Morphological Analysis

We divided the approach of the morphological analyzer function of the WCVL system into five stages, as shown in the flowchart (Figure 29).

Stage 1). The English text was analyzed morphologically with JavaScript Library called "NLP Compromise" without numbers (Kelly, 2018).

Stage 2) The analyzed words with other type forms (i.e., Verb Present Participle, Verb Past Participle, and Plural Nouns) would be converted into basic forms.

Stage 3) The WCVL system calculated the analyzed words as the vocabulary frequency.

Stage 4) The WCVL system would check the words in or out of the "SVL12000" database.

Stage 5) The WCVL system would sort only the vocabulary in the database by difficulty level and add their meaning in Thai and Japanese.



Figure 29 Morphological Analysis Function was Divided into 5 Stages

3.3.2.2 The Conversion of Analyzed Word Forms into Base Form

Figure 30 shows examples of English sentences analyzed by the system. The researchers present examples with various sentence patterns to try the analysis.

"Joe waited for the train." the system changed past simple tense "waited" to wait. and "I bought a book yesterday." it changed "bought" to "buy".

"The women are watching the bag." the system changed the plural word form "women" to be "woman" and changed "watching" to be "watch".

Text Analyzer

Joe waited for the train.
 I bought a book yesterday.
 The women are watching the bag.

Level: 1 Language: Japanese

Submit

New

| Vocabulary inside ALC Database. | | | |
|---------------------------------|-------|------|----------|
| # | Word | Type | Meaning |
| 1 | for | prep | เพื่อ |
| 1 | the | adj | คำนำหน้า |
| 1 | train | n | รถไฟ |
| 1 | wait | v | รอ |

| Vocabulary inside ALC Database. | | | |
|---------------------------------|-----------|------|----------|
| # | Word | Type | Meaning |
| 1 | a | n | |
| 1 | book | n | |
| 1 | buy | v | |
| 1 | i | pron | |
| 1 | yesterday | n | เมื่อวาน |

| Vocabulary inside ALC Database. | | | |
|---------------------------------|-------|------|------------------------|
| # | Word | Type | Meaning |
| 1 | are | v | เป็น, อยู่, คือ |
| 1 | bag | n | ถุง, กระเป๋า |
| 1 | the | adj | คำนำหน้านามชี้เฉพาะ |
| 1 | watch | v | ดูหนัง |
| 1 | woman | n | ผู้หญิง |
| 3 | being | n | การมีอยู่, สิ่งมีชีวิต |

| Vocabulary Outside ALC Database. | |
|----------------------------------|------|
| # | Word |
| 1 | joe |

Figure 30 The result display transformed words which analyze by our system

3.3.2.3 Six types of the Exercise

We use the activity diagrams below to describe the workflow for learning unknown vocabulary through the following steps (Figure 31).

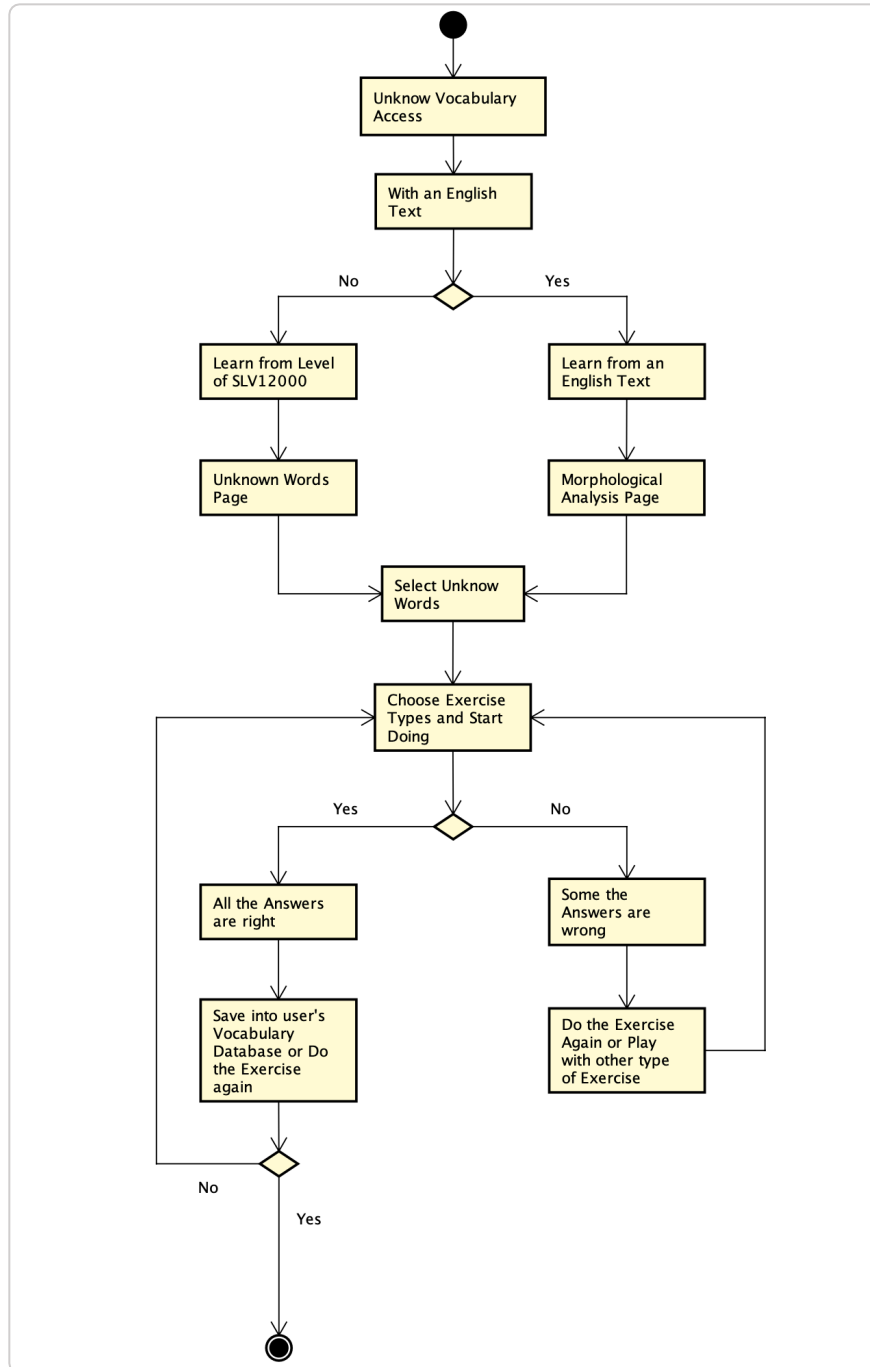


Figure 31 The Activity Diagram of Learning Unknown Vocabulary with the WCVL System

a. Spelling

This exercise aims to improve the ability to use English vocabulary correctly. The student should write and memorize the correct spelling of the English vocabulary being studied (Figure 32).

b. Dictation

This exercise aims to improve the learner's ability to use English vocabulary correctly and to improve listening skills. The student should listen to the audio of the English vocabulary from the system and correctly memorize and write the English vocabulary spelling (Figure 33).

c. Multiple Choices

This exercise aims to improve the ability to use English vocabulary correctly. First, the student should memorize the vocabulary and its meaning (Thai or Japanese) by matching the vocabulary with its meaning (Thai or Japanese) in multiple-choice questions (Figure 34).

d. Matching

This exercise aims to improve the ability to use English vocabulary correctly. The student should learn the English vocabulary and its meaning by selecting the vocabulary-meaning side from the English vocabulary side (Figure 35).

e. True-False

This exercise aims to improve the ability to use English vocabulary correctly. The student must recognize the English vocabulary and the displayed vocabulary meaning from the system as true/false before memorizing the English vocabulary and meaning (Figure 36).

f. Flashcard

This exercise aims to improve the ability to use English vocabulary correctly. The student should be able to recall the vocabulary meaning on the back side of the vocabulary from the English vocabulary on the front side (Figure 37).

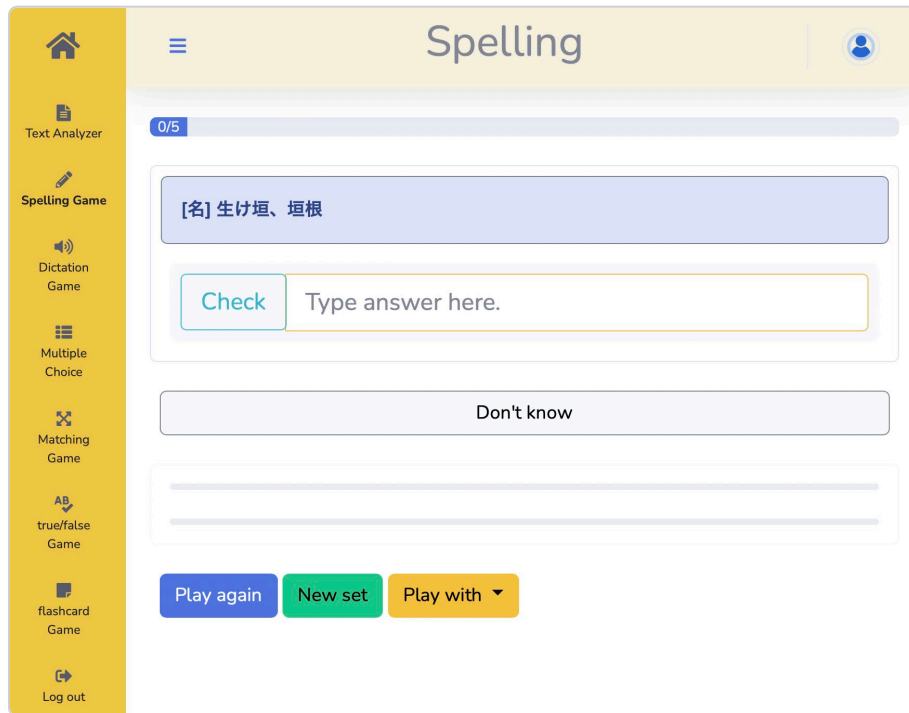


Figure 32 The User-Interface of Spelling Exercise Created from Five Vocabulary with JavaScript

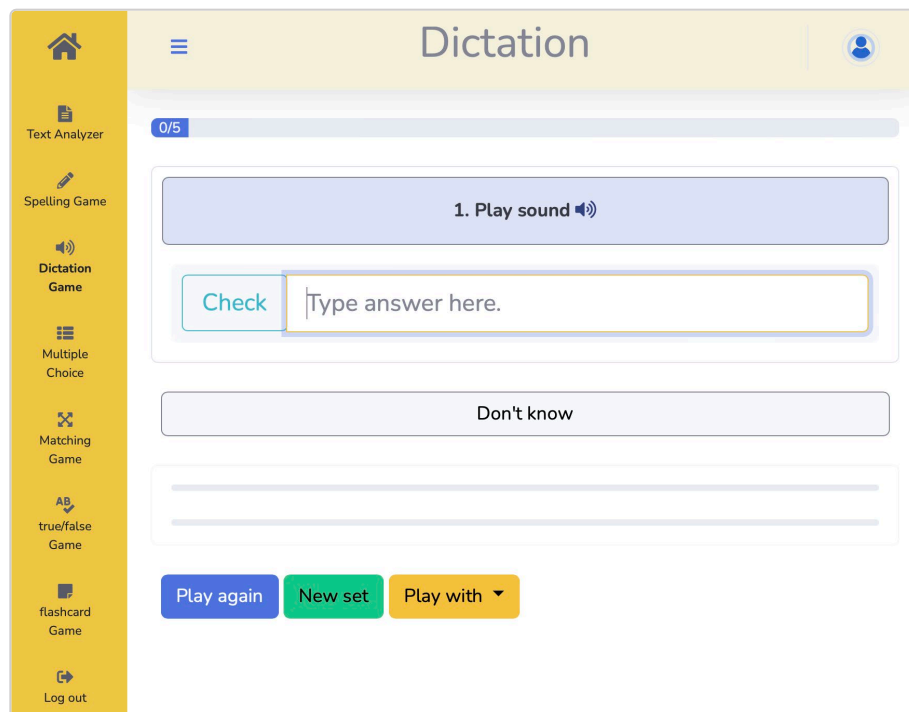


Figure 33 The User-Interface of Dictation Exercise Created from Five Vocabulary with JavaScript



Figure 34 The User-Interface of Multiple-Choice Exercise Created from Five Vocabulary with JavaScript

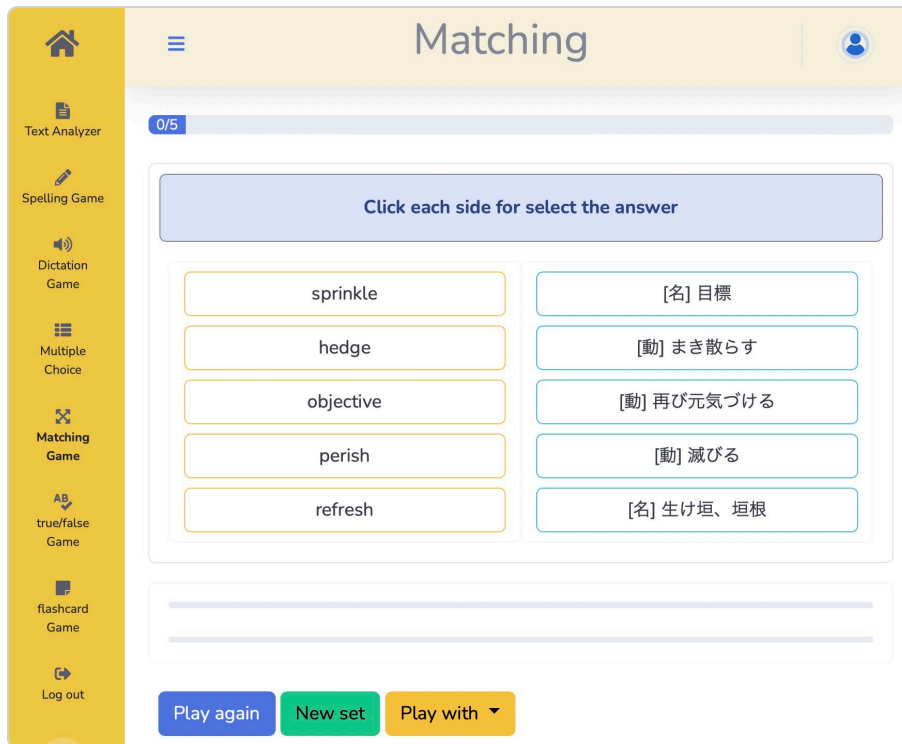


Figure 35 The User-Interface of Matching Exercise Created from Five Vocabulary with JavaScript

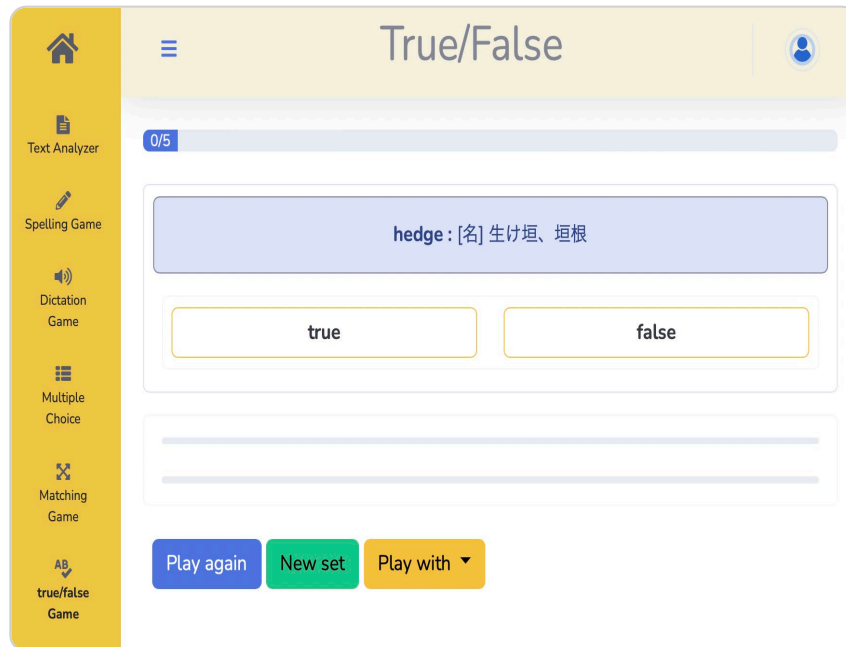


Figure 36 The User-Interface of True/False Exercise Created from Five Vocabulary with JavaScript

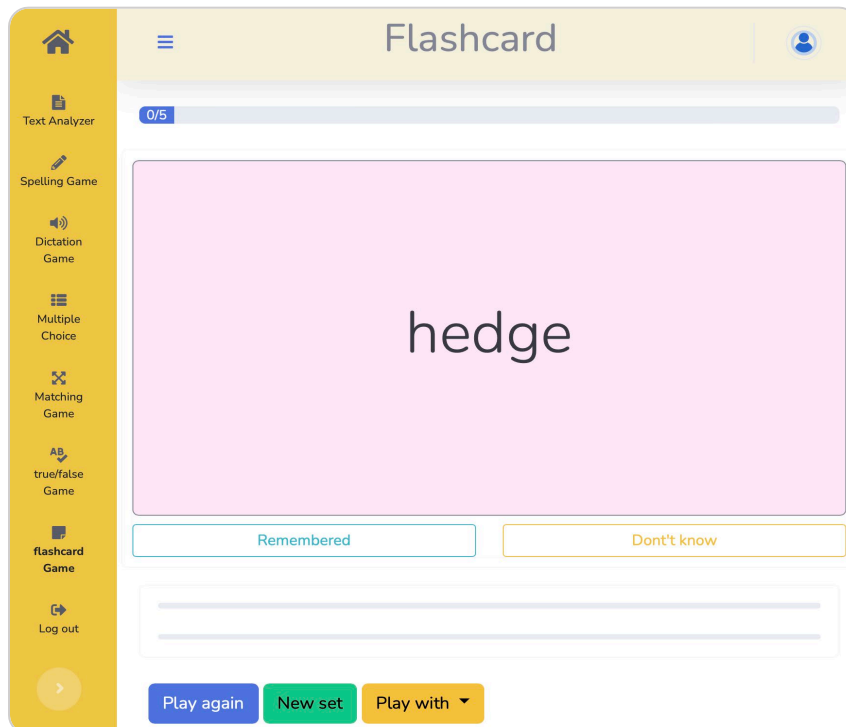


Figure 37 The User-Interface of Flashcard Exercise Created from Five Vocabulary with JavaScript

3.4 Setup

We uploaded the WCVL system to a website with the URL <https://www.txtanalyse.com> using the File Transfer Protocol (FTP) through the FileZilla program. Thus, students can access the WCVL system from any device (Fig. 7).

Before students access the system, they are required to create an account by pressing the “Create an Account” button and registering information such as school email, password, first name, and last name. Once students complete the registration, they can log in to the system, and the main page with the Text Analyzer option is displayed.

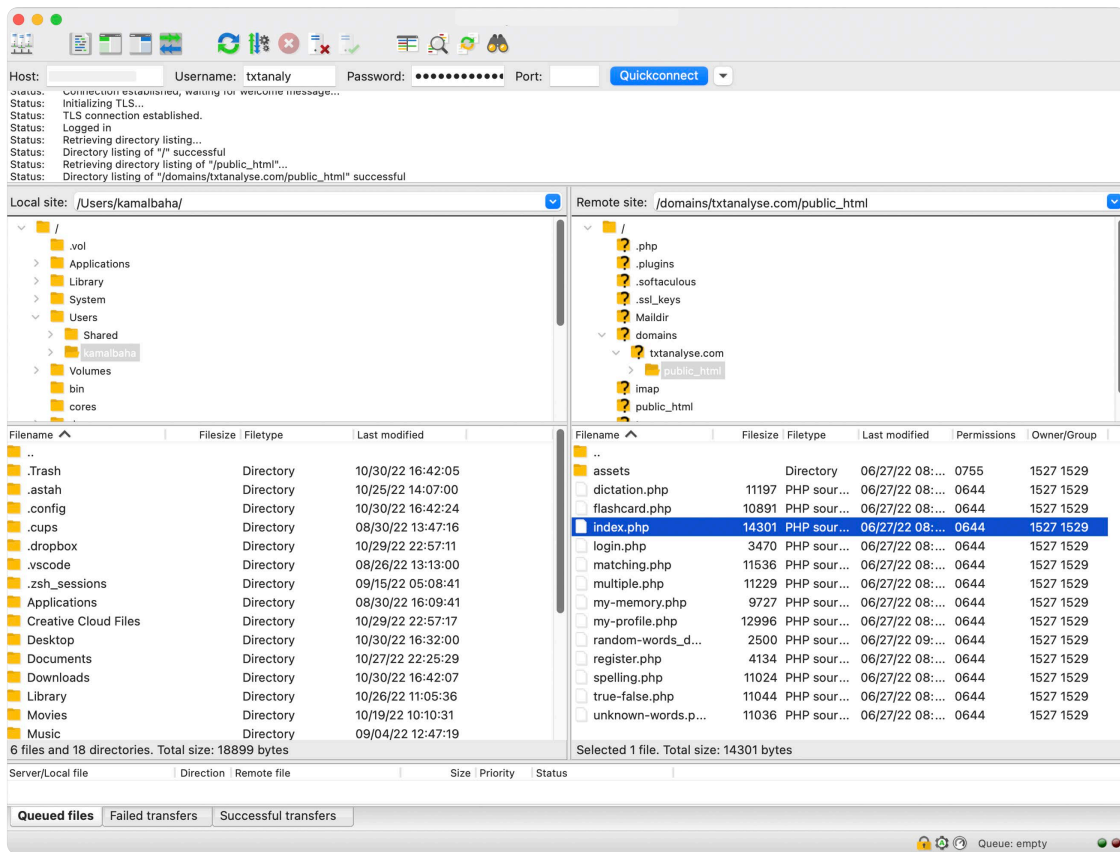


Figure 38 The FileZilla Software Using for Transferring Files to Sever through Transfer Protocol (FTP)

3.5 Evaluation

The reliability index was calculated using the following equation for Cronbach's alpha coefficient (Equation 1) (Cronbach, 1951):

Equation 1 Cronbach's Alpha Coefficient

$$\alpha = \frac{k}{k - 1} \left(1 - \frac{\sum_{i=1}^k \sigma_i^2}{\sigma_t^2} \right)$$

where k is the number of items on a scale, σ_i^2 is the variance of i th item, and σ_t^2 is the variance of the scale (total) scores.

The Alpha Cronbach reliability of the questionnaires was 0.899 and 0.898 for the Thai and Japanese questionnaires, respectively, which indicated good reliability (Table 2).

Table 2 Coefficient of Cronbach's Alpha and Reliability Level

| No | Coefficient of Cronbach's Alpha α | Reliability Level |
|----|--|-------------------|
| 1 | $\alpha \geq 0.90$ | Excellent |
| 2 | $0.80 \leq \alpha < 0.90$ | Good |
| 3 | $0.70 \leq \alpha < 0.80$ | Acceptable |
| 4 | $0.60 \leq \alpha < 0.70$ | Questionable |
| 5 | $0.50 \leq \alpha < 0.60$ | Poor |
| 6 | $\alpha < 0.50$ | Unacceptable |

Chapter 4

Experimental Section

This study was conducted in two stages for the purpose of examining the effectiveness of the WCVL system as a support system for students' vocabulary learning and reading comprehension and the student's attitude toward the WCVL system after utilizing the system. In the first stage of the study, we conducted the pre-test and post-test to investigate the effectiveness of the system for students' vocabulary learning and reading comprehension. In the second stage of the research, we provide the questionnaire for evaluating the student's attitude and behavior toward the WCVL system and satisfaction after utilizing the system.

Many researchers used the pre-and post-test to analyze the improvement of the study. First, Solhi Andarab studied whether 70 learners in Turkey would be more efficient on a pre-post vocabulary test if they learned words on the Quizlet (Solhi Andarab, 2019).

Second, Tsai and Shang tested their Taiwanese counterparts by reading short stories and compared them to the TOEFL pre- and post-test (Tsai & Shang, 2010).

In addition, Y. Ishikawa et al. conducted a study of the effectiveness of the TOEIC pre- and post-test using "ATR CALL BRIX," a WBT-type e-learning system to support English language learning (Ishikawa et al., 2011).

4.1 Participants

The participants in this study were a group of 37 senior high school students from Azizstan Foundation School with a similar background and limited expertise in English

learning in Thailand (Figure 39, Figure 40) and a group of 44 third- and fourth-year students from Tokyo Denki University in Japan.



Figure 39 The senior high-school participants in Thailand (Pre-Test)



Figure 40 The senior high-school participants in Thailand (Post-Test)

4.2 Experiment Tools

4.2.1 Pre-Test and Post-Test

Pre- and post-tests were provided to both student groups. For Thai students, we use the General Aptitude Test (GAT) for the English part of the General test (GAT-English) for applying to universities in Thailand. In addition, we collect pre-test and post-test scores from their TOEIC test for Japanese students.

4.2.2 Design of Test for Thai Students

In this study, we utilize the GAT for the English part of the General test (GAT-English) for applying to universities in Thailand. First, we select six passages from GAT-English for the reading comprehension test. Then, we select 30 vocabularies analyzed by The WCVL system from these six passages (Figure 41).

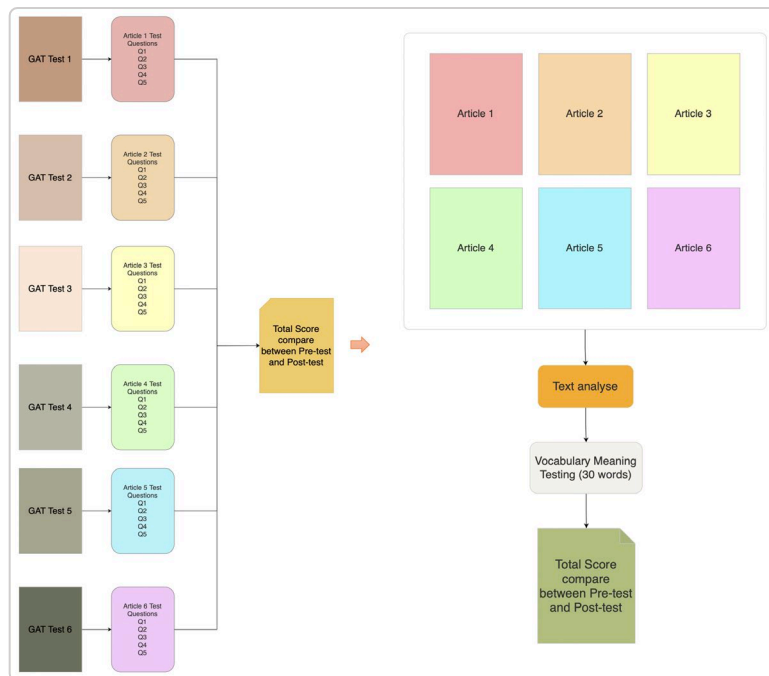


Figure 41 The Procedure of Designing Pre- & Post-Test for Thai Student Subjects

4.2.2.1 Readability Index

Identifying the complexity of any article, we evaluate the article using the readability index. Numerous indexes, such as The SMOG Index, The Coleman-Liau Index, and the Automated Readability Index (ARI), are reliable and widely used. The SMOG Index returns a U.S. school grade level, indicating that the average student at that grade level can read the text. For instance, a score of 7.4 indicates that an average seventh-grade student comprehends the text.

a. The Coleman-Liau Index

The Coleman-Liau Index measures the length of words and sentences based on the number of characters rather than the number of syllables. A grade will be determined by using this formula. If the literature has a rating of 10.6, for instance, it indicates that it is suitable for students in the 10th and 11th grades of high school. Using the formula that is provided below, one can determine their Coleman-Liau Index value.

Equation 2 Coleman-Liau Index Equation

$$CLI = (0.0588 \times L) - (0.296 \times S) - 15.8$$

L = the average number of letters per 100 words.

S = the average number of sentences per 100 words.

b. Automated Readability

The ARI will produce a number that provides a rough estimate of the required grade level to understand the text fully. For instance, if the ARI outputs the number 3, it indicates that children in third grade (about 8 or 9 years old) should be able to understand

what is being communicated in the text. Using the formula that is provided below, one is able to determine the ARI.

Equation 3 Automated Readability Equation

$$ARI = 4.71 \times \left(\frac{\text{Characters}}{\text{Words}} \right) + 0.5 \times \left(\frac{\text{Words}}{\text{Sentences}} \right) - 21.43$$

Table 3 The breakdown of grade levels in the U.S and readability score

| Score | Age | Grade |
|-------|----------------|----------------|
| 1 | 5-6 yrs. old | Kindergarten |
| 2 | 6-7 yrs. old | First Grade |
| 3 | 7-8 yrs. old | Second Grade |
| 4 | 8-9 yrs. old | Third Grade |
| 5 | 9-10 yrs. old | Fourth Grade |
| 6 | 10-11 yrs. old | Fifth Grade |
| 7 | 11-12 yrs. old | Sixth Grade |
| 8 | 12-13 yrs. old | Seventh Grade |
| 9 | 13-14 yrs. old | Eighth Grade |
| 10 | 14-15 yrs. old | Ninth Grade |
| 11 | 15-16 yrs. old | Tenth Grade |
| 12 | 16-17 yrs. old | Eleventh grade |
| 13 | 17-18 yrs. old | Twelfth grade |
| 14 | 18-22 yrs. old | College |

Someya (2006), analyzes English texts. It produces a graded word-level profile of the vocabulary contained and calculates readability indices using the ARI and Coleman-Liau formulas. All the inflected words will be automatically lemmatized before processing except for some designated words, including modal verbs. Numbers and figures will be ignored unless they are part of a meaningful lexical item. His website analyzes vocabulary from English essays. It checks levels of vocabulary and only shows the frequency statistics. Table 4 shows the ARI and CLI index of the pre-test passage, 10.3 and 11.3, respectively, whereas Table 5 shows that the ARI and CLI index of the post-test passage were 9.8 and 11.2, respectively. The number and percentage of vocabulary for all passage questions in the pre-&post-test sorted by the SVL120000 database, we found that the rest of the vocabulary upper level 4 of the pre-test was 8.5% (Figure 42, Figure 43) and post-test was only 8.1% (Figure 44). These results above indicated that pre-test and post-test passages almost have the same vocabulary difficulty index.

Table 4 Readability Indices of All Passage Questions in the Pre-Test of Thai Students

| Statistics | |
|-----------------------------------|---------|
| Total Number of Words | 1627 |
| Total Number of Word Types | NA |
| Type/Token Ratio (TTR) | NA |
| Total Number of Sentences | 92 |
| Average Sentence Length (in wrds) | 17.3 |
| Average Word Length (in chars) | 4.9 |
| Average Word Level | 1.63675 |
| Var | 2.64064 |
| S.D. | 1.62500 |
| Readability Indices | |
| Automated Readability Index (ARI) | 10.3 |
| Coleman-Liau Index (CLI) | 11.3 |

Table 5 Readability Indices of All Passage Questions in the Post-Test of Thai Students

| Statistics | |
|-----------------------------------|---------|
| Total Number of Words | 1528 |
| Total Number of Word Types | NA |
| Type/Token Ratio (TTR) | NA |
| Total Number of Sentences | 91 |
| Average Sentence Length (in wrds) | 16.4 |
| Average Word Length (in chars) | 4.9 |
| Average Word Level | 1.55955 |
| Var | 2.51216 |
| S.D. | 1.58498 |
| Readability Indices | |
| Automated Readability Index (ARI) | 9.8 |
| Coleman-Liau Index (CLI) | 11.2 |

| Word Level | Type | Frequency | % | Cumulative |
|--------------|------|-----------|-------|------------|
| PropNoun_Num | 28 | 50 | 3.06 | 3.06 |
| 1000 | 271 | 1114 | 68.09 | 71.15 |
| 2000 | 122 | 163 | 9.96 | 81.11 |
| 3000 | 78 | 104 | 6.36 | 87.47 |
| 4000 | 50 | 66 | 4.03 | 91.5 |
| 5000 | 26 | 38 | 2.32 | 93.83 |
| 6000 | 19 | 23 | 1.41 | 95.23 |
| 7000 | 19 | 21 | 1.28 | 96.52 |
| 8000 | 10 | 10 | 0.61 | 97.13 |
| 9000 | 8 | 8 | 0.49 | 97.62 |
| 10000 | 7 | 7 | 0.43 | 98.04 |
| 11000 | 5 | 5 | 0.31 | 98.35 |
| 12000 | 0 | 0 | 0.0 | 98.35 |
| NA | 26 | 27 | 1.65 | 100.0 |
| ALL | 669 | 1636 | 100 | 100 |

a

| Word Level | Type | Frequency | % | Cumulative |
|--------------|------|-----------|-------|------------|
| PropNoun_Num | 39 | 64 | 4.16 | 4.16 |
| 1000 | 281 | 1056 | 68.71 | 72.87 |
| 2000 | 115 | 142 | 9.24 | 82.11 |
| 3000 | 79 | 96 | 6.25 | 88.35 |
| 4000 | 44 | 55 | 3.58 | 91.93 |
| 5000 | 25 | 33 | 2.15 | 94.08 |
| 6000 | 14 | 14 | 0.91 | 94.99 |
| 7000 | 15 | 15 | 0.98 | 95.97 |
| 8000 | 9 | 9 | 0.59 | 96.55 |
| 9000 | 9 | 9 | 0.59 | 97.14 |
| 10000 | 3 | 3 | 0.2 | 97.33 |
| 11000 | 5 | 6 | 0.39 | 97.72 |
| 12000 | 1 | 1 | 0.07 | 97.79 |
| NA | 29 | 34 | 2.21 | 100.0 |
| ALL | 668 | 1537 | 100 | 100 |

b

Figure 42 The Number and Percentage of Vocabulary in Pre-Test (a), The Number and Percentage of Vocabulary in Post-Test (b)

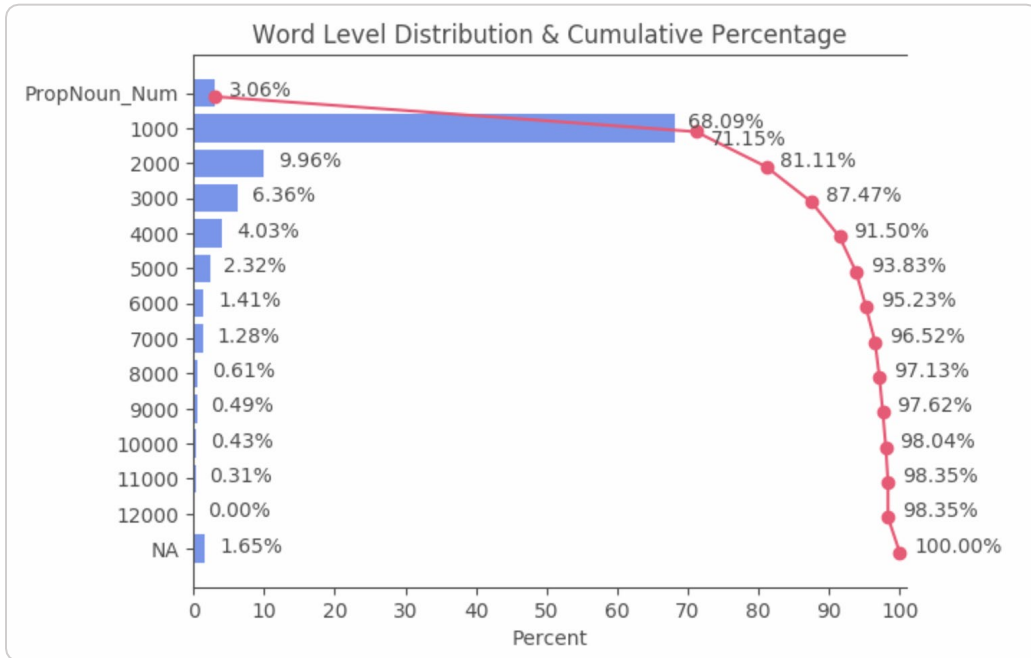


Figure 43 The Number and Percentage of Vocabulary in all Passage Questions (Pre-Test) Sorted by the SVL120000 Database

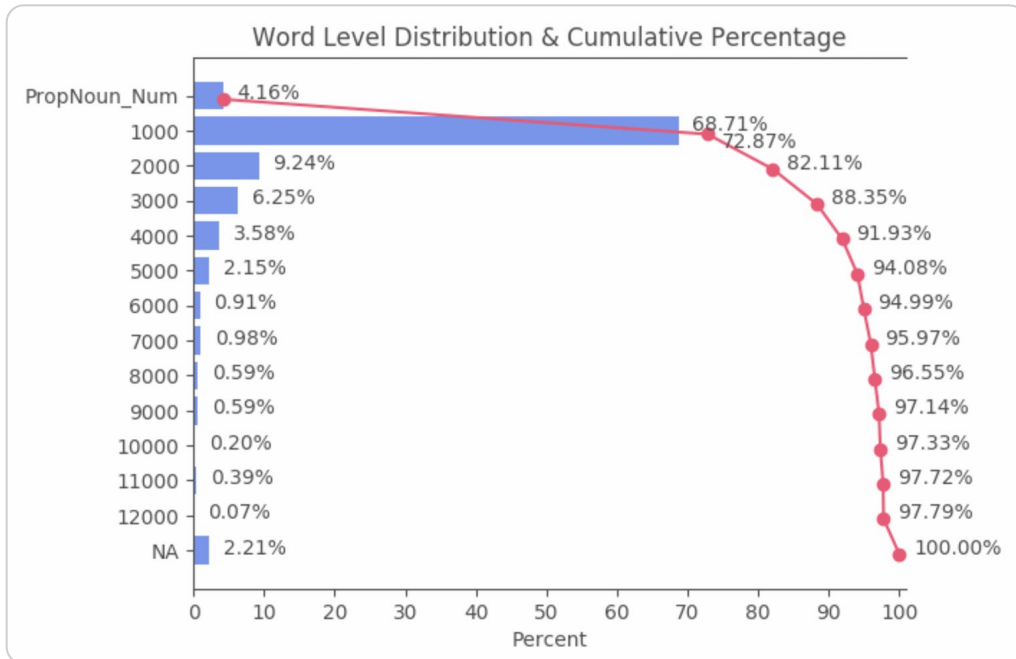


Figure 44 The Number and Percentage of Vocabulary in all Passage Questions (Post - Test) Sorted by the SVL120000 Database

4.2.3 Questionnaire

We also evaluated the WCVL system after collecting data on the attitudes and behaviors of students using a Google Forms-created online questionnaire. We utilized a questionnaire with 38 items based on eight question categories: English vocabulary acquisition, satisfaction with system usage, appropriateness of content and test system, the effectiveness of exercise tasks, improvement in reading comprehension, system user interface design, system functions, and future system usage.

Table 6 The Categories of the Questionnaire and the Numbers of Items

| No. | Category Name (Abbreviation) | Item's Number |
|-----|---|---------------|
| 1 | English Vocabulary Learning (V) | 5 |
| 2 | Satisfaction of System Usage (S) | 5 |
| 3 | The Appropriateness of Content and Test (C) | 5 |
| 4 | Effectiveness of Practice Tasks (P) | 6 |
| 5 | Reading Comprehension Improvement (R) | 4 |
| 6 | System User Interface Design (D) | 4 |
| 7 | System Functions (F) | 5 |
| 8 | Future System Usage (N) | 4 |

Table 7 Five-Point Likert-Type Scale with Five Corresponding

| Representation | Point |
|-------------------|-------|
| Strongly Agree | 5 |
| Agree | 4 |
| Neither | 3 |
| Disagree | 2 |
| Strongly Disagree | 1 |

4.3 Study Method

In terms of examining the effectiveness of the system as a support system for students' vocabulary learning and reading comprehension, the activities were carried out for 15 weeks or one semester for both groups, including pre-test and post-test and questionnaires.

4.3.1 Vocabulary Acquisition Procedure

Figure 45 shows an example of the passage from the Gat English test. The Thai students would learn vocabulary with our system, one GAT passage per week, and alternating students would select an interesting passage per week as shown in the learning schedule below (Table 9).

At the University of Virginia in Charlottesville, psychology professor Bella DePaulo got 77 students and 70 townspeople to volunteer for an unusual project. All kept diaries for a week, recording the numbers and details of the lies they told. (P1)

One student and six Charlottesville residents professed to have told no falsehoods. The other 140 participants told 1,535. (P2)

The lies were most often not what most of us would call earth-shattering. Someone would pretend to be more positive or supportive of a spouse or friend than he or she really was, or feign agreement with a relative's opinion. According to DePaulo, women in their interactions with other women lied mostly **to spare others' feelings**. Men lied to other men generally for self-promoting reasons. (P3)

Most strikingly, **these tellers-of-a-thousand-lies** reported that their deceptions caused them 'a little preoccupation or regret.' Might that, too, be a lie? Perhaps. But there is evidence that this attitude towards casual use of prevarication is common. (P4)

Think how often we hear the expressions "I'll call you" or "The check is in the mail" or "I'm sorry, but he stepped out." And then there are professions— lawyers, pundits, public relations consultants—whose members seem to specialize in shaping or spinning the truth to suit clients' needs. (P5)

Figure 45 The Example of the Passage from the Gat English Test

However, the same method of learning English vocabulary using the WCVL system for both groups (Thai and Japanese students) is as follows.

1. First, the students select an English text and copy it. Then, paste it into the system-provided text box. Alternatively, the student may use the paste button above the text box to insert the text.

2. Students then select the language (Japanese or Thai) whose meaning they would like to display after morphological analysis. Afterward, they select one of the 12 levels based on SLV12000 from the Level drop-down menu. After clicking the “Submit” button, the system displays the selected level, the words at a higher level or “Unknown Words”, and a table of “Known Words” for words at a lower level than the selected level. The table illustrates the word’s level, grammatical category, and meaning. In addition, students can hear how English words are pronounced (Figure 46).

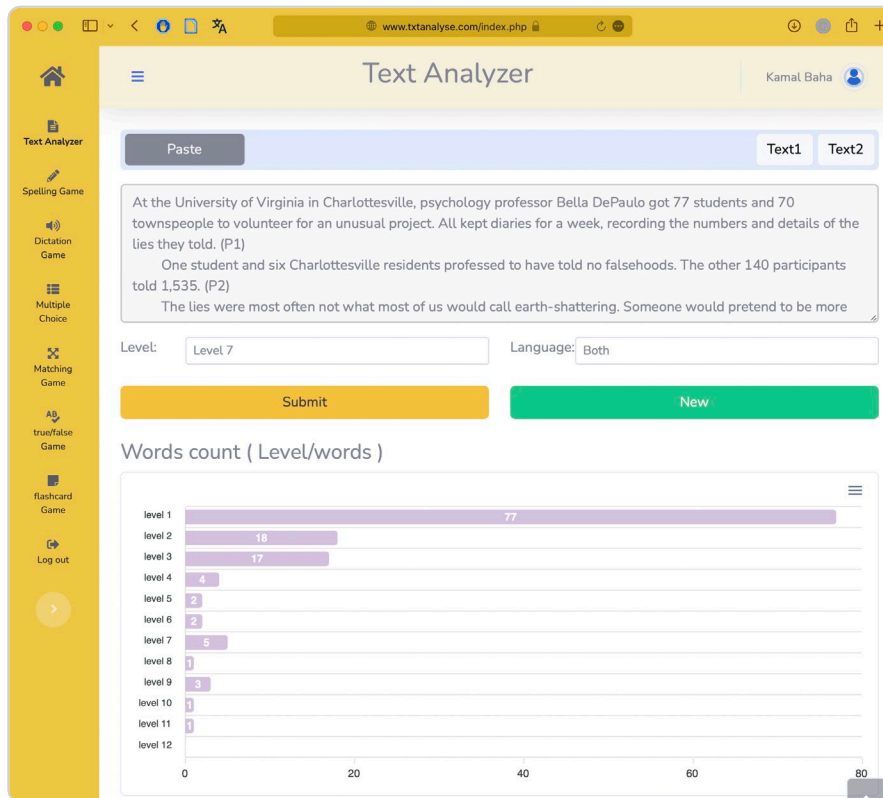


Figure 46 Morphological Analysis User Interface

3. There are three access methods for the exercises. The first method requires the student to select each word individually from the Unknown Words table and then press the Play button directly below the table. The 'Play' button provides access to six different types of exercises (Figure 47). The second method is to access the student's Unknown Words page, which displays a table containing only words not included in the database. The student can select the level of English words the student desires to learn, and the type of exercises desired from this page. Additionally, the student can choose the number of words to study or use the Random button to study English words at random. Thirdly, the six practice menus on the left side of the display are also directly accessible. Finally, the system will randomly generate five English word exercises when directly accessed.

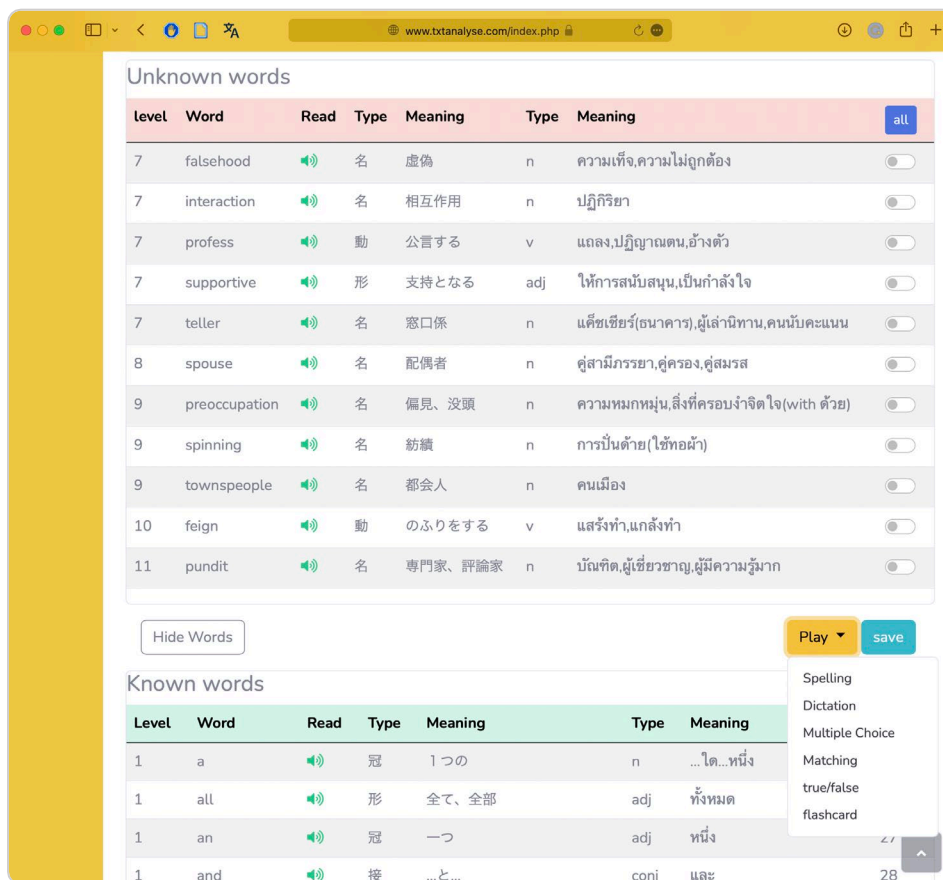


Figure 47 The Unknown & Known words table showed the results of the Morphological Analysis

4. Furthermore, to save the words they have learned; students can immediately select and save if a known word appears in the Unknown Words section after morphological analysis. Alternatively, if all the answers are correct after learning the word in word practice, the system will display a save button, allowing the word to be saved. The saved word data will be displayed as a graph on the My memory page for the students' personal database (Figure 48).

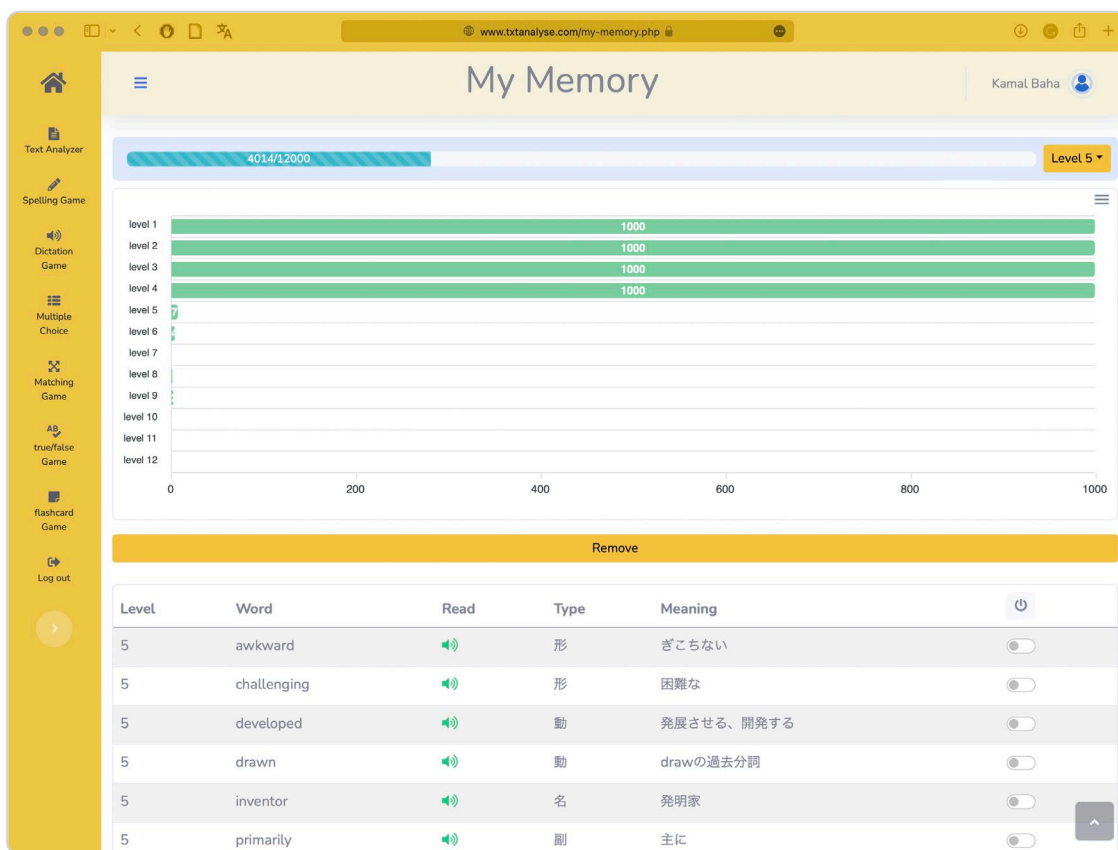


Figure 48 The Individual Learned Vocabulary Database (My Memory Page)

4.3.2. Learning Schedule

Japanese students learned vocabulary from the school textbook in one weekly lesson. There were 13 weeks for vocabulary acquisition (Table 8). While Thai students learned vocabulary with our system, one passage from the GAT test per week (Table 9).

A week after the program, the questionnaire was used to evaluate Students' attitudes and behavior toward the WCVL system in both groups.

Table 8 Learning Schedule of Japanese Students

| Week No. | Description |
|-----------------|--|
| Week 1 | Learn vocaulary from schoolbook in Lesson 01 |
| Week 2 | Learn vocaulary from schoolbook in Lesson 02 |
| Week 3 | Learn vocaulary from schoolbook in Lesson 03 |
| Week 4 | Learn vocaulary from schoolbook in Lesson 04 |
| Week 5 | Learn vocaulary from schoolbook in Lesson 05 |
| Week 6 | Learn vocaulary from schoolbook in Lesson 06 |
| Week 7 | Learn vocaulary from schoolbook in Lesson 07 |
| Week 8 | Learn vocaulary from schoolbook in Lesson 08 |
| Week 9 | Learn vocaulary from schoolbook in Lesson 09 |
| Week 10 | Learn vocaulary from schoolbook in Lesson 10 |
| Week 11 | Learn vocaulary from schoolbook in Lesson 11 |
| Week 12 | Learn vocaulary from schoolbook in Lesson 12 |
| Week 13 | Learn vocaulary from schoolbook in Lesson 13 |
| Week 14 | Post test |
| Week 15 | Answer Questionnaire |

Table 9 Learning schedule of Thai students

| Week No. | Description |
|----------|---|
| Week 1 | Pre-test |
| | 1. Vocabulary Meaning Test (30 words) from 6 articles (15 minutes) |
| | 2. Reading Comprehension Test (6 articles, 45 minutes) |
| Week 2 | Introduce and explain how to use the WCVM system. |
| Week 3 | Learning vocabulary from article 1 by using practices in WCVM system. |
| Week 4 | Learning vocabulary from an article that students are interested in using practices in WCVM system. |
| Week 5 | Learning vocabulary from article 2 by using practices in WCVM system. |
| Week 6 | Learning vocabulary from an article that students are interested in using practices in WCVM system. |
| Week 7 | Learning vocabulary from article 3 by using practices in WCVM system. |
| Week 8 | Learning vocabulary from an article that students are interested in using practices in WCVM system. |
| Week 9 | Learning vocabulary from article 4 by using practices in WCVM system. |
| Week 10 | Learning vocabulary from an article that students are interested in using practices in WCVM system. |
| Week 11 | Learning vocabulary from article 5 by using practices in WCVM system. |
| Week 12 | Learning vocabulary from an article that students are interested in using practices in WCVM system. |
| Week 13 | Learning vocabulary from article 6 by using practices in WCVM system. |
| Week 14 | Learning vocabulary from an article that students are interested in using practices in WCVM system. |
| Week 15 | Post-test |
| | 1. Vocabulary Meaning Test (30 words) from 6 articles (15 minutes) |
| | 2. Reading Comprehension Test (6 articles, 45 minutes) |
| | 3. Answering the questionnaire of student's attitudes toward the system |

Chapter 5

Results and Discussion

5.1 t-Test

Statistics is primarily concerned with probabilities. A statistical conclusion of a great or small difference between two groups is not based on an absolute standard but on the probability of an event happening (Kim, 2015). For example, we use statistics to analyze educational data about a student studying, a teacher teaching, or any other professional working in an educational institution. The information or data points typically consist of the following: name, date of birth, date of enrollment, the current status of participation in various institutional practices, roles, responsibilities, performance parameters, and accomplishments.

A t-test is a statistical test that compares the means of two groups. The independent t-test applies when the two groups being compared are independent of one another, and the paired t-test applies when the two groups being compared are dependent on one another (Kim, 2015). In a t-test, like in most tests of significance, the significance threshold is traditionally set at $p = 0.05$. The P-Values used in hypothesis testing to help us support or reject the null hypothesis. The p-value is the evidence against a null hypothesis. The level of statistical significance is often expressed as a P-Value between 0 and 1 because probability cannot be negative. The smaller the P-value, the more substantial the evidence that we should reject the null hypothesis. The more extensive the P-value, the weaker the evidence that we should reject the null hypothesis (Westfall & Young, 1993). P-values are used by many tests such as Z-test, t-test, F-test & chi-Square test used the P-value to get significance or insignificance results at 5%. It is essential to note that P-value, when

computed in software, is in decimal form, and we will observe it either lower or higher than 5% or 0.05 level of significance (Table 10).

Table 10 The Significance Level of P-Value and Specification

| Significance Level | Specification | |
|--------------------|--|--------------------|
| $P > 0.10$ | No evidence against the nul hypothesis. | not significant |
| $0.05 < P < 0.10$ | Weak evidence against the nul hypothesis | not significant |
| $0.01 < P < 0.05$ | Moderate evidence against the nul hypothesis | significant |
| $0.001 < P < 0.01$ | Good evidence against the null hypothesis | very significant |
| $P < 0.001$ | Strong evidence against the null hypothesis | highly significant |

In this research, we used a t-test to compare the means score of pre-test, and post-test vocabulary and reading comprehension for Thai student subjects and the means TOEIC score for Japanese student subjects.

5.2 The Effectiveness Index

In this study, we used the Effectiveness Index (E.I.) to display the learning improvement direction. The Effectiveness Index is an index showing the progress or achievement of learning to indicate the amount or magnitude of the change. After using media or educational innovations (Goodman et al., 1980).

E.I. was calculated using the following equation (Goodman et al., 1980):

Equation 4 The Effectiveness Index

$$E.I. = \frac{\Delta E}{100 - E_{pre}}$$

where the difference of Efficiency: $\Delta E = E_{post} - E_{pre}$, and $E = \frac{\sum X_i}{N \times A} \times 100\%$

where $\sum X_i$: Student's total score, $N \times A$: All activities score.

The t-Test may reveal the difference in the data set between the groups. But could not specify the direction of development, whether it is increasing or decreasing. Therefore, we need to calculate E.I. additionally to understand the improvement of the experimental results. We showed an example of the E.I. in a pre-test/post-test for Thai students' scores in Figure 49 where the pre-test score was 17.7% and the post-test score was 86.5%.

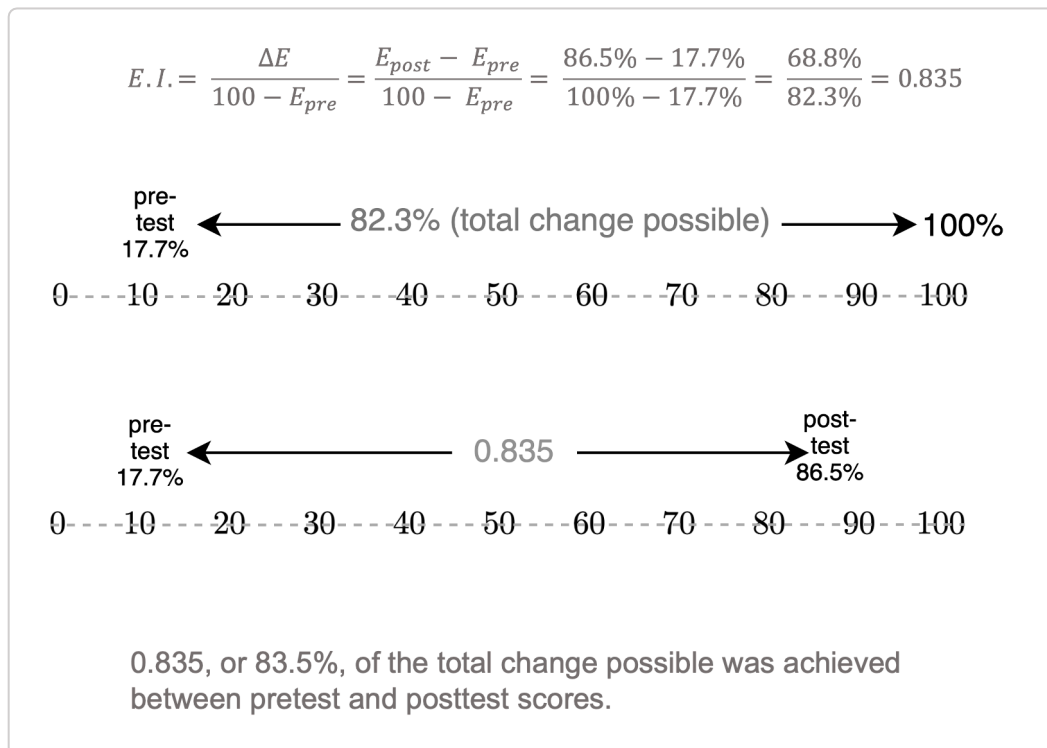


Figure 49 The Example of the E.I. in a Pre-Test/Post-Test for Thai Students' Scores

5.3 The Result of the Pre-test and Post-test

5.3.1 Thai Students

According to the vocabulary comprehension scores (Figure 49), reading comprehension scores (Figure 50), and total scores (Figure 51) of the pre-&post-test results for Thai students, we found that the average score of the total score on the post-test ($\bar{x} = 38.70$) is significantly higher than that of the pre-test ($\bar{x} = 14.95$). Especially the average vocabulary test score on the post-test ($\bar{x} = 25.95$) is extremely higher than that of the pre-test ($\bar{x} = 5.30$). In addition, we found that the post-test average score of the reading test part ($\bar{x} = 12.76$) is also higher than that of their pre-test ($\bar{x} = 9.65$). Moreover, the Scatter plot between the pre-test and post-test for Thai students is shown in Figure 52. When we considered the relative of Thai students' pre/post-test results, we found that their post-test score was significantly higher than that of their pre-test score.

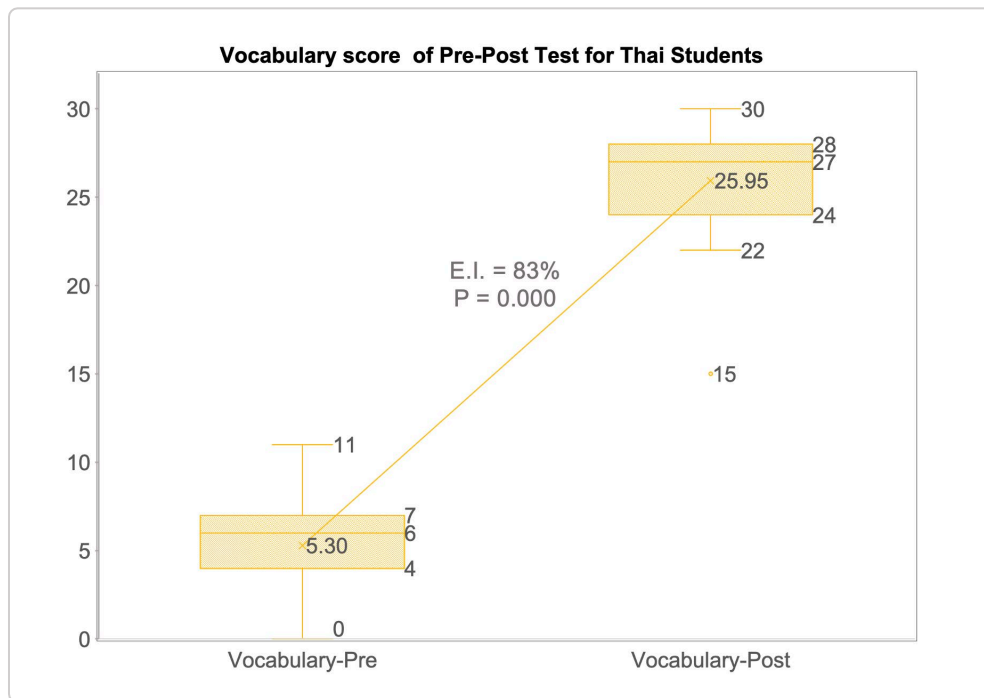


Figure 50 Vocabulary Score of Pre-&Post-Test for Thai Students

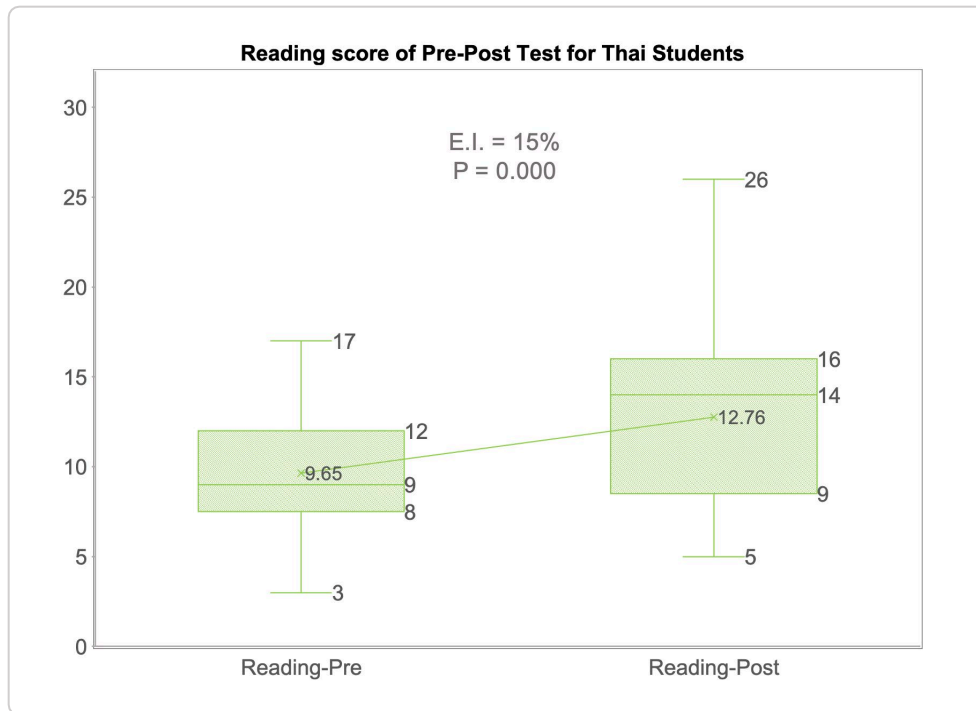


Figure 51 Reading Comprehension Score of Pre-&Post-Test for Thai Students

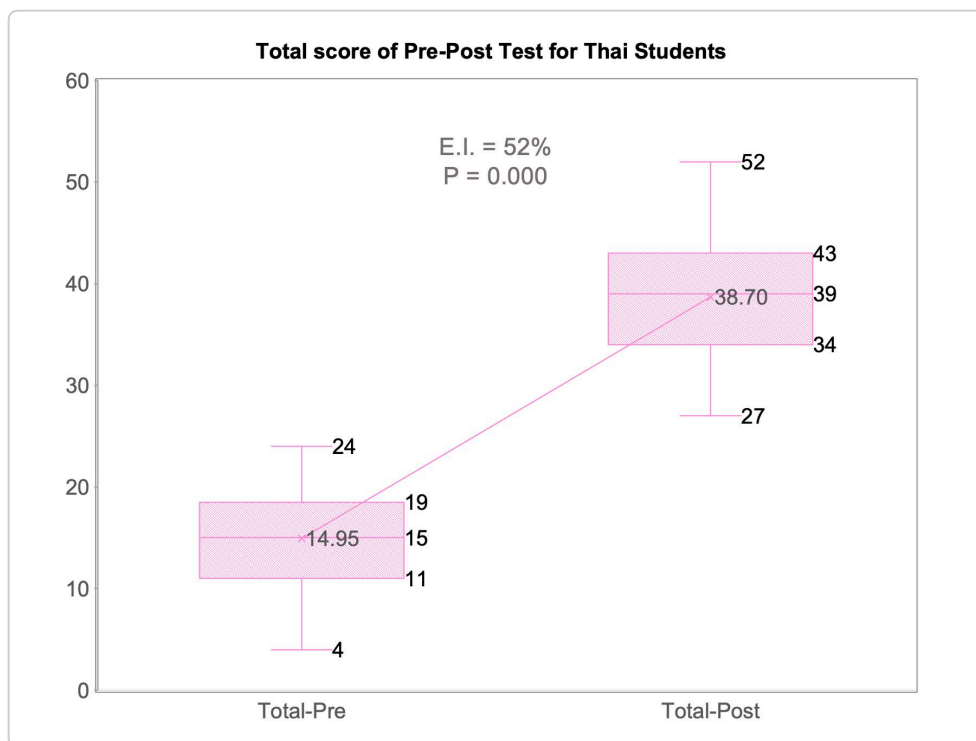


Figure 52 Total Score of Pre-&Post-Test for Thai Students

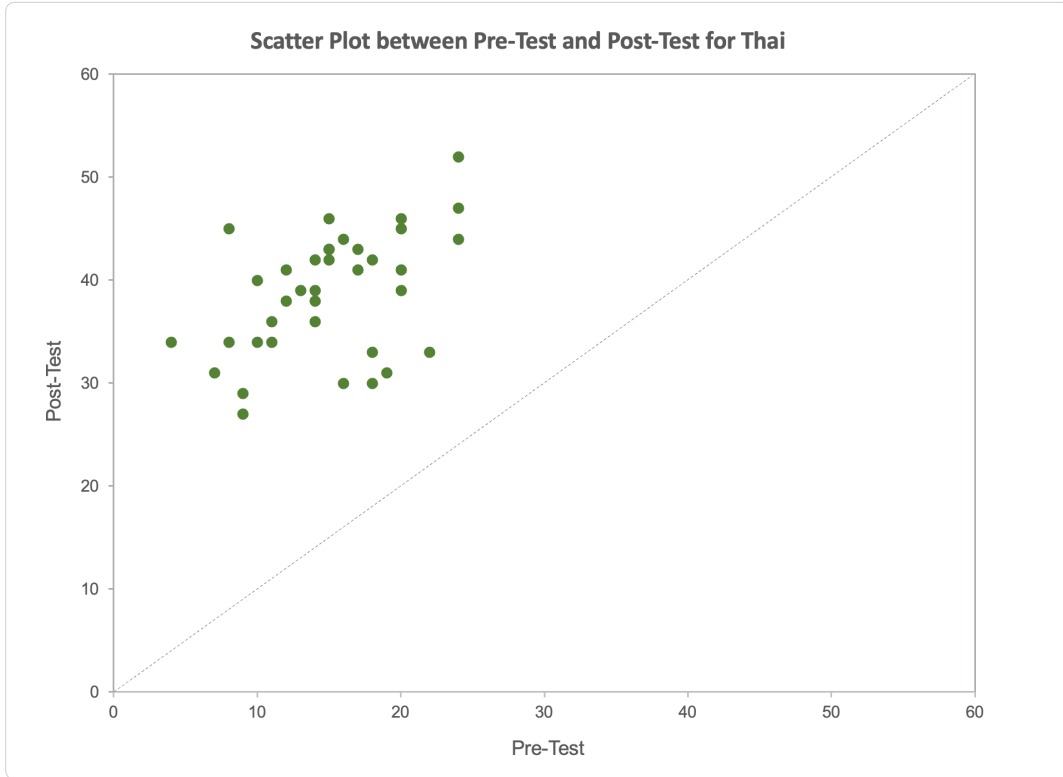


Figure 53 Scatter Plot between Pre-Test and Post-Test for Thai Students

According to the difference between the pre-and post-test of efficiencies and the pair-sample t-test results for Thai students (Table 11), we discovered that The E.I. of the vocabulary part was 0.83 (83%), the reading part 0.15 (15%), and the total score was 0.52 (52%), which indicated a lot of improvement.

Furthermore, the results of the p-value of the vocabulary test score, reading test score, and Total score are less than 0.05 of the Significant Value.

Table 11 The Difference between the Pre-and Post-Test of Efficiencies and the Pair-Sample t-Test Results for Thai Students

| GAT Test | Test | Paired Difference | | | | E.I. | df | P |
|-------------|------|-------------------|-------|-------|--------|------|----|----------------|
| | | av. | SD | E (%) | ΔE (%) | | | |
| Vocabulary | Pre | 5.297 | 2.807 | 17.7 | 68.8 | 0.83 | 36 | 0.0001030E-28* |
| | Post | 25.946 | 2.934 | 86.5 | | | | |
| Reading | Pre | 9.649 | 3.377 | 32.2 | 10.4 | 0.15 | 36 | 0.0004885401* |
| | Post | 12.757 | 4.573 | 42.5 | | | | |
| Total score | Pre | 14.946 | 5.022 | 24.9 | 39.6 | 0.52 | 36 | 0.0001522E-20* |
| | Post | 38.703 | 5.925 | 64.5 | | | | |

N_{Students} = 37, p < .05

Consequently, the E.I. and the p-value indicated that there was a statistically significant difference between the results of the pre-test and post-test. Therefore, the WCVL approach is considered to have aided Thai students in acquiring vocabulary and improving their reading comprehension.

5.3.2 Japanese Students

According to the listening score (Figure 53), reading scores (Figure 54), and total scores (Figure 55) of the pre-/post-test results for Japanese students, we found that the average score of the total score on the post-test ($\bar{x} = 434.32$) is slightly higher than that of the pre-test ($\bar{x} = 413.52$). Also, the average Listening test score on the post-test ($\bar{x} = 253.42$) is slightly higher than that of on pre-test ($\bar{x} = 232.05$). However, when we considered the average score of the reading part, we found that the average post-test score ($\bar{x} = 180.91$) was lower than that of the pre-test ($\bar{x} = 181.48$). Furthermore, Figure 56 illustrates Scatter plot between the pre-test and post-test for Japanese students. We found that half of the students have a total post-test score lower than that of the pre-test score on the chart.

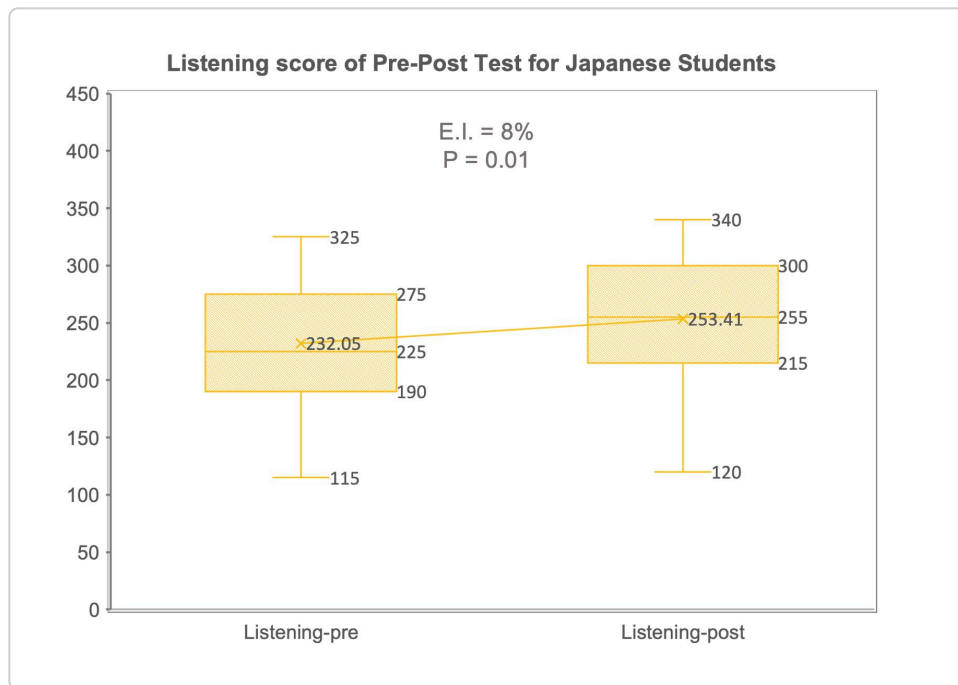


Figure 54 The Listening Score of Pre-Post Test for Japanese Students

Half of the students have a total post-test score lower than the pre-test score because the content of the TOEIC test does not match what was studied in class, so only a few learners of the score have increased.

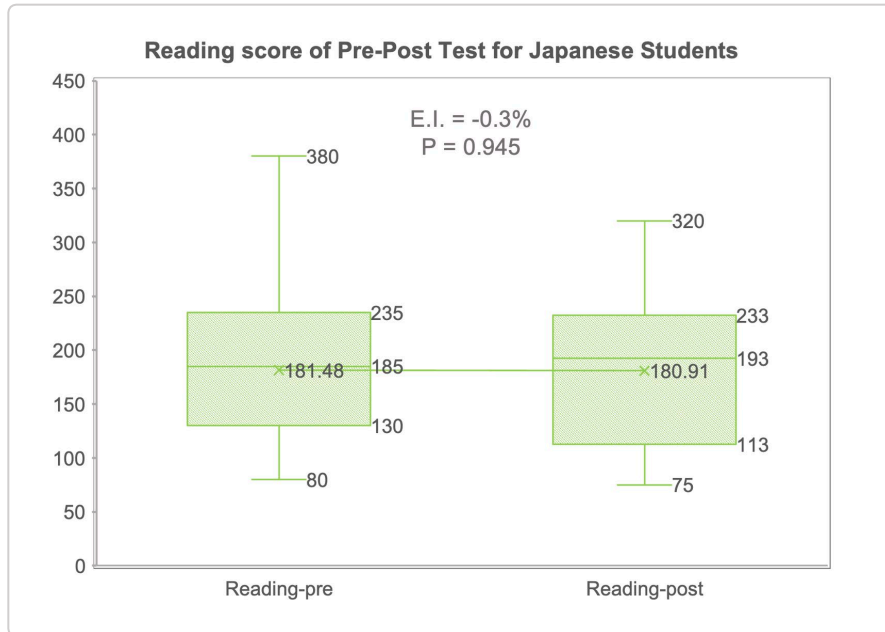


Figure 55 The Reading Score of Pre-Post Test for Japanese Students

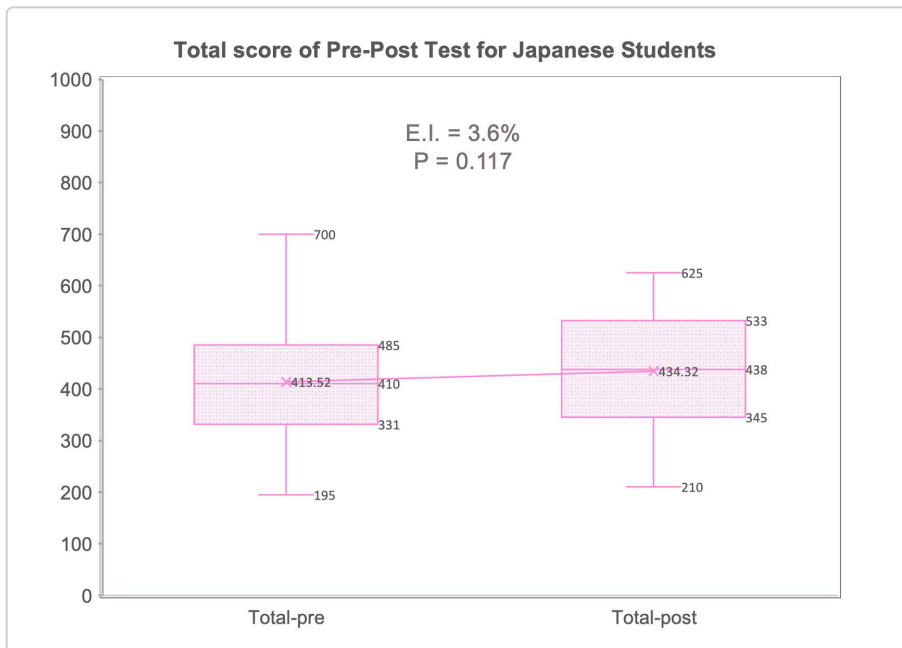


Figure 56 The Total Score of Pre-Post Test for Japanese Students

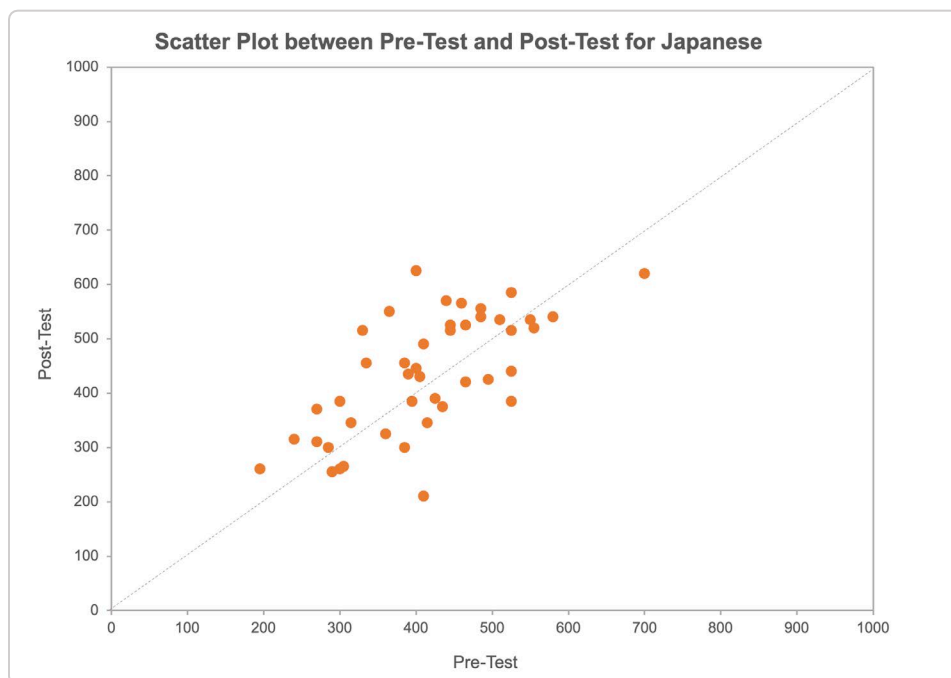


Figure 57 Scatter Plot between Pre-Test and Post-Test for Japanese Students

According to the difference between the pre-and post-test of efficiencies and the pair-sample t-test results for Japanese students (Table 12), we discovered that The E.I. of the listening part was 0.08 (8%), the reading part -0.003 (-0.3%), and the total score was 0.036 (3.6%), which indicated total score and listening part was little bit improve while the reading part had no any improvement.

In addition, the results of the p-value of the listening score, reading score, and total score, which are 0.013, 0.945, and 0.118, respectively, we found that only the listening part is less than a significant value at 0.05.

Table 12 The Effectiveness Index and the Difference between Pre- and Post-Test of the Pair-Sample t-Test Results for Japanese Students

| TOEIC Test | Test | Paired Difference | | | | E.I. | df | p |
|-------------|------|-------------------|---------|-------|--------|--------|----|---------------|
| | | av. | SD | E (%) | ΔE (%) | | | |
| Listening | Pre | 232.045 | 50.616 | 46.9 | 4.32 | 0.08 | 43 | 0.0132936624* |
| | Post | 253.409 | 53.892 | 51.2 | | | | |
| Reading | Pre | 181.477 | 68.536 | 36.7 | -0.11 | -0.003 | 43 | 0.9457238313 |
| | Post | 180.909 | 68.261 | 36.5 | | | | |
| Total score | Pre | 413.523 | 102.807 | 41.8 | 2.10 | 0.036 | 43 | 0.1178046342 |
| | Post | 434.318 | 111.003 | 43.9 | | | | |

N_{Students} = 44, p < .05

5.4 The Result of Learning Time

5.4.1 Relationship between Learning Time and Exercises

The relationship between Learning Time and Exercises for Thai (Figure 57) was shown as follows: Spelling ($\bar{x} = 137.56$ min.), Dictation ($\bar{x} = 93.78$ min.), Multiple Choices ($\bar{x} = 59.18$ min.), Matching ($\bar{x} = 47.29$ min.), True/False ($\bar{x} = 19.86$ min.), and Flashcard ($\bar{x} = 19.05$). At the same time, the relationship between Learning Time and Exercises for Japanese students (Figure 58) was shown: Spelling ($\bar{x} = 192.81$ min.), Dictation ($\bar{x} = 115.20$ min.), Multiple Choices ($\bar{x} = 105.61$ min.), Matching ($\bar{x} = 96.09$ min.), True/False ($\bar{x} = 81.34$ min.), and Flashcard ($\bar{x} = 64.31$ min.), indicating that that the most frequently used as the vocabulary learning tool. Conversely, true/false and Flashcard were used less frequently in both countries (Thailand and Japan).

5.4.2 Relationship between Learning Time and Increased Score

When we considered The Relationship between Study Time and Increased Scores for Thai students (Figure 59), we found that more extended vocabulary study time showed the potential for higher test scores. On the other hand, the Relationship between Study Time and Increased Scores for Japanese Students (Figure 60) showed that both relationships were not found between them.

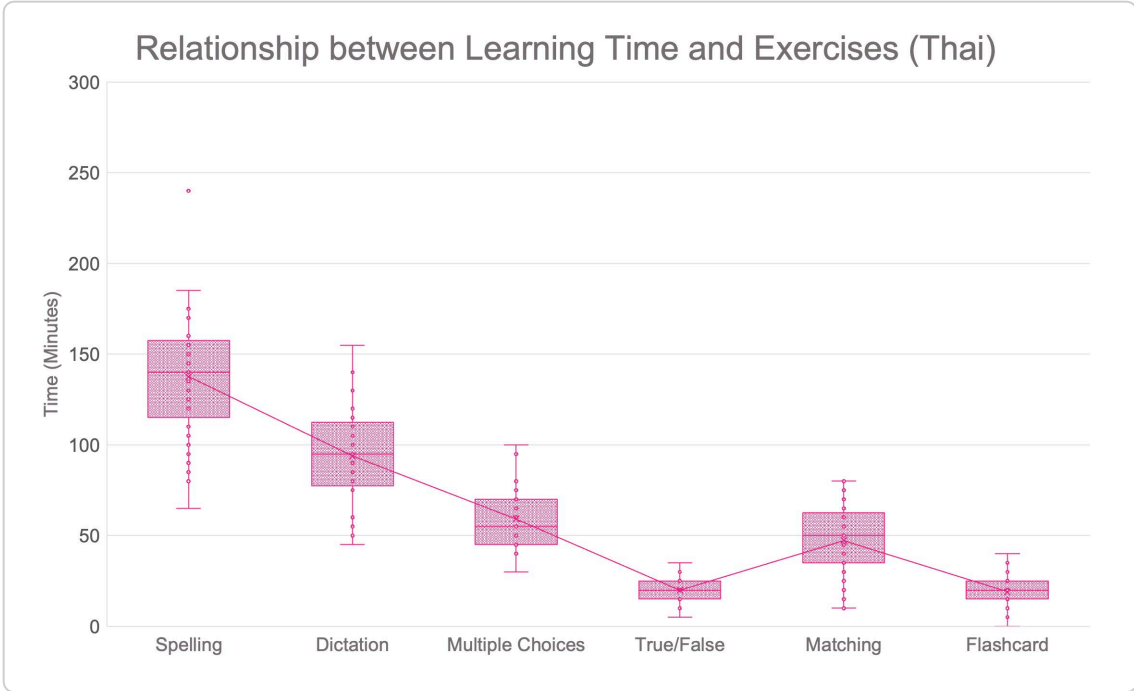


Figure 58 The Relationship between Learning Time and Exercises for Thai Students

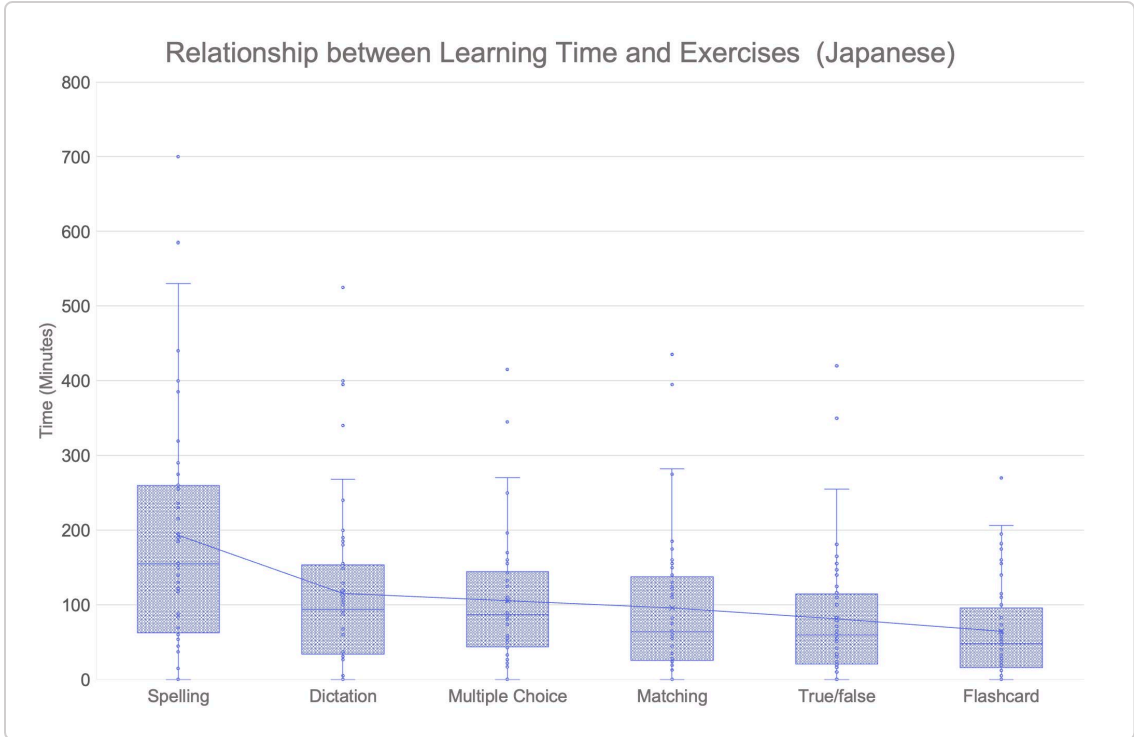


Figure 59 The Relationship between Learning Time and Exercises for Japanese Students

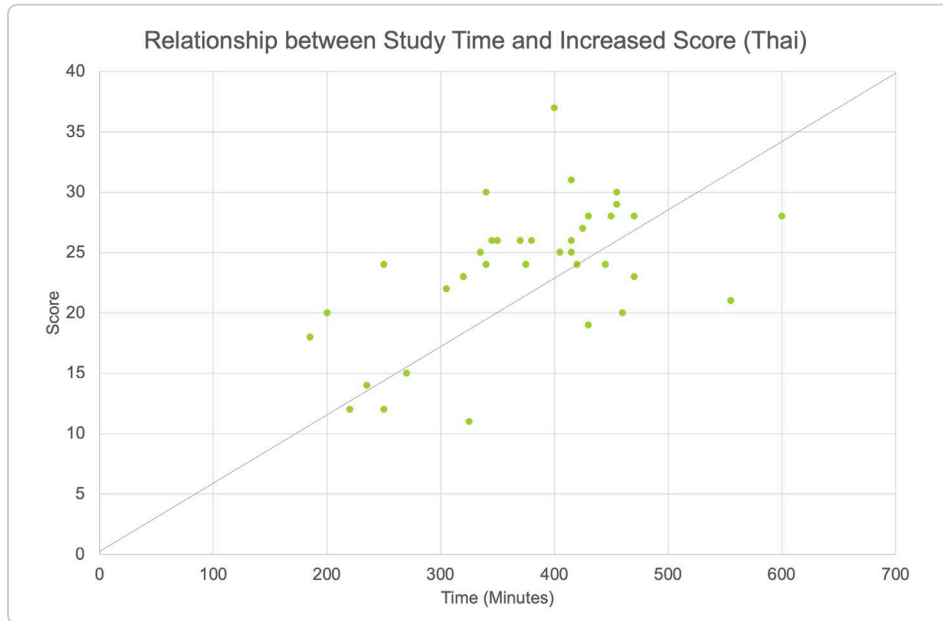


Figure 60 The Relationship between Study Time and Increased Scores for Thai Students

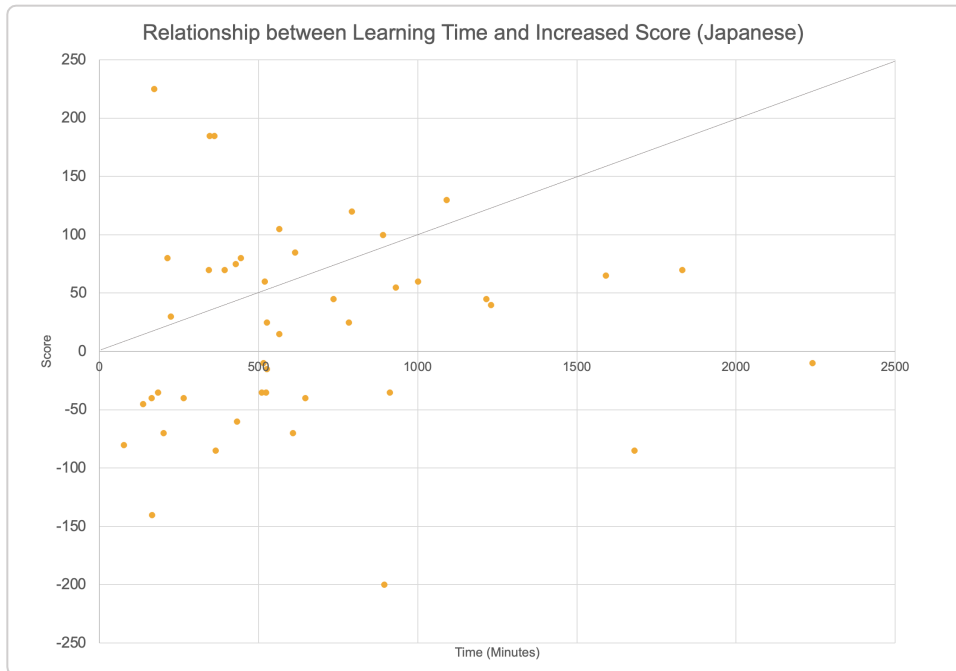


Figure 61 The Relationship between Study Time and Increased Scores for Japanese Students

5.5 The Result of the Questionnaire

We also evaluated the effectiveness of the system by analyzing the results of students' attitudes and behavior toward the system questionnaire.

5.5.1 Students' Attitudes and Behavior Toward the Exercise Options

In the WCVL system, we provided six exercise options: Spelling, Dictation, Multiple choice, Matching, True/False, and Flashcard. Then, we asked the students about their satisfaction and the effectiveness of the exercises for vocabulary learning. According to the radar chart of the student's attitudes and behavior toward exercises (Figure 61), and the results of the student's attitudes and behavior toward the exercises (Table 13), we found that, on average, the level of satisfaction and the effectiveness of all exercises from both countries (Thailand, Japan) were as follows: Spelling ($\bar{x} = 4.47$), Dictation ($\bar{x} = 4.41$), Multiple Choices ($\bar{x} = 4.35$), Matching ($\bar{x} = 4.22$), True/False ($\bar{x} = 3.86$), and Flashcard ($\bar{x} = 3.74$), indicating that each type of exercise was highly effectiveness for English vocabulary learning. However, when we compared the average satisfaction and effectiveness of each type of exercise in the two countries, we discovered that there were some disparities. The spelling exercises had the highest average score in both nations (Thai: $\bar{x} = 4.30$, Japanese: $\bar{x} = 4.64$). For Thai students, the True/False exercise had the lowest average score ($\bar{x} = 3.81$) among all exercise types. The Flashcard exercise was given the lowest average score ($\bar{x} = 3.39$) among all exercise types for Japanese students. The reason might be that in comparison to other exercise types, the Flashcard and True/False tasks may have been too easy and unchallenging for the students.

Table 13 Results of the Student's Attitudes and Behavior toward the Exercises

| Categories | | av. | SD |
|-----------------|----------|------|------|
| Spelling | Thai | 4.30 | 0.62 |
| | Japanese | 4.64 | 0.80 |
| Dictation | Thai | 4.24 | 0.60 |
| | Japanese | 4.57 | 0.61 |
| Multiple Choice | Thai | 4.22 | 0.53 |
| | Japanese | 4.48 | 0.66 |
| Matching | Thai | 4.16 | 0.65 |
| | Japanese | 4.27 | 0.82 |
| True/false | Thai | 3.81 | 0.78 |
| | Japanese | 3.91 | 1.03 |
| Flashcard | Thai | 4.08 | 0.80 |
| | Japanese | 3.39 | 1.20 |

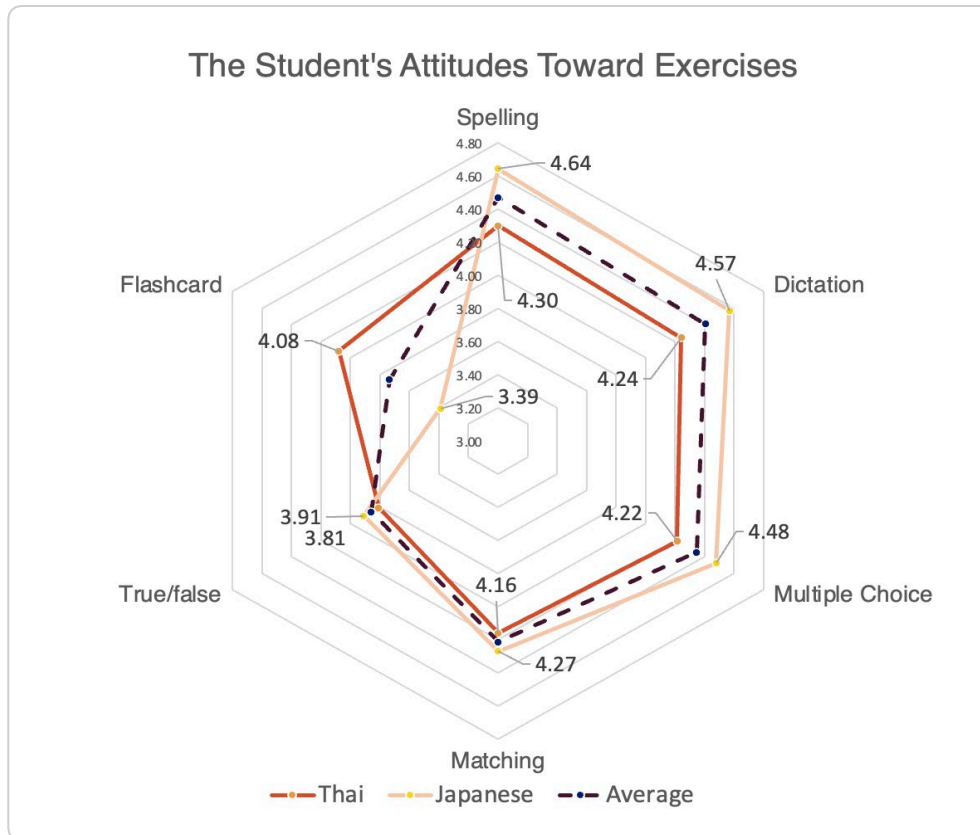


Figure 62 Radar Chart of the Student's Attitudes and Behavior toward Exercises

5.5.2 Students' Attitudes and Behavior Toward the System

The radar chart of students' attitudes and behavior toward the system (Figure 62), the results of the student's attitudes and behavior toward the system (Table 14), and the percentage of Thai and Japanese students' answers to the questionnaire (Figure 63 and Figure 64, respectively), providing significant insight into students' attitudes and behavior toward the WCVL system.

The overall average of the study was 4.34, the average score of Thai students was 4.25, and the percentage of Thai students who answered Strongly Agree and Agree was 95.28%. Contrariwise, the average score of Japanese students was 4.43, and the percentage of Japanese students who answered Strongly Agree and Agree was 91.80%. These results indicate that students from both nations have satisfied with using our system to improve their English vocabulary learning and reading comprehension.

Table 14 Results of the Student's Attitudes and Behavior toward the System

| Question's Categories | | av. | SD |
|---|-------|------|------|
| English Vocabulary Learning (V) | Thai | 4.30 | 0.55 |
| | Japan | 4.67 | 0.52 |
| Satisfaction of System Usage (S) | Thai | 4.34 | 0.52 |
| | Japan | 4.38 | 0.69 |
| The Appropriateness of Content and Test (C) | Thai | 4.21 | 0.50 |
| | Japan | 4.39 | 0.67 |
| Effectiveness of Practice Tasks (P) | Thai | 4.14 | 0.68 |
| | Japan | 4.21 | 0.96 |
| Reading Comprehension Improvement (R) | Thai | 4.36 | 0.48 |
| | Japan | 4.63 | 0.54 |
| System User Interface Design (D) | Thai | 4.03 | 0.41 |
| | Japan | 4.37 | 0.77 |
| System Functions (F) | Thai | 4.30 | 0.62 |
| | Japan | 4.47 | 0.72 |
| Future System Usage (N) | Thai | 4.30 | 0.46 |
| | Japan | 4.31 | 0.75 |

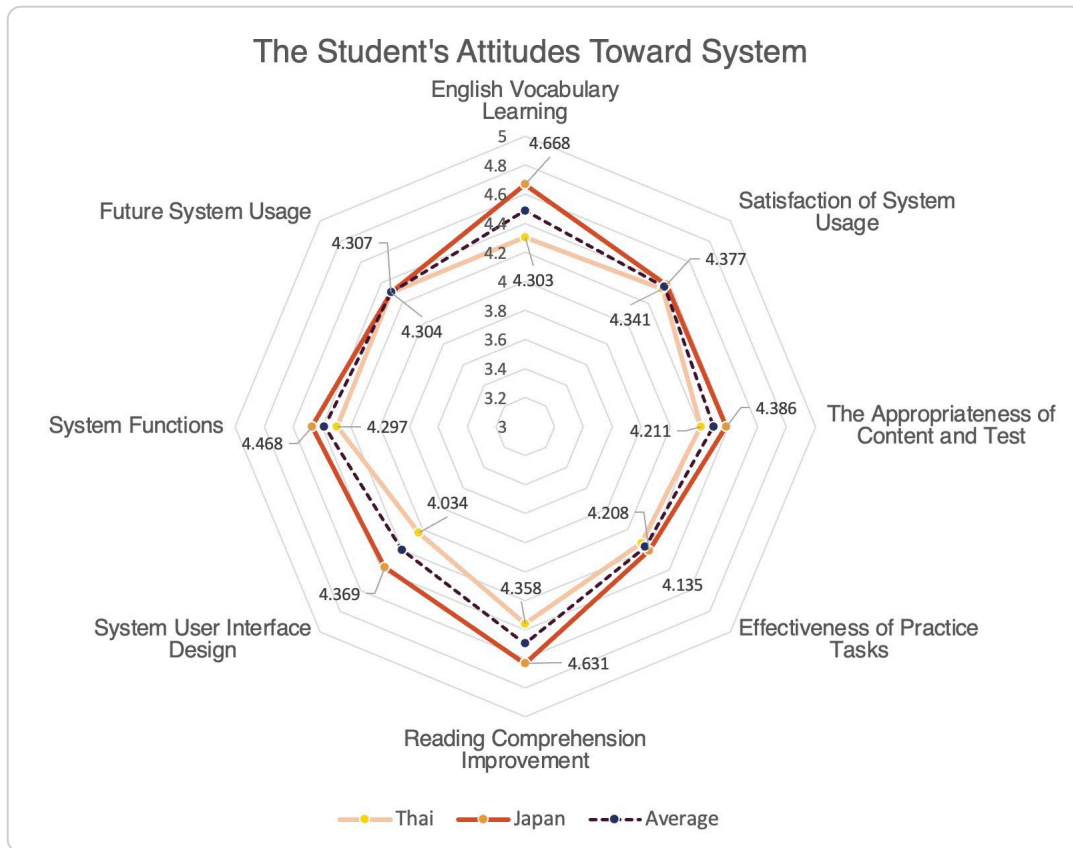


Figure 63 Rader Chart of the Student's Attitudes and Behavior toward the System

Therefore, the pre-and post-tests and the questionnaire result demonstrate that our developed system efficiently enhances Thai students' English vocabulary acquisition and reading comprehension. These results suggest that the system is appropriate for English vocabulary learning support in Thailand's senior high schools. On the other hand, the system may not be helpful for enhancing the reading comprehension of Japanese students. Nevertheless, according to the questionnaire, the average scores for English Vocabulary Learning, Reading Comprehension Improvement, and Usage Satisfaction were higher than 4 points. Thus, the results suggest that Japanese students are satisfied and comfortable with our system as a support tool and that it might motivate them to learn English vocabulary via the WCVL system.

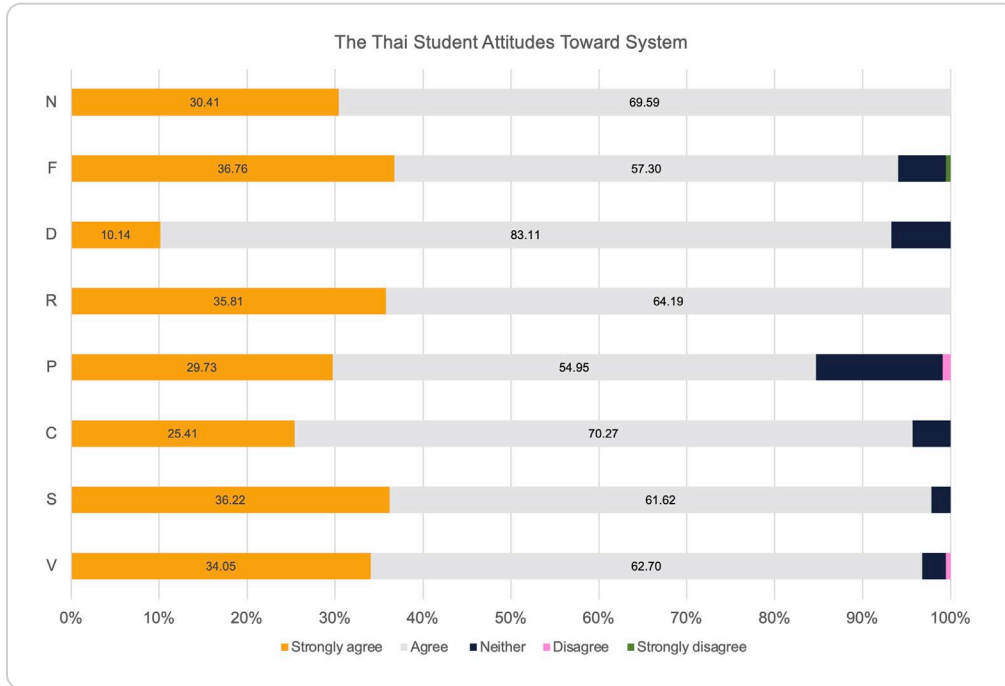


Figure 64 The Thai Students' Answers to Items in the Questionnaire in Percentage Terms

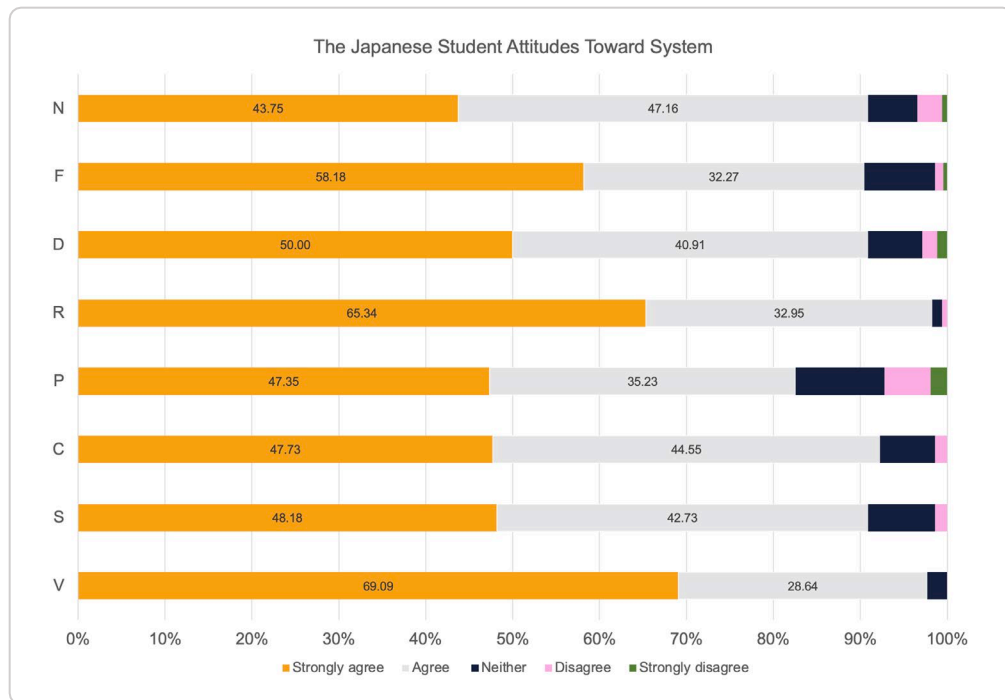


Figure 65 The Japanese Students' Answers to Items in the Questionnaire in Percentage Terms

Chapter 6

Conclusions and Future works

In this chapter, to achieve a new approach to learning unknown words through various vocabulary exercises using the WCVL system as a support system for enhancing students' reading comprehension, we summarize the results throughout the research and state the contributions of our studies to provide proof of concept.

6.1 Summary of contributions

The novelties and contributions of this Doctoral research were:

- 1) We developed a multi-device Word-level Classification and Vocabulary Learning (WCVL) system that automatically extracts English vocabulary from any English text and automatically creates various types of vocabulary learning materials. As shown in chapter 2, the Word-level Classification and Vocabulary Learning System (WCVL) was developed utilizing the Waterfall software development methodology, which consists of five stages: requirements analysis, system design, implementation, setup, and evaluation.
- 2) In the requirements analysis stage, we analyzed the shortfalls of features in previous works, including the KH coder, Word-Level Checker, and Quizlet, to propose a new system with the following features.

2.1) The system can morphologically extract words from any English text and transform grammatically conditioned forms of words, e.g., plural nouns or past tense forms, into base forms.

2.2) The extracted words are classified according to their difficulty levels in accordance with the SVL12000 standard vocabulary level database, which contains 12,000 English words and is divided into 12 difficulty levels.

2.3) The system can automatically add meanings of English words in Thai (English–Thai Cambridge Dictionary) and Japanese (ALC Education). To the best of our knowledge, this is the first time to develop an English vocabulary database with classification by 12 difficulty levels and adding Thai meanings.

2.4) The system can create various learning vocabulary materials automatically.

2.5) The system can be offered on a website. The learners (users) can access this learning system with smartphones, tablet devices, or laptops.

- 3) In the system design stage, the design of the WCVL system was modeled in the form of a UML (Unified Modeling Language) to create use case diagrams. The use case diagrams show the interaction between students (actors) and the WCVL system, as in chapter 3.
- 4) We evaluated the effectiveness of the WCVL system by analyzing the results of the student's attitudes toward the WCLV system questionnaire (Pilot study). In this pilot study, the overall average of the study was 4.30. The average score of Thai students was 4.48, and the percentage of Thai students who answered Strongly Agree and Agree was 96.56%. Conversely, the average score of Japanese students was 4.22, and the percentage of Japanese students who answered Strongly Agree and Agree was 79.49% (Chapter 3). The results reveal that the WCVL system we developed is powerful enough to function as a support system for students in learning and memorizing vocabulary.
- 5) In the WCVL system, we provided six exercise options: spelling, dictation, multiple choices, matching, true/false, and flashcards. We analyzed the relationship between learning time and exercises, and also considered the

relationship between learning time and increased Scores. We found that more extended vocabulary study time showed the potential for higher test scores. On the other hand, the Relationship between Study Time and Increased Scores for Japanese Students showed that both relationships were not found between them. We then asked the students about their satisfaction and the effectiveness of the exercises for vocabulary learning. According to the radar chart (Figure 61) and the results of the student's attitudes and behavior toward the exercise (Table 13) we found that, on average, the level of satisfaction and effectiveness of all exercises from both countries (Thailand and Japan) were as follows: spelling ($\bar{x} = 4.47$), dictation ($\bar{x} = 4.41$), multiple choices ($\bar{x} = 4.35$), matching ($\bar{x} = 4.22$), true/false ($\bar{x} = 3.86$), and flashcards ($\bar{x} = 3.74$). These results indicate that each type of exercise had high effectiveness for English vocabulary learning (Chapter 5).

- 6) This study was conducted in two stages to evaluate the effectiveness of the WCVL system as a support system for students' vocabulary learning and reading comprehension, as well as the students' attitudes toward the WCVL system after using it (Chapter 5). The results of the pre/post-tests and questionnaire indicate that our proposed system enhances English vocabulary learning and reading comprehension in Thai students. These results suggest that the system is appropriate for use as an English vocabulary learning support system in Thailand's senior high schools. However, the system might need to be more effective in enhancing the reading comprehension of Japanese students. Notwithstanding, according to the questionnaire, the average scores for the English vocabulary learning, reading comprehension improvement, and usage satisfaction categories were higher than 4 points. Thus, the results suggest that Japanese students are satisfied with our system as a support system and that it can motivate them to learn English vocabulary.

6.2 Limitations

The developed WCVL system can morphologically extract words from any English text and transform grammatically conditioned forms of words, e.g., plural nouns or past tense forms, into base forms. However, the system cannot analyze the Phase of verbs, idioms, and vocabulary outside the SVL12000 database, which might affect students' reading comprehension. Due to the small sample size of this study, the result may be not representative. Furthermore, regarding the results between Thailand and Japanese students, we provide the different types of content and the type of exam in pre/post-test.

6.3 Future works

In the future, we will develop a new feature such as analyzing the Phase of verbs, idioms, and vocabulary outside the SVL12000 database that will make our system more effective in enhancing the reading comprehension of students. In addition, we will change the parameter such as the type of test, and the types of contents, and conduct the new experiment with more participants.

List of Publications

1. Publications

(1) Kamal Baha, Makoto Shishido, “Development of Word-Level Classification and Vocabulary Meaning System”, International Journal of Information and Education Technology (IJIET). Vol. 12, No. 11(2022), P.1205 – P.1210.

(2) Kamal Baha, Makoto Shishido, “Development of Vocabulary Study System and Measurement of its Effect”, Submitted to International Journal on E-Learning (IJEL), P.05 - P.18.

2. Conferences

a. International Conferences

(1) Development of Vocabulary Study System and Measurement of its Effect, Kamal Baha, Makoto Shishido, The Barcelona Conference on Education (BCE2022) (Online, Spain), 2022.09.

(2) Development of Vocabulary Study System and Measurement of its Effect, Kamal Baha, Makoto Shishido, EdMedia + Innovate Learning Online, Association for the advancement of computing in Education (AACE, USA) ,2022.11.

(3) Development of a Word-Level Classification and Vocabulary Learning (WCVL) System, Kamal Baha, Makoto Shishido, International Conference on Soft Computing and Intelligent Systems and 23rd International Symposium on Advanced Intelligent Systems (SCIS&ISIS) (Online, Japan), 2022.11.

b. Domestic Conferences

(1) Development of English Text Analysis and Vocabulary Level Checking System, Kamal Baha, Makoto Shishido, The 34th Annual Conference of JSET, Tohoku University, Tohoku Japan, 2018.09.

(2) Development of English Text Analysis and Vocabulary Level Checking System, Kamal Baha, Makoto Shishido, The JSET Autumn Conference 2019, Nagoya Congress Center, Nagoya Japan, 2019.09 .

(3) Developing English Vocabulary Study Support System Based on Constructivism Learning Theory, Kamal Baha, Makoto Shishido, The Association for Natural Language Processing Conference (NLP2022) (Online, Japan), 2022.03.

(4) Development of a Word-Level Classification and Vocabulary Learning (WCVL) System, Kamal Baha, Makoto Shishido, The 23rd International Symposium on Advanced Intelligent Systems (SCIS&ISIS2022.), 2022.11.

References

- Afzal, N. (2019). A Study on Vocabulary-Learning Problems Encountered by BA English Majors at the University Level of Education. *Arab World English Journal*, 10(3), 81–98. <https://doi.org/10.24093/awej/vol10no3.6>
- Al-Ansi, A. M., Garad, A., & Al-Ansi, A. (2021). ICT-Based Learning During Covid-19 Outbreak: Advantages, Opportunities and Challenges. *Gagasan Pendidikan Indonesia*, 2(1), 10. <https://doi.org/10.30870/gpi.v2i1.10176>
- Alghamdi, H. H. (2018). Exploring Second Language Vocabulary Learning in ESL Classes. *Vocabulary Acquisition Style in the ESL Classroom: A Survey on the Use of Vocabulary Learning Strategies by the Primary 3 Learners*, 12(1), Article 1. <https://doi.org/10.5539/elt.v12n1p78>
- Bauersfeld, H. (2012). “Language Games” in the Mathematics Classroom: Their Function and Their Effects. In *The emergence of mathematical meaning* (pp. 277–297). Routledge.
- Binyamin, S. S., Rutter, M., & Smith, S. (2019). Extending the Technology Acceptance Model to Understand Students’ Use of Learning Management Systems in Saudi Higher Education. *International Journal of Emerging Technologies in Learning (IJET)*, 14(03), 4. <https://doi.org/10.3991/ijet.v14i03.9732>
- Bruckner, M. (2015). Educational technology. *Faculty of Education Naresuan University.*, 10(2.1), 2180–9449. <https://doi.org/doi:10.13140/2.1.2180.9449>.
- Christie, A. (2005). *Constructivism and its implications for educators*.

- Chujo, K. (2004). Measuring Vocabulary Levels of English Textbooks and Tests Using a BNC Lemmatized High Frequency Word List. *Language and Computers*, 51, 231–249.
- Chujo, K., & Oghigian, K. (2015). *Examining Corpus-based L2 Vocabulary Lists for Grade Level and Semantic Field Distribution*. 9.
- Clements, D. H. (1997). In my opinion:(Mis?) Constructing constructivism. *Teaching Children Mathematics*, 4(4), 198–200.
- Cronbach, L. J. (1951). Coefficient Alpha and the Internal Structure of Tests. *Psychometrika*, 16(3), 297–334.
- Davies, M., & Gardner, D. (2010). *Word Frequency List of American English*. 632.
- Decarrico, J. S. (2001). Vocabulary Learning and Teaching. *Teaching English as a Second or Foreign Language*, 3, 285–299.
- Dizon, G. & others. (2016). Quizlet in the Efl Classroom: Enhancing Academic Vocabulary Acquisition of Japanese University Students. *Teaching English with Technology*, 16(2), 40–56.
- Evans, R. I. (1973). *Jean Piaget: The man and his ideas*. EP Dutton.
- Flavell, J. H. (1963). *The developmental psychology of Jean Piaget*. D van Nostrand.
- Gagne, R. M., & Briggs, L. J. (1974). *Principles of instructional design*. Holt, Rinehart & Winston.
- Goodman, R. I., Fletcher, K. A., & Schneider, E. W. (1980). The Effectiveness Index as a Comparative Measure in Media Product Evaluations. *Educational Technology*, 20(9), 30–34.

- Grabowski, S., & Branch, R. (2003). Teaching & Media: A Systematic Approach. Retrieved, August, 14, 2018.
- Harmon, J. M. (2002). Teaching Independent Word Learning Strategies to Struggling Readers. *Journal of Adolescent and Adult Literacy*, 45(7), 606–615.
- Higuchi, K. (2016). *KH Coder 3 Reference Manual*. Ritsumeikan University. https://kncoder.net/en/manual_en_v3.pdf
- Higuchi, K. (2017). Using KH Coder in the Field of Linguistics. *The Mathematical Linguistic Society of Japan*, 31(1), 36–45.
- Hoover, W. A. (1996). The practice implications of constructivism. *SEDL Letter*, 9(3), 1–2.
- Huang, R., Spector, J. M., & Yang, J. (2019). *Educational Technology a Primer for the 21st century*. Springer.
- Ishikawa, Y., Reiko, Y., Mutsumi, K., Takashi, K., Hiroshi, H., & Norihisa, W. (2011). TOEIC® Test Learning with ATR CALL BRIX: A Case Study of a University and a Company. *Proceedings of the 2011 Annual Conference of the University ICT Promotion Association*, 296–300.
- Katsumi, K., & Tamura, T. (2021). International Comparison of Parental Perception Regarding Young Children's ICT Usage. *Information and Technology in Education and Learning*, 1(1), Reg-p001-Reg-p001. <https://doi.org/10.12937/itel.1.1.Reg.p001>
- Kelly, S. (2018). *Morphological Analysis Library* [Javascript Library]. Compromise. <http://compromise.cool/>
- Kim, T. K. (2015). T test as a parametric statistic. *Korean Journal of Anesthesiology*, 68(6), 540–546.

- Lazar, S. (2015). The importance of educational technology in teaching. *International Journal of Cognitive Research in Science, Engineering and Education*, 3(1), 111–114.
- Linda, A., & Shah, P. M. (2020). Vocabulary Acquisition Style in the ESL Classroom: A Survey on the Use of Vocabulary Learning Strategies by the Primary 3 Learners. *Creative Education*, 11(10), Article 10. <https://doi.org/10.4236/ce.2020.1110144>
- Lucitasari, D. R., Khannan, M. S. A., & others. (2019). Designing Mobile Alumni Tracer Study System Using Waterfall Method: An Android Based. *International Journal of Computer Networks and Communications Security*, 7(9), 196–202.
- Machmud, M. T., Widiyan, A. P., & Ramadhani, N. R. (2021). The development and policies of ICT supporting educational technology in Singapore, Thailand, Indonesia, and Myanmar. *International Journal of Evaluation and Research in Education (IJERE)*, 10(1), 78. <https://doi.org/10.11591/ijere.v10i1.20786>
- Manihuruk, D. H. (2020). The Correlation Between EFL Students' Vocabulary Knowledge and Reading Comprehension: A Case Study at the English Education Department of Universitas Kristen Indonesia. *Journal of English Teaching*, 6(1), Article 1.
- Mayer, R. E. (2002). Multimedia learning. In *Psychology of learning and motivation* (Vol. 41, pp. 85–139). Elsevier.
- Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist*, 38(1), 43–52.
- Mezynski, K. (1983). Issues Concerning the Acquisition of Knowledge: Effects of Vocabulary Training on Reading Comprehension. *Review of Educational Research*, 53(2), 253–279. <https://doi.org/10.3102/00346543053002253>

- Mizumoto, A. (2021). *New Word Level Checker* [Web application].
<https://nwlc.pythonanywhere.com/>
- Mvududu, N. H., & Thiel-Burgess, J. (2012). Constructivism in Practice: The Case for English Language Learners. *International Journal of Education*, 4(3), p108–p118.
<https://doi.org/10.5296/ije.v4i3.2223>
- Nunan, D. (Ed.). (2003). *Practical English Language Teaching* (1st ed). McGraw-Hill/Contemporary.
- Pan, Q., & Xu, R. (2011). Vocabulary Teaching in English Language Teaching. *Theory & Practice in Language Studies*, 1(11).
- Patten, B., Arnedillo Sánchez, I., & Tangney, B. (2006). Designing collaborative, constructionist and contextual applications for handheld devices. *Computers and Education*, 46(3), 294–308. <https://doi.org/10.1016/j.compedu.2005.11.011>
- Piaget, J. (1952). *Jean Piaget*.
- Qian, D. D. (2002). Investigating the Relationship Between Vocabulary Knowledge and Academic Reading Performance: An Assessment Perspective. *Language Learning*, 52(3), 513–536.
- Rezaei, A., Mai, N., & Pesaranghader, A. (2014). The Effect of Mobile Applications on English Vocabulary Acquisition. *Jurnal Teknologi*, 68(2).
<https://doi.org/10.11113/jt.v68.2912>
- Rupley, W. H., Logan, J. W., & Nichols, W. D. (1998). Vocabulary Instruction in a Balanced Reading Program. *The Reading Teacher*, 52(4), 336–346.

- Seneviratne, C. (2013). Integrating e-learning with English language learning. *2013 International Conference on Advances in ICT for Emerging Regions (ICTer)*, 282–282. <https://doi.org/10.1109/ICTer.2013.6761196>
- Setuju, Ratnawati, D., Wijayanti, A., Widodo, W., & Setiadi, B. R. (2020). ICT-based learning media development. *Journal of Physics: Conference Series*, *1446*(1), 012038. <https://doi.org/10.1088/1742-6596/1446/1/012038>
- Solhi Andarab, M. (2019). Learning Vocabulary through Collocating on Quizlet. *Universal Journal of Educational Research*, *7*(4), 980–985. <https://doi.org/10.13189/ujer.2019.070409>
- Spector, J. M. (2015). *Foundations of educational technology: Integrative approaches and interdisciplinary perspectives*. Routledge.
- Suryn, W. (2013). *Software Quality Engineering: A Practitioner's Approach*. John Wiley & Sons.
- Tomljenović, Z., & Tatalović Vorkapić, S. (2020). Constructivism in Visual Arts Classes. *Center for Educational Policy Studies Journal*, *10*(4), 13–32. <https://doi.org/10.26529/cepsj.913>
- Tsai, Y.-L., & Shang, H.-F. (2010). The Impact of Content-Based Language Instruction on EFL Students' Reading Performance. *Asian Social Science*, *6*(3), p77. <https://doi.org/10.5539/ass.v6n3p77>
- Wang, B.-T. (2017). Designing Mobile Apps for English Vocabulary Learning. *International Journal of Information and Education Technology*, *7*(4), Article 4. <https://doi.org/10.18178/ijiet.2017.7.4.881>

- Westfall, P. H., & Young, S. S. (1993). *Resampling-based multiple testing: Examples and methods for p-value adjustment* (Vol. 279). John Wiley & Sons.
- Woolf, B. P., Arroyo, I., & Zualkernan, I. A. (2011). Education technology for the developing world. *2011 IEEE Global Humanitarian Technology Conference*, 493–498.
- Yang, W., & Dai, W. (2012). Vocabulary memorizing strategies by Chinese university students. *International Education Studies*, 5(1), 208–214.
- Yasumasa, S. (2006). *Aoyama Gakuin University Word Level Checker*. <http://someya-net.com/wlc/index.html?fbclid=IwAR3IbTZSGadkvMMYq5ngLXoBxKFpNa3Vfcq3RVNJ6DtrM-o6YQDMaVjd-fU>

Picture Reference

Figure 1

General ICT Tools for Teaching and Learning

From

"Image: Freepik.com". The Figure 1 has been designed using assets from Freepik.com

Acknowledgments

First of all, I would like to express my deepest gratitude to my advisor, Prof. Dr. Makoto Shishido for the support of my Ph.D. studies at Multimedia Educational Technology Research Laboratory and start my journey into the world of educational technology and system development. I have been fortunate to have an advisor who cared so much about my work and responded promptly to my questions and queries. There would not have been possible without his continued patience and endless support. It is a privilege to work with him and have him as my advisor. His wisdom and experiences will always be the guidance for my future work and life.

Besides my advisors, I would like to thank my committee members Prof. Dr. T. Shibata sensei, Prof. Dr. H. Abe sensei and Prof. Dr. S. Dohi sensei who gave useful advice for the revision and improvement of my thesis.

I would like to thank Mr. Kamal Abdulwahab, the principal of Azizstan Foundation School, the teachers who managed the pilot study test, and all senior students who participated in the compilation of this study.

I would like to thank my friends in the lab, for all their help and support from beginning to end. I am really lucky to know them all.

I would like to thank Mr. Amir, Ms. Kornkanok, Asst. Prof. Dr. Yutthasak, Dr. Chayanis, Ms. Waranrach, Ms. Yanika, and all the people who have supported me during the period of my life in Japan for providing wonderful moments, keeping me going through life, and always pushing and encouraging me to get through all obstacles not only in research but also in my personal life.

I would like to thank my parents for supporting my decision to leave the homeland to pursue my Ph.D. in Japan and for providing me with emotional support, love, and understanding. In addition, I thank my little brother Basil Baha, Akil Baha, Waiil Baha

and my little sister Manal Baha and Nurhana Ussama for taking his/her time to video call me on the weekends to give me an update on her exciting teenage life.

Last but definitely not least, I would like to thank my wife, Ms. Warunya Ussama, for all her cooking for me when I was blue in the past five years. I would not have been able to complete this thesis without her encouragement and support. Thank you so much from the bottom of my heart.

Appendixes

I. The Questions used in the Questionnaire

The questionnaire was provided to evaluate the student's attitude and behavior toward the WCVL system and satisfaction after utilizing the system (This questionnaire will be translated into Thai and Japanese).

This questionnaire has been created as a part of a research study, conducted by Mr. Kamal Baha, in Azizstan Foundation School with 37 senior high school of a similar background and limited expertise in English learning and a group of 44 third- and fourth-year students from Tokyo Denki University in Japan.

The purpose of this questionnaire is to evaluate the WCVL system after collecting data on the attitudes and behaviors of students using a Google Forms-created online questionnaire.

The questionnaire will be divided into eight question categories: English vocabulary acquisition, satisfaction with system usage, appropriateness of content and test system, the effectiveness of exercise tasks, improvement in reading comprehension, system user interface design, system functions, and future system usage.

| Extent of Your Satisfaction with the Following (5 Liker Scales) | | | | |
|---|-------|---------|----------|-------------------|
| 5 | 4 | 3 | 2 | 1 |
| Strongly agree | Agree | Neither | Disagree | Strongly disagree |

| English Vocabulary Learning (W) | | 5 | 4 | 3 | 2 | 1 |
|---------------------------------|--|---|---|---|---|---|
| W1 | Information and communication technologies (ICT) such as websites and applications are useful for vocabulary learning. | | | | | |
| W2 | Knowing the meaning of English words in mother tongue is useful for learning English. | | | | | |
| W3 | Knowing the meaning of English words in mother tongue is useful for reading English text. | | | | | |
| W4 | Distinguishing between existing words and unknown words in a vocabulary is useful for learning new words. | | | | | |
| W5 | Vocabulary is divided into 12 levels of difficulty, making it easy to learn vocabulary. | | | | | |

| Satisfaction of system usage (S) | | 5 | 4 | 3 | 2 | 1 |
|----------------------------------|---|---|---|---|---|---|
| S1 | The WCVL system is easy to use and easy to understand how to use. | | | | | |
| S2 | The WCVL system is useful as a support system to enhance English vocabulary learning. | | | | | |
| S3 | Satisfied with the use of the WCVL system. | | | | | |
| S4 | The WCVL system increases interest in learning English vocabulary. | | | | | |
| S5 | After using the WCVL system, I can remember English vocabulary well. | | | | | |

| Study and Test Content (C) | | 5 | 4 | 3 | 2 | 1 |
|----------------------------|--|---|---|---|---|---|
| C1 | The database of words and Japanese meanings used in the WCVL system matches the learning contents in the class. | | | | | |
| C2 | The database of words and Japanese meanings used in the WCVL system can be used to learn words for the TOEIC test or GAT test. | | | | | |
| C3 | If you study English sentences that you are interested in with WCVL, your interest in learning words will increase further. | | | | | |
| C4 | The content of the English texts provided in the class is appropriate for the learner. | | | | | |
| C5 | It is a suitable pace for student to learn English words in one English essay every week. | | | | | |

| Effectiveness of Exercise Tasks (E) | | 5 | 4 | 3 | 2 | 1 |
|-------------------------------------|--|---|---|---|---|---|
| E1 | The spelling exercises were easy to do and effective for vocabulary learning. | | | | | |
| E2 | The Dictation exercises were easy to do and effective for vocabulary learning. | | | | | |
| E3 | The Multiple-Choice exercises were easy to do and effective for vocabulary learning. | | | | | |
| E4 | The Matching exercises were easy to do and effective for vocabulary learning. | | | | | |
| E5 | The True/False exercises were easy to do and effective for vocabulary learning. | | | | | |
| E6 | The Flashcard exercises were easy to do and effective for vocabulary learning. | | | | | |

| Reading Comprehension Improvement (R) | | 5 | 4 | 3 | 2 | 1 |
|---------------------------------------|--|---|---|---|---|---|
| R1 | Information and communication technologies (ICT) such as the Web and applications are useful in enhancing reading comprehension. | | | | | |
| R2 | Knowing the meaning of English words in mother tongue is useful for understanding the content of English texts. | | | | | |
| R3 | Learning English vocabulary before reading an English text can help you better understand the content of the English text. | | | | | |
| R4 | The WCVM system allows for a deeper understanding of the English content. | | | | | |

| System User Interface Design (D) | | 5 | 4 | 3 | 2 | 1 |
|----------------------------------|--|---|---|---|---|---|
| D1 | The system used appropriate font type, size, and color. | | | | | |
| D2 | The system showed appropriate position of known and unknown word list. | | | | | |
| D3 | Icon or symbols on menus are appropriate and easy to understand | | | | | |
| D4 | The layout of system components and menus is appropriate and easy for usage. | | | | | |

| System Functions (F) | | 5 | 4 | 3 | 2 | 1 |
|----------------------|---|---|---|---|---|---|
| F1 | Six types of practices are provided, which learners can choose from to encourage and help them learn vocabulary. | | | | | |
| F2 | The WCVL system processing speed is fast. | | | | | |
| F3 | The voices function for reading English words helps you to remember English words with their correct pronunciation. | | | | | |
| F4 | The WCVL system allows you to learn and review English vocabulary anywhere on any other device. | | | | | |
| F5 | Displaying remembered words and progress graphs in learner's personal database will increase the learner's interest in learning English vocabulary. | | | | | |

| Future System Usage (N) | | 5 | 4 | 3 | 2 | 1 |
|-------------------------|--|---|---|---|---|---|
| N1 | In the future, if possible, I would like to use the WCVL system as an English vocabulary learning support system inside the classroom. | | | | | |
| N2 | In the future, if possible, I would like to use the WCVL system as an English vocabulary learning support system outside the classroom. | | | | | |
| N3 | In the future, I am interested in using the WCVL system as a support system and creating my own unknown vocabulary database in the system. | | | | | |
| N4 | I would like to introduce the WCVL system to friends who are interested in learning English. | | | | | |

II. GAT Test for Thai Students

Pre-test

ชุดคำถาม

ข้อสอบ วัดระดับคำศัพท์และความเข้าใจบทความภาษาอังกฤษ
จำนวนข้อ เขียนความหมาย 30 คำ, ตอบคำถามจากบทความ 30 ข้อ

บทความที่ 1 (คำถามข้อ 1 - 5)

A couple of years ago, my husband and I moved into our new house. My husband was proud of the house while I was super excited because I had always wanted to live in a house with a big garden. But, life is never easy. On the first night, while I was sleeping in my new bed, I was woken abruptly. The cause was the sound of our doorbell ringing. It was 2 a.m. I went downstairs and opened the door, but there was no one there, I was very angry. Whoever rang the doorbell woke me up for nothing! It happened again the next night. There was no one! This time I felt a **chill running down my spine**. On the third night, I could barely sleep. It was as if I was expecting the doorbell to ring. And it didn't disappoint me. The doorbell rang again at exactly 2 a.m. I was really scared, so I woke up my husband and told him to go check. He jumped up, grabbed one of his golf clubs, then rushed to the door and opened it. I watched him step outside, as I nervously waited at the bottom of the stairs. When I heard him call out to me, "Babe?", I answered shakily, "Yes?" He stood in the doorway and said, "We don't have a doorbell."

1. The wife was excited because _____.
 - a. she was moving in with her husband
 - b. her husband bought her a house
 - c. she and her husband were just married
 - d. her new house had a big garden
 - e. she bought herself a new bed
2. On the first night, the wife was angry possibly because _____.
 - a. she could not sleep at all
 - b. she thought she was tricked
 - c. her husband was not home
 - d. she hated walking downstairs
 - e. someone was trying to get into her house
3. The phrase "a chill running down my spine" means _____.
 - a. ill
 - b. relaxed
 - c. tired
 - d. awake
 - e. scared
4. It can be inferred from the passage that the husband _____.
 - a. was unhappy with the house
 - b. did not hear the doorbell sound
 - c. was tired after the hard day of work
 - d. designed the new house
 - e. had forgotten to install a doorbell

5. Which can be the best title of the passage?

- a. Lovely Couple
- b. Nasty Experience
- c. Secret Door
- d. Silent House
- e. Mysterious Sound

บทความที่ 2 (คำถามข้อ 6 - 10)

Soothing acoustic music drifted through the clinical, high-tech ward. As the professional musician brought the gentle sounds of her African harp to patients' bedsides, I witnessed the warming responses of relatives, staff and patients themselves. This was the most privileged and rewarding day I had experienced in more than 25 years of voluntary work.

This was the first time live music had been played in the intensive care unit (ICU) of Manchester Royal Infirmary. I had volunteered with the charity 'Music in Hospitals' for seven years. After my own experience of ICU, I was sure that the therapeutic benefits of live performance could be brought not only to patients on general wards, but to those who were critically ill.

The musicians are trained to enter a ward or care home with **empathy** and flexibility and adjust their music to the setting. Care staff are able to continue with their duties as the musicians play, often reporting that **they**, too, have benefited from the relaxing and calming mood the music offers.

I spoke to relatives afterwards. Their feedback was overwhelmingly positive. Far from feeling it inappropriate to have had a music performance in an environment where their relatives were gravely ill, they thought it had been a welcome and heartening respite.

More hospitals are now interested in the *ICU-Hear Project*. I've been able to contribute to making a difference to people's lives. Through trying to help others, I've also helped myself.

6. The word "empathy" means _____.

- a. patience
- b. understanding
- c. pity
- d. temper
- e. knowledge

7. The pronoun "they" refers to _____.

- a. patients
- b. relatives
- c. musicians
- d. volunteers
- e. ICU care staff

8. In the author's opinion, live music performance _____.

- a. should not be limited to patients in general wards
- b. sometimes interferes with the work of doctors and nurses
- c. should be banned in intensive care units
- d. should only be performed by trained musicians
- e. is unfairly opposed of by relatives of seriously ill patients

9. According to the passage, the ICU-Hear Project _____.
- brings live musical performance to patients in intensive care units
 - was created by a group of volunteers at Manchester Royal Infirmary
 - is internationally accepted and supported
 - consists of both professional musicians and medical staff
 - aims to introduce a new hospital management system
10. Which statement best expresses the overall idea of the passage?
- Hospitals should allow patients in ICU to play musical instruments.
 - Live music performance is beneficial to both patients and others in ICU.
 - Music can improve the environment of every hospital.
 - Volunteer musicians should be employed in all hospital departments.
 - Being a volunteer musician can change people's lives.

บทความที่ 3 (คำถามข้อ 11 - 15)

Her suitcase has been dusted off. All her necessary winter clothes and personal belongings have been promptly prepared. Ready to set off, Suchana is about to head off for a destination that no Thai woman has reached. (p1)

Suchana is Thailand's first female scientist to journey to Antarctica, the world's coldest, driest and windiest continent. She was chosen by the National Institute of Polar Research (NIPR) to join the scientific expedition after her male colleague took part in a similar adventure five years ago. (P2)

Unlike the stereotypical scientist, who has thick glasses, a white laboratory coat and an obsession with scientific jargon, the 37-year-old possesses a good sense of humor and, fortunately, an ability to translate complicated scientific concepts into plain, easy-to-understand language. Suchana would never be recognized as a scientist at first glance. But in conversation, her intellect is easy to spot. Her fascination with science sprang from her familiarity with the sea and nature as a child. It will take her three weeks on the icebreaker to get to Antarctica. (p3)

For Suchana, the trip is definitely going to be a tough one. Prior to **setting off**, she was required to undergo a thorough physical and mental examination. She was trained to endure extreme weather and tough, unpredictable situations. (p4)

While on the ice-breaking vessel, Suchana will investigate water quality along the way. But as soon as she disembarks at the frozen desert, her job will be to collect samples of soil for microorganism analysis and to observe animal behaviors. (p5)

However, her underlying goal is for people in general to have a clearer picture of how human activity is impacting the Antarctica environment. Suchana warns that unless steps are taken to halt further deterioration, the damage we are doing to Antarctica and our entire planet may be irreversible. (p6)

11. Why is Suchana famous?
- She's a professor at a university.
 - She's an intelligent marine scientist.
 - She's Thailand's first female scientist to visit Antarctica.
 - Her colleague made a similar research journey.
12. What is NOT mentioned in the passage as a characteristic of a typical scientist?
- Wearing thick glasses
 - Carrying a laptop
 - Conversing using scientific terms
 - Wearing a lab coat

13. Why is Suchana NOT afraid of traveling by ship for several months?

- a. The trip is going to be easy and fun.
- b. She was trained to cope with hardships.
- c. She likes scuba diving and swimming.
- d. She is traveling with a male colleague.

14. What will Suchana's main responsibility on the expedition be?

- a. To go to the world's coldest continent
- b. To take part in an adventure
- c. To collect marine life
- d. To gather soil samples

15. What does "setting off" (paragraph4) mean?

- a. Starting a journey
- b. Organizing a conference
- c. Being accepted
- d. Being unexpectedly arranged

บทความที่ 4 (คำถามข้อ 16 - 20)

Children with aggressive behavior can be helped in two ways: with prevention and by treating the symptoms as the aggression occurs.

Preventing behavior before it emerges requires good parenting. By staying in control of their emotions, not using force, using creative ways to solve problems and speaking in a kind, soft tone, parents can provide positive examples for their children. If parents cannot do this, it will be difficult for children to learn good behavior. Another preventive measure is to make the family atmosphere warm, relaxed, and secure. **In this sort of environment**, the children will grow up to be contented adults, in control of their emotions.

Not only do parents need to set an example but they have to teach their children how to express their unhappy feelings appropriately. Children must learn to consider other people's feelings. Cooling down anger by counting from one to ten, practicing breathing exercises, learning how to forgive or praising good behavior are several ways they can be taught.

Correcting a child's behavior is not an easy task. It takes a great deal of determination, effort and consistency. However, it is worth all the effort.

16. What is this passage mainly about?

- a. How to control children's unhappy feelings
- b. How to help aggressive children
- c. How to discipline ill-behaved children
- d. How to learn about children's behaviors

17. Which word does NOT describe "this sort of environment" (paragraph 2)?

- a. Closed
- b. Happy
- c. Comfortable
- d. Safe

18. Which is NOT an example of good parenting?
- Controlling emotions
 - Treating children inconsistently
 - Speaking with a kind tone
 - Finding creative solutions to problems
19. Which statement would the writer agree with the most?
- We cannot correct children's aggressive behavior.
 - We can prevent aggression in our children.
 - Aggressive behavior is sometimes good for children.
 - Aggression in children is not a serious concern.
20. What does "they" (paragraph 3) refer to?
- Parents
 - Children
 - Unhappy feelings
 - Breathing exercises

บทความที่ 5 (คำถามข้อ 21 - 25)

At the University of Virginia in Charlottesville, psychology professor Bella DePaulo got 77 students and 70 townspeople to volunteer for an unusual project. All kept diaries for a week, recording the numbers and details of the lies they told. (P1)

One student and six Charlottesville residents professed to have told no falsehoods. The other 140 participants told 1,535. (P2) The lies were most often not what most of us would call earth-shattering. Someone would pretend to be more positive or supportive of a spouse or friend than he or she really was, or feign agreement with a relative's opinion. According to DePaulo, women in their interactions with other women lied mostly **to spare others' feelings**. Men lied to other men generally for self-promoting reasons. (P3)

Most strikingly, **these tellers-of-a-thousand-lies** reported that their deceptions caused them 'a little preoccupation or regret.' Might that, too, be a lie? Perhaps. But there is evidence that this attitude towards casual use of prevarication is common. (P4)

Think how often we hear the expressions "I'll call you" or "The check is in the mail" or "I'm sorry, but he stepped out." And then there are professions—lawyers, pundits, public relations consultants—whose members seem to specialize in shaping or spinning the truth to suit clients' needs. (P5)

21. What is the best title for this passage?
- Male and Female Lies
 - The Truth about Lies
 - Definitions of Lies
 - Attitudes towards Lying
 -
22. What does the phrase "to spare others' feelings" (paragraph 3) mean?
- To avoid upsetting other people
 - To give other people compliments
 - To find excuses for others
 - To make an acceptable compromise

23. What does the phrase ‘these tellers-of-a-thousand-lies’ (paragraph 4) refer to?
- Male and female liars
 - DePaulo’s students
 - Charlottesville residents
 - Participants in DePaulo’s study
24. According to DePaulo’s study, which of the following is NOT true?
- A lot of people tell lies for their own sake.
 - Some people lie out of kindness to others.
 - Men tell more lies than women do.
 - A few people in the study reported always telling the truth.
25. Which of the following does NOT mean “lie”?
- Preoccupation
 - Deception
 - Prevarication
 - Falsehood

บทความที่ 6 (คำถามข้อ 26 - 30)

The debate about global warming is about the outcome of a gamble. We are betting that the benefits of our industrial and agricultural activities--increasing standards of living for the rich and poor alike--will outweigh possible adverse consequences of an unfortunate by-product of our activities, an increase in the atmospheric concentration of greenhouse gases that could lead to global warming and global climate changes. Some experts are warning that we are making poor bets, that global warming has started and that disasters are imminent. Others assure that the chances of global warming are so remote that the outcome of our wager will definitely be in our favor. The impasse is disquieting because the issue is of vital importance to each of us; it concerns the habitability of our planet. How long will it be before it is imperative that we take action?

Some people are under the false impression that global warming is a theory that still has to be confirmed. They do not realize that scientists are in complete agreement that a continual rise in the atmospheric concentration of greenhouse gases will inevitably lead to global warming and global climate changes. The disagreements are about the timing and amplitude of the expected warming. It is as if we are in a raft, gliding smoothly down a river, towards dangerous rapids and possibly a waterfall, and are uncertain of the distance to the waterfall. If we know what the distance is then we can tackle the very difficult political matter of deciding on the appropriate time to get out of the water. Suppose, however, that the scientific results have uncertainties, that the scientists can do no better than estimate that we will arrive at the waterfall in thirty minutes, plus or minus ten minutes. Pessimists will then insist that we will arrive in 20 minutes or less, while optimists will state confidently that we won’t be there for 40 minutes or more. Such disagreements usually result in the postponement of the political decision until more accurate scientific results are available-everyone knows that scientists should be capable of precise predictions-or until we are in sight of the waterfall. We recently had such an experience.

It is in our interest to limit the growth in the atmospheric concentration of greenhouse gases. It is wise to avoid comprehensive programs that decree a rigid course of action to reach a grand, final solution. It is better to take action, and to correct mistakes at an early stage before scarce resources have been wasted. We are courting a disaster and need to accept that uncertainties do not justify inaction.

กระดาษคำตอบ
ข้อสอบ วัดระดับคำศัพท์และความเข้าใจบทความภาษาอังกฤษ
จำนวนข้อ เขียนความหมาย 30 คำ, ตอบคำถามจากบทความ 30 ข้อ

เลขประจำตัว ชื่อ สกุล

จงเขียนความหมายของคำต่อไปนี้เป็นภาษาไทย

| คำศัพท์ | ความหมาย | คำศัพท์ | ความหมาย |
|----------------------|----------|---------------------|----------|
| barely(adv.) | | atmosphere (n.) | |
| doorbell (n.) | | behavior (n.) | |
| doorway (n.) | | determination (n.) | |
| scared (adj) | | emerge (v.) | |
| spine (n) | | aggressive (adj.) | |
| contribute (v.) | | psychology (n.) | |
| experienced. (adj.) | | specialize (v.) | |
| flexibility (n.) | | deception (n.) | |
| voluntary (adj.) | | participant (n.) | |
| intensive (adj.) | | falsehood (n.) | |
| complicate (v.) | | agricultural (adj.) | |
| familiarity (n.) | | appropriate (adj.) | |
| intellect (n.) | | assure (v.) | |
| fascination (n.) | | concentration (n.) | |
| unpredictable (adj.) | | greenhouse (n.) | |

จงเขียนเครื่องหมาย ✗ ตัวเลือกที่ต้องการลงในกระดาษคำตอบ

คำชี้แจง เลือกคำตอบที่ถูกต้องที่สุดเพียงข้อเดียว คำถามอาจมีคำตอบ 4 หรือ 5 ตัวเลือก

| | a | b | c | d | e | | a | b | c | d | e | | a | b | c | d | e |
|----|---|---|---|---|---|----|---|---|---|---|---|----|---|---|---|---|---|
| 1 | | | | | | 11 | | | | | | 21 | | | | | |
| 2 | | | | | | 12 | | | | | | 22 | | | | | |
| 3 | | | | | | 13 | | | | | | 23 | | | | | |
| 4 | | | | | | 14 | | | | | | 24 | | | | | |
| 5 | | | | | | 15 | | | | | | 25 | | | | | |
| 6 | | | | | | 16 | | | | | | 26 | | | | | |
| 7 | | | | | | 17 | | | | | | 27 | | | | | |
| 8 | | | | | | 18 | | | | | | 28 | | | | | |
| 9 | | | | | | 19 | | | | | | 29 | | | | | |
| 10 | | | | | | 20 | | | | | | 30 | | | | | |

Post-test

ชุดคำถาม Post Test

ข้อสอบ วัดระดับคำศัพท์และความเข้าใจบทความภาษาอังกฤษ

จำนวนข้อ เขียนความหมาย 30 คำ, ตอบคำถามจากบทความ 30 ข้อ

บทความที่ 1 (คำถามข้อ 1 - 5)

A couple of years ago, my husband and I moved into our new house. My husband was proud of the house while I was super excited because I had always wanted to live in a house with a big garden. But, life is never easy. On the first night, while I was sleeping in my new bed, I was woken abruptly. The cause was the sound of our doorbell ringing. It was 2 a.m. I went downstairs and opened the door, but there was no one there, I was very angry. Whoever rang the doorbell woke me up for nothing! It happened again the next night. There was no one! This time I felt a **chill running down my spine**. On the third night, I could barely sleep. It was as if I was expecting the doorbell to ring. And it didn't disappoint me. The doorbell rang again at exactly 2 a.m. I was really scared, so I woke up my husband and told him to go check. He jumped up, grabbed one of his golf clubs, then rushed to the door and opened it. I watched him step outside, as I nervously waited at the bottom of the stairs. When I heard him call out to me, "Babe?", I answered shakily, "Yes?" He stood in the doorway and said, "We don't have a doorbell."

1. The wife was excited because _____.
 - a. she was moving in with her husband
 - b. her husband bought her a house
 - c. she and her husband were just married
 - d. her new house had a big garden
 - e. she bought herself a new bed
2. On the first night, the wife was angry possibly because _____.
 - a. she could not sleep at all
 - b. she thought she was tricked
 - c. her husband was not home
 - d. she hated walking downstairs
 - e. someone was trying to get into her house
3. The phrase "a chill running down my spine" means _____.
 - a. ill
 - b. relaxed
 - c. tired
 - d. awake
 - e. scared
4. It can be inferred from the passage that the husband _____.
 - a. was unhappy with the house
 - b. did not hear the doorbell sound
 - c. was tired after the hard day of work
 - d. designed the new house
 - e. had forgotten to install a doorbell

5. Which can be the best title of the passage?

- a. Lovely Couple
- b. Nasty Experience
- c. Secret Door
- d. Silent House
- e. Mysterious Sound

บทความที่ 2 (คำถามข้อ 6 - 10)

At the University of Virginia in Charlottesville, psychology professor Bella DePaulo got 77 students and 70 townspeople to volunteer for an unusual project. All kept diaries for a week, recording the numbers and details of the lies they told. (P1)

One student and six Charlottesville residents professed to have told no falsehoods. The other 140 participants told 1,535. (P2)

The lies were most often not what most of us would call earth-shattering. Someone would pretend to be more positive or supportive of a spouse or friend than he or she really was, or feign agreement with a relative's opinion. According to DePaulo, women in their interactions with other women lied mostly to spare others' feelings. Men lied to other men generally for self-promoting reasons. (P3)

Most strikingly, these tellers-of-a-thousand-lies reported that their deceptions caused them 'a little preoccupation or regret.' Might that, too, be a lie? Perhaps. But there is evidence that this attitude towards casual use of prevarication is common. (P4)

Think how often we hear the expressions "I'll call you" or "The check is in the mail" or "I'm sorry, but he stepped out." And then there are professions—lawyers, pundits, public relations consultants—whose members seem to specialize in shaping or spinning the truth to suit clients' needs. (P5)

6. What is the best title for this passage?

- a. Male and Female Lies
- b. The Truth about Lies
- c. Definitions of Lies
- d. Attitudes towards Lying

7. What does the phrase "to spare others' feelings" (paragraph 3) mean?

- a. To avoid upsetting other people
- b. To give other people compliments
- c. To find excuses for others
- d. To make an acceptable compromise

8. What does the phrase 'these tellers-of-a-thousand-lies' (paragraph 4) refer to?

- a. Male and female liars
- b. DePaulo's students
- c. Charlottesville residents
- d. Participants in DePaulo's study

9. According to DePaulo's study, which of the following is NOT true?

- a. A lot of people tell lies for their own sake.
- b. Some people lie out of kindness to others.
- c. Men tell more lies than women do.
- d. A few people in the study reported always telling the truth.

10. Which of the following does NOT mean “lie”?

- a. Preoccupation
- b. Deception
- c. Prevarication
- d. Falsehood

บทความที่ 3 (คำถามข้อ 11 - 15)

Children with aggressive behavior can be helped in two ways: with prevention and by treating the symptoms as the aggression occurs.

Preventing behavior before it emerges requires good parenting. By staying in control of their emotions, not using force, using creative ways to solve problems and speaking in a kind, soft tone, parents can provide positive examples for their children. If parents cannot do this, it will be difficult for children to learn good behavior. Another preventive measure is to make the family atmosphere warm, relaxed, and secure. **In this sort of environment**, the children will grow up to be contented adults, in control of their emotions.

Not only do parents need to set an example but they have to teach their children how to express their unhappy feelings appropriately. Children must learn to consider other people’s feelings. Cooling down anger by counting from one to ten, practicing breathing exercises, learning how to forgive or praising good behavior are several ways they can be taught.

Correcting a child’s behavior is not an easy task. It takes a great deal of determination, effort and consistency. However, it is worth all the effort.

11. What is this passage mainly about?

- a. How to control children’s unhappy feelings
- b. How to help aggressive children
- c. How to discipline ill-behaved children
- d. How to learn about children’s behaviors

12. Which word does NOT describe “this sort of environment” (paragraph 2)?

- a. Closed
- b. Happy
- c. Comfortable
- d. Safe

13. Which is NOT an example of good parenting?

- a. Controlling emotions
- b. Treating children inconsistently
- c. Speaking with a kind tone
- d. Finding creative solutions to problems

14. Which statement would the writer agree with the most?

- a. We cannot correct children’s aggressive behavior.
- b. We can prevent aggression in our children.
- c. Aggressive behavior is sometimes good for children.
- d. Aggression in children is not a serious concern.

15. What does "they" (paragraph 3) refer to?

- a. Parents
- b. Children
- c. Unhappy feelings
- d. Breathing exercises

บทความที่ 4 (คำถามข้อ 16 - 20)

Soothing acoustic music drifted through the clinical, high-tech ward. As the professional musician brought the gentle sounds of her African harp to patients' bedsides, I witnessed the warming responses of relatives, staff and patients themselves. This was the most privileged and rewarding day I had experienced in more than 25 years of voluntary work.

This was the first time live music had been played in the intensive care unit (ICU) of Manchester Royal Infirmary. I had volunteered with the charity 'Music in Hospitals' for seven years. After my own experience of ICU, I was sure that the therapeutic benefits of live performance could be brought not only to patients on general wards, but to those who were critically ill.

The musicians are trained to enter a ward or care home with **empathy** and flexibility and adjust their music to the setting. Care staff are able to continue with their duties as the musicians play, often reporting that **they**, too, have benefited from the relaxing and calming mood the music offers.

I spoke to relatives afterwards. Their feedback was overwhelmingly positive. Far from feeling it inappropriate to have had a music performance in an environment where their relatives were gravely ill, they thought it had been a welcome and heartening respite.

More hospitals are now interested in the *ICU-Hear Project*. I've been able to contribute to making a difference to people's lives. Through trying to help others, I've also helped myself.

16. The word "empathy" means _____.

- a. patience
- b. understanding
- c. pity
- d. temper
- e. knowledge

17. The pronoun "they" refers to _____.

- a. patients
- b. relatives
- c. musicians
- d. volunteers
- e. ICU care staff

18. In the author's opinion, live music performance _____.

- a. should not be limited to patients in general wards
- b. sometimes interferes with the work of doctors and nurses
- c. should be banned in intensive care units
- d. should only be performed by trained musicians

- e. is unfairly opposed of by relatives of seriously ill patients

19. According to the passage, the ICU-Hear Project _____.

- a. brings live musical performance to patients in intensive care units
- b. was created by a group of volunteers at Manchester Royal Infirmary
- c. is internationally accepted and supported
- d. consists of both professional musicians and medical staff
- e. aims to introduce a new hospital management system

20. Which statement best expresses the overall idea of the passage?

- a. Hospitals should allow patients in ICU to play musical instruments.
- b. Live music performance is beneficial to both patients and others in ICU.
- c. Music can improve the environment of every hospital.
- d. Volunteer musicians should be employed in all hospital departments.
- e. Being a volunteer musician can change people's lives.

บทความที่ 5 (คำถามข้อ 21 - 25)

Her suitcase has been dusted off. All her necessary winter clothes and personal belongings have been promptly prepared. Ready to set off, Suchana is about to head off for a destination that no Thai woman has reached. (p1)

Suchana is Thailand's first female scientist to journey to Antarctica, the world's coldest, driest and windiest continent. She was chosen by the National Institute of Polar Research (NIPR) to join the scientific expedition after her male colleague took part in a similar adventure five years ago. (P2)

Unlike the stereotypical scientist, who has thick glasses, a white laboratory coat and an obsession with scientific jargon, the 37-year-old possesses a good sense of humor and, fortunately, an ability to translate complicated scientific concepts into plain, easy-to-understand language. Suchana would never be recognized as a scientist at first glance. But in conversation, her intellect is easy to spot. Her fascination with science sprang from her familiarity with the sea and nature as a child. It will take her three weeks on the icebreaker to get to Antarctica. (p3)

For Suchana, the trip is definitely going to be a tough one. Prior to **setting off**, she was required to undergo a thorough physical and mental examination. She was trained to endure extreme weather and tough, unpredictable situations. (p4)

While on the ice-breaking vessel, Suchana will investigate water quality along the way. But as soon as she disembarks at the frozen desert, her job will be to collect samples of soil for microorganism analysis and to observe animal behaviors. (p5)

However, her underlying goal is for people in general to have a clearer picture of how human activity is impacting the Antarctica environment. Suchana warns that unless steps are taken to halt further deterioration, the damage we are doing to Antarctica and our entire planet may be irreversible. (p6)

21. Why is Suchana famous?

- a. She's a professor at a university.
- b. She's an intelligent marine scientist.
- c. She's Thailand's first female scientist to visit Antarctica.
- d. Her colleague made a similar research journey.

22. What is NOT mentioned in the passage as a characteristic of a typical scientist?

- a. Wearing thick glasses
- b. Carrying a laptop
- c. Conversing using scientific terms
- d. Wearing a lab coat

23. Why is Suchana NOT afraid of traveling by ship for several months?

- a. The trip is going to be easy and fun.
- b. She was trained to cope with hardships.
- c. She likes scuba diving and swimming.
- d. She is traveling with a male colleague.

24. What will Suchana's main responsibility on the expedition be?

- a. To go to the world's coldest continent
- b. To take part in an adventure
- c. To collect marine life
- d. To gather soil samples

25. What does "setting off" (paragraph4) mean?

- a. Starting a journey
- b. Organizing a conference
- c. Being accepted
- d. Being unexpectedly arranged

บทความที่ 6 (คำถามข้อ 26 - 30)

The sea cucumber—a warty, sausage-shaped creature that feeds on the ocean floor - can sell for half its weight in silver in the markets of Guangzhou in southern China. This fleshy sea-slug is prized as a delicacy, a traditional medicine believed to be capable of curing joint pain and fatigue, and a natural aphrodisiac. As overexploitation has reduced stocks throughout Asia, merchants have sought the creature further afield. Six years ago, two Chinese traders discovered that the waters around Sierra Leone’s Banana Island were abundant with sea cucumbers; islanders have been diving for them ever since.

When the Chinese traders, known to the islanders only as Mr. Cham and Mr. Lee, first turned up, locals say they promised to use some of the profits from the sea-cucumber trade to boost the islanders’ quality of life. A motorboat, a community center, solar panels and water pumps were promised in exchange for being allowed to operate there. Six years on, a group of young men sit on empty petrol cans in the rundown village of Dublin, passing a cigarette around in the pitch dark. “They delivered nothing,” says another diver. “The traders made a lot of money and we didn’t get any of it.”

Similar words have echoed throughout Sierra Leonean history. For centuries foreigners have come to buy its resources-gold, diamonds, bauxite-but the country remains one of the world’s poorest, with a GDP per head of less than \$800 a year. Yet, despite the old complaint, most of the island’s young men are grateful that the Chinese came. They still get paid about \$1 per cucumber. “I did not have any work before. I had no plans, but now I have a trade. I built my house with the sea- cucumber money,” says Mr. Emmanuel Pratt. He proudly gestures to his cement house. Painted lime green, it stands out against the other old clapboard houses. Imagine how much more could be built if the islanders got a grip on their own resources.

26. The passage mainly concerns _____.

- a. foreign traders’ exploitation of Sierra Leone’s natural resources
- b. Chinese unethical business practices overseas
- c. the quality of life of people on the Banana Island
- d. the alarming decrease in sea cucumbers in Sierra Leone
- e. benefits of sea cucumbers other than their medicinal properties

27. The writer mentions people in Dublin (paragraph 2) in order to _____.

- a. support the idea their life has worsened since the Chinese traders’ arrival
- b. illustrate the idea that Chinese traders have not fulfilled their promises
- c. criticize foreign investors for not delivering enough food
- d. inform us that most of the villagers are uneducated and unemployed
- e. suggest that people there are the country’s poorest

28. The first sentence in paragraph 3 means _____.

- a. historically, Sierra Leone has been a great place for foreign investment
- b. the country’s history has been distorted by Chinese business people
- c. foreigners have repeatedly taken advantage of the country
- d. wherever you go in Sierra Leone, you encounter people facing hardships
- e. the country has traditionally been known for its abundance of sea cucumbers

29. Which of the following is NOT specifically answered in the passage?

- a. Why Sierra Leone has attracted foreign investors
- b. What makes sea cucumbers desirable among the Chinese
- c. When the people on the island will take control of the sea cucumber trade
- d. How Mr. Pratt has managed to finance the construction of a new house
- e. How poor Sierra Leone is in comparison to other countries

30. It can be inferred from the passage that _____.

- a. Sierra Leone's poverty results from a lack of natural resources
- b. the locals on the island do not care about the medical benefits of sea cucumbers
- c. the only source of income for islanders is from diving
- d. the islanders' have a mixed attitude towards Chinese investors
- e. in addition to their medicinal properties, sea cucumbers are rich in silver

กระดาษคำตอบ

ข้อสอบ วัดระดับคำศัพท์และความเข้าใจบทความภาษาอังกฤษ

จำนวนข้อ เขียนความหมาย 30 คำ, ตอบคำถามจากบทความ 30 ข้อ

เลขประจำตัว ชื่อ สกุล

จงเขียนความหมายของคำต่อไปนี้เป็นภาษาไทย

| คำศัพท์ | ความหมาย | คำศัพท์ | ความหมาย |
|-------------------|----------|--------------------|----------|
| resident (adj.) | | cucumber (n.) | |
| volunteer (n.) | | solar (adj.) | |
| psychology (n.) | | resource (n.) | |
| participant (n.) | | abundant (adj.) | |
| interaction (n.) | | trader (n.) | |
| atmosphere (n.) | | adjust (v.) | |
| emerge (v.) | | charity (n.) | |
| aggressive (adj.) | | experienced (adj.) | |
| prevention (n.) | | feedback (n.) | |
| symptom (n.) | | privileged (adj.) | |
| laboratory (n.) | | barely (adv.) | |
| complicate (v.) | | doorway (n.) | |
| colleague (n.) | | doorbell (n.) | |
| endure (v.) | | chill (adj.) | |
| destination (n.) | | babe (n.) | |

จงเขียนเครื่องหมาย ✗ ตัวเลือกที่ต้องการลงในกระดาษคำตอบ

คำชี้แจง เลือกคำตอบที่ถูกต้องที่สุดเพียงข้อเดียว คำถามอาจมีคำตอบ 4 หรือ 5 ตัวเลือก

| | a | b | c | d | e | | a | b | c | d | e | | a | b | c | d | e |
|----|---|---|---|---|---|----|---|---|---|---|---|----|---|---|---|---|---|
| 1 | | | | | | 11 | | | | | | 21 | | | | | |
| 2 | | | | | | 12 | | | | | | 22 | | | | | |
| 3 | | | | | | 13 | | | | | | 23 | | | | | |
| 4 | | | | | | 14 | | | | | | 24 | | | | | |
| 5 | | | | | | 15 | | | | | | 25 | | | | | |
| 6 | | | | | | 16 | | | | | | 26 | | | | | |
| 7 | | | | | | 17 | | | | | | 27 | | | | | |
| 8 | | | | | | 18 | | | | | | 28 | | | | | |
| 9 | | | | | | 19 | | | | | | 29 | | | | | |
| 10 | | | | | | 20 | | | | | | 30 | | | | | |

III. Standard Vocabulary List (SVL12000)

Level 1

a, able, about, above, across, act, afraid, after, afternoon, again, against, age, ago, air, airplane, airport, album, all, almost, alone, along, already, also, always, am, among, an, and, angry, animal, another, answer, any, anybody, anyone, anything, apartment, apple, april, are, arm, around, arrive, art, artist, as, ask, at, attack, august, aunt, autumn, away, baby, back, bad, bag, bake, baker, ball, banana, bank, baseball, basket, basketball, bat, bath, bathroom, be, beautiful, because, become, bed, bedroom, beef, been, before, begin, beginning, behind, believe, bell, below, bench, beside, best, better, between, bicycle, big, bike, bird, birthday, black, blackboard, blow, blue, boat, body, book, boot, born, both, bottle, box, boy, bread, break, breakfast, bridge, bring, brother, brown, build, building, bus, business, busy, but, butter, buy, by, bye, cafe, cake, calendar, call, camera, camp, can, candy, cap, captain, car, card, careful, carry, case, cat, catch, center, certain, chair, chalk, chance, change, cheap, cheese, chicken, chief, child, children, chocolate, choose, christmas, church, circle, city, class, classmate, classroom, clean, clear, clever, climb, clock, close, clothes, cloud, cloudy, club, coat, coffee, cold, college, color, come, company, cook, cookie, cool, corner, could, count, country, cover, cow, cry, cup, cut, dad, daddy, dance, dangerous, dark, date, daughter, day, dead, dear, death, december, decide, deep, delicious, department, desk, diary, dictionary, did, die, different, difficult, dinner, dirty, discover, dish, do, doctor, does, dog, doll, dollar, door, down, draw, dream, dress, drink, drive, driver, drop, dry, during, each, ear, early, earth, east, easy, eat, egg, eight, eighteen, eighty, either, elephant, eleven, else, end, enjoy, enough, enter, even, evening, ever, every, everybody, everyone, everything, everywhere, excuse, eye, face, fact, factory, fall, family, famous, far, farm, farmer, fast, fat, father, february, feel, feeling, few, field, fifteen, fifty, fight, film, find, fine, finger, finish, fire, first, fish, five, flat, floor, flower, fly, food, fool, foot, football, for, forest, forget, fork, forty, four, fourteen, fox, free, fresh, friday, friend, friendly, frog, from, front, fruit, full, fun, funny, future, game, garden, gas, gentleman, get, girl, give, glad, glass, glove, go, goal, god, gold, golden, golf, gone, good, goodbye, grandfather, grandmother, grass, gray, great, green, ground, group, grow, guest, guide, guitar, gun, hair, half, hand, happen, happiness, happy, hard, has, hat, have, he, head, healthy, hear, heart, heavy, hello, help, her, here, hers, hi, high, hill, him, his, history, hit, hobby, hold, hole, holiday, home, homework, honest, honey, hope, horse, hospital, hot, hotel, hour, house, how, hundred, hungry, hurry, hurt, husband, i, ice, idea, if, ill, important, in, inside, interest, interested, interesting, into, invite, is, island, it, its, jan, january, job, join, joke, joy, juice, july, jump, june, junior, just, keep, key, kick, kid, kill, kind, king, kiss, kitchen, knee, knife, know, lady, lake, land, language, large, last, late, later, laugh, leaf, learn, leave, left, leg, lesson, let, letter, level, library, life, light, like, line, lion, lip, list, listen, little, live, long, look, lose, love, low, lucky, lunch, machine, magazine, mail, make, man, many, map, march, market, marry, master, matter, may, May, me, meal, mean, meat, meet, meeting, member, memory, men, meter, middle, midnight, mile, milk, mind, mine, minute, mirror, miss, Miss, mistake, monday, money, monkey, month, moon, more, morning, most, mother, mountain, mouse, mouth, move, movie, mr., mrs., ms., much, museum, music, musician, must, my, nail, name, narrow, natural, near, necessary, neck, need, neighbor, never, new, news, newspaper, next, nice, night, nine, nineteen, ninety, no, nobody, noise, none, noon, north, nose, not, note, notebook, nothing, november, now, number, nurse, o'clock, october, of, off, office, often, oh, oil, ok, old, on, once, one, only, open, or, orange, order, other, our, ours, out, outside, over, page, paint, pair, pants, paper, parent, park, part, party, pass, past, pay, pen, pencil, people, percent, perhaps, person, pet, phone, photograph, piano, pick, picnic, picture, piece, pig, pilot, pink, pipe, place, plan, plane, plant, play, please, pocket, point, police, policeman, pool, poor, popular, pork, post, pot, potato, pound, power, practice, present, pretty, price, promise, proud, pull, push, put, quarter, queen, question, quick, quickly, quiet, rabbit, race, radio, rain, rainy, reach, read, ready, real, really, receive, red, remember, restaurant, return, rice, rich, ride, right, ring, rise, river, road, robot, rock, rocket, roof, room, rope, rose, round, rule, run, sad, safe, salad, sale, salt, same, sand, sandwich, saturday, save, say, scene, school, science, sea, season, seat, second, secret, see, seem, sell, send, september, set, seven, seventeen, seventy, several, shake, shall, shape, sharp, she, sheep, shine, ship, shirt, shoe, shop, shopping, short, should, shoulder, show, shower, shut, sick, side, sign, silent, silver, simple, since, sing, singer, sister, sit, six, sixteen, sixty, size, ski, skiing, skin, sky, sleep, sleepy, slow, slowly, small, smell, smile, smoke, smoker, smoking, snake, snow, so, soap, soccer, soda, soft, some, somebody, someone, something, sometimes, son, song, soon, sorry, sound, soup, south, space, speak, speaker, special, speed, spend, spoon, sport, spring, square, stamp, stand, star, start, station, stay, step, still, stone, stop, store, story, straight, strange, street, strong, student, study, subway, such, suddenly, sugar, suit, summer, sun, sunday, supermarket, sure, surprise, sweet, swim, switch, table, take, talk, tall, tape, taste, taxi, tea, teach, teacher, team, telephone, television, tell, ten, tennis, tent, test, textbook, then, thank, that, the, their, theirs, them, then, there, these, they, thick, thin, thing, think, third, thirteen, thirty, this, those, though, thousand, three, through, thru, thursday, ticket, tie, tiger, till, time, tired, to, today, toe, together, toilet, tomato, tomorrow, tongue, tonight, too, tooth, top, touch, toward, towel, tower, town, toy, train, travel, tree, trip, trouble, true, try, tuesday, tunnel, turn, twelve, twenty, two, type, umbrella, uncle, under, understand, until, up, upon, us, use, useful, usual, usually, vacation, vegetable, very, video, videotape, village, violin, visit, visitor, voice, wait, wake, walk, wall, want, war, warm, was, wash, watch, water, wave, way, we, weak, wear, wednesday, week, weekend, welcome, well, were, west, wet, what, when, where, which, while, white, who, whom, whose, why, wide, wife, wild, will, wind, window, wine, winter, wise, with, without, woman, wonderful, wood, word, work, world, worry, worst, would, write, wrong, yard, year, yellow, yes, yesterday, you, young, your, yours, zoo

Level 2

ability, abroad, absent, accent, accept, accident, account, action, active, activity, actor, actress, actual, actually, add, address, admire, adult, adventure, advice, advise, afterward, agency, agent, agree, ah, ahead, aim, airline, alive, allow, almond, alphabet, amount, angel, anger, announce, ant, anxious, anyway, anywhere, apart, appear, appearance, apply, approach, apron, area, army, arrange, arrangement, arrival, aside, asleep, assist, attend, attention, audience, automobile, awake, aware, awful, backward, bacon, badly, balance, balloon, band, bar, base, basic, battle, bay, beach, bean, bear, beard, beat, beautifully, beauty, bee, beer, behave, belong, belt, bend, beyond, bill, birth, bit, blame, blanket, blind, block, blood, board, boil, bone, bookshop, bookstore, boring, borrow, boss, bottom, bow, bowl, boyfriend, brain, brake, branch, brave, breathe, brick, bright, brilliant, broad, broadcast, broken, brush, burn, burst, bush, businessman, butterfly, button, cab, cable, cage, campus, candle, capital, care, carefully, carpenter, cash, cast, castle, cause, ceiling, cent, centimeter, central, century, certainly, chain, champion, chapter, character, charge, check, cheek, cheer, cherry, chest, choice, cigar, cigarette, cinema, citizen, claim, cleaning, clearly, clerk, clinic, cloth, coal, coast, cocoa, coin, collect, collection, colorful, comfort, comfortable, comic, common, companion, compare, complain, complete, completely, computer, concert, condition, contain, content, continue, control, conversation, cooking, copy, corn, correct, cost, cotton, couple, courage, course, court, cousin, cowboy, crash, crazy, cream, create, creation, crew, cross, crowd, crowded, crown, culture, curtain, curve, custom, customer, cycle, daily, damage, danger, dancer, dancing, danger, dare, deaf, deal, decision, deeply, defend, defense, degree, deliver, demand, dentist, deny, depend, depth, describe, desert, design, designer, destroy, detail, develop, dial, diamond, difference, difficulty, dig, direct, direction, directly, disappear, discount, discuss, discussion, disease, disk, dislike, distance, distant, district, divide, double, doubt, downstairs, downtown, dozen, drama, drill, drinking, drown, drug, drunk, dust, duty, earn, earning, easily, edge, educate, education, effect, effort, eighteenth, eighth, eightieth, elbow, elder, electric, electricity, elevator, eleventh, empty, ending, enemy, energy, engine, engineer, entrance, envelope, equal, eraser, error, escape, especially, event, everyday, exact, exactly, examination, examine, example, excellent, except, exciting, exercise, exist, exit, expect, expensive, experience, explain, express, fail, fair, false, familiar, fan, fare, fashion, fault, favor, favorite, fax, fear, feed, fellow, female, fence, festival, fifteenth, fifth, fiftieth, figure, fill, final, finally, firm, fisherman, fishing, fit, fix, flag, flight, float, flood, flow, follow, following, foolish, force, foreign, foreigner, forever, forgive, form, formal, former, fortieth, fortunate, forward, fourteenth, fourth, freedom, freeze, friendship, fuel, furniture, further, gain, garage, gate, gather, general, generally, gentle, ghost, giant, gift, girlfriend, gorilla, grade, grammar, grand, granddaughter, grandma, grandpa, grandson, grape, grapefruit, grateful, greatly, greatness, greeting, guard, guess, gym, habit, hairbrush, haircut, hall, ham, hamburger, hammer, handkerchief, handle, handsome, hang, happily, harbor, hardly, harm, hate, headache, health, heat, heaven, height, helicopter, hell, helpful, hero, herself, hey, hide, highly, hiking, himself, hire, holy, homeroom, hook, host, however, human, hunt, illness, image, imagination, imagine, immediate, immediately, importance, impossible, impression, improve, inch, include, industry, inform, information, ink, insect, instead, intelligent, intend, international, introduce, invitation, iron, itself, jacket, jazz, jeans, jet, journey, judge, jungle, kilo, kilogram, kilometer, knock, knowledge, labor, lack, lamp, law, lawyer, lay, lazy, lead, leader, least, leader, lemon, lend, length, less, lie, lift, likely, limit, load, local, lock, locker, lonely, lot, loud, lovely, luck, mad, magic, main, maker, male, mama, manage, manager, mankind, manner, march, mark, married, mass, match, mate, material, mathematics, maybe, meaning, measure, medal, medical, medicine, melon, melt, mention, menu, merry, message, metal, method, might, mild, millimeter, million, mix, model, modern, moment, monster, monthly, mood, mosquito, motor, movement, mud, murder, musical, myself, mystery, nation, national, native, naturally, nature, navy, nearly, neat, necklace, needle, neither, nephew, nervous, nest, net, niece, nineteenth, ninetieth, ninth, noble, nod, noisy, nor, normal, notice, nowhere, nut, object, occasion, ocean, offer, officer, official, oneself, onion, opera, opinion, opposite, ought, ourselves, oven, owe, own, owner, pack, package, pain, painful, painter, painting, pajamas, palace, pan, panda, papa, parade, pardon, particular, partly, passage, passenger, passport, path, patient, pattern, pause, pea, peace, peaceful, peach, peak, peanut, pearl, pepper, perfect, perform, period, permit, personal, photographer, pie, pillow, pin, pineapple, pizza, plain, planet, plastic, plate, platform, player, pleasant, pleased, pleasure, plenty, poem, poet, poison, pole, policy, polish, polite, pond, port, position, positive, possibility, possible, pour, powder, powerful, practical, praise, pray, precious, prefer, prepare, president, press, prevent, pride, priest, prince, princess, print, prison, prisoner, private, prize, probably, problem, process, produce, product, professional, professor, profit, program, progress, proof, proper, propose, protect, protection, prove, provide, public, publish, punish, pupil, pure, purple, purpose, purse, puzzle, quietly, quite, quiz, racket, rail, railroad, railway, rainbow, raise, rank, rapid, rat, rate, rather, raw, reader, realize, reason, reasonable, recently, record, recover, regard, regular, remain, remove, repair, repeat, reply, report, reporter, request, reserve, respect, responsible, rest, result, ribbon, role, roll, root, rough, route, row, royal, ruler, rumor, runner, rush, safety, sail, sailing, sailor, salary, sauce, saying, schoolboy, schoolgirl, scientific, scientist, score, scream, secretary, seller, sense, sentence, separate, serious, servant, serve, service, seventeenth, seventh, seventieth, sex, shade, shadow, shampoo, share, sheet, shock, shoot, shore, shot, shout, shrimp, sight, signal, silence, silk, silly, similar, single, sink, sir, sixteenth, sixth, sixtieth, skate, skating, skirt, slide, slip, smooth, social, society, sock, sofa, soldier, solid, solve, somewhere, sort, spaghetti, spare, speaking, speech, spell, spelling, spider, spirit, spoken, spot, spread, stage, stair, standard, state, steak, steal, steam, steel, stereo, stick, stomach, storm, stranger, straw, strawberry, stream, strength, stretch, strike, struggle, stuff, stupid, style, subject, succeed, success, successful, sudden, suffer, suggest, suitcase, sunday, sunlight, sunset, sunshine, super, supper, support, surely, surprised, swallow, swan, sweat, sweater, swing, symbol, system, tail, tax, tear, teen, teenage, teenager, temple, tenth, term, terrible, text, theater, themselves, thief, thinking, thirsty, thirteenth, thirtieth, thought, throat, thumb, tight, tiny, tip, tire, title, tobacco, ton, tool, toothbrush, toothpaste, topic, total, four, tourist, track, trade, traffic, training, trick, truck, trumpet, trust, truth, tube, tulp, tummy, turkey, twelfth, twentieth, twice, twin, unable, understanding, underwear, unhappy, uniform, university, unless, upper, upstairs, used, valley, valuable, value, view, violent, violet, vocabulary, volleyball, vote, waiter, waitress, walker, warm, warning,

waste, wealth, weather, wedding, weekly, weigh, weight, western, wheel, whether, whiskey, whole, willing, win, wing, wipe, wire, wish, within, wolf, wonder, wooden, wool, worker, worried, worse, worth, writer, writing, yeah, yet, yourself, yourselves, youth, zero

Level 3

absence, absolute, academic, access, accompany, according, achieve, addition, additional, admit, adopt, advance, advantage, adviser, affair, affect, afford, agreement, aid, aircraft, airmail, alarm, alcohol, alike, aloud, although, altogether, ambulance, analysis, angle, ankle, announcement, announcer, anyhow, anymore, appeal, application, appoint, appointment, approve, arch, argue, argument, arrest, arrow, article, ashamed, asparagus, assistance, assistant, atlas, atom, atomic, attach, attempt, attitude, attract, attractive, audio, author, authority, automatic, available, avenue, average, avoid, babysitter, background, backyard, baggage, bakery, baking, balcony, banker, barber, bare, bargain, bark, basement, basis, bathe, bathtub, battery, beast, bedtime, beefsteak, beg, beginner, being, belief, believer, beneath, benefit, besides, bet, bible, bind, biscuit, bitter, blank, bless, blouse, boast, bold, bomb, bookcase, bookseller, bookshelf, border, bore, bored, bound, bowling, boxer, boxing, brand, breast, breed, brightly, broccoli, brow, bubble, bucket, bull, bullet, bunch, burger, bury, busily, businesswoman, cabbage, cafeteria, calm, calmly, cancel, canoe, carbon, career, careless, carpet, carriage, carrot, cart, cassette, casual, celebrate, celebration, cell, ceremony, chairman, challenge, channel, chapel, chart, chase, cheerful, chemical, childhood, chimney, chimpanzee, chin, christ, circus, classic, cleaner, cleanly, client, cliff, climate, climbing, closed, closely, clothe, clothing, cocktail, coffeepot, cola, collar, collector, comb, combination, comfortably, comment, commercial, committee, communication, community, compact, competition, complaint, complex, composition, concern, conduct, confidence, confirm, connect, connection, conscious, consider, considerable, contact, continent, contract, convenient, costume, cough, countryside, covering, crack, crayon, creative, creature, credit, crime, criminal, crop, cruel, crush, cupboard, cure, curl, curry, cushion, cutter, darkness, data, dawn, daytime, deck, decrease, deer, defeat, delay, delight, delighted, democracy, democratic, description, deserve, desire, determine, development, device, devil, diet, differently, director, dirt, disappoint, disappointment, discovery, dismiss, display, distribution, document, doing, domestic, dramatic, drawer, drawing, drugstore, drum, duck, due, dull, eager, eagle, earthquake, ease, eastern, economic, economy, educational, effective, elect, election, element, elsewhere, emotion, employ, employee, employer, employment, encourage, engineering, entertain, entertainment, entire, entirely, environment, equally, equipment, escalator, essay, essential, establish, evidence, evil, exception, exchange, excite, excited, excitement, expense, experiment, expert, explanation, explore, explorer, export, expression, extra, extremely, eyebrow, failure, fairly, faith, fancy, farther, fashionable, feather, feature, fee, fever, file, finance, financial, firefighter, fireplace, firstly, fixed, flash, flock, flour, flute, fog, folk, fond, forth, fortunately, fortune, found, foundation, fountain, frame, frank, freezer, frighten, frightened, fry, fully, function, fund, funeral, fur, gang, gap, garlic, gasoline, generation, gently, geography, glance, global, glue, goalkeeper, goat, goods, goose, gossip, government, governor, grace, gradually, graduate, gram, grandchild, grant, grave, greet, grip, grown, growth, guilty, guy, handbag, handy, happening, harmony, harp, hawk, hearing, heel, helmet, helpless, hen, highway, hint, hip, homemade, hometown, honor, hopeful, hopeless, horizon, horn, horrible, horror, housewife, housework, housing, huge, humor, hundredth, hunger, hunter, ideal, identify, ignore, impact, import, impress, improvement, including, income, increase, indeed, independent, index, individual, indoor, indoors, industrial, influence, informal, injury, in, in, insist, instant, institution, instruction, instrument, insurance, intelligence, intention, interrupt, interview, introduction, invent, issue, item, jail, jar, jaw, jealous, jeep, jelly, jewel, joint, journal, journalist, justice, kangaroo, keen, ketchup, kettle, keyboard, killing, kindly, kindness, kingdom, kite, kitten, kitty, kiwi, knit, known, koala, label, ladder, lamb, landing, lane, lap, largely, lately, latest, lawn, leading, league, lean, learned, learning, lecture, legal, leisure, lemonade, lens, lettuce, liberty, license, lid, lifestyle, lightly, lightning, lily, link, listener, liter, literature, living, loaf, loan, location, loose, lord, loss, lost, lover, loving, lower, loyal, loyalty, luggage, lunchtime, lung, madam, mailman, mainly, maintain, major, majority, management, marriage, mask, means, meantime, media, melody, membership, mental, merchant, merely, merit, microphone, military, mineral, minister, ministry, minor, missing, mistaken, mixer, moonlight, moral, moreover, mostly, motion, motorboat, motorcycle, mount, moustache, moving, muscle, mushroom, mustard, mysterious, naked, napkin, necessity, needless, negative, neglect, neighborhood, nerve, network, nickname, nonsense, northern, novel, observation, observe, obvious, occupy, occur, odd, offend, offense, olive, omelette, onto, opening, operate, operation, operator, opportunity, oppose, option, orchestra, ordinary, organ, organization, original, otherwise, outdoor, overcoat, overnight, pace, paid, pale, palm, pancake, paradise, parcel, parking, particularly, partner, passion, pat, patch, patience, patrol, payment, pear, pence, penny, per, percentage, perfectly, performance, permanent, permission, personality, photography, phrase, physical, physics, pianist, pigeon, pile, pill, pistol, pitcher, pity, planning, playground, plum, plus, poetry, pointed, political, politician, politics, pop, population, porch, pose, possess, possibly, postcard, postman, practically, prayer, presence, pressure, pretend, previous, principal, principle, printer, probable, producer, production, profession, project, promising, properly, property, proposal, protest, pub, pudding, pump, pumpkin, punishment, quality, quarrel, raincoat, range, rapidly, rare, rarely, ray, reaction, reading, reality, receipt, recent, recognize, recommend, recorder, reduce, refer, reflect, reform, refrigerator, refuse, regret, regulation, reject, relate, relation, relationship, relative, relax, release, relief, religion, religious, rely, remind, rent, replace, represent, require, research, respond, response, responsibility, retire, review, revolution, reward, rhythm, rid, risk, rival, roast, rob, robber, robe, rod, romantic, roughly, rub, rubber, rude, ruin, sack, sadly, safely, sake, sales, salesman, sample, sandal, satisfy, saucer, sausage, saving, saw, scale, scarf, schedule, scissors, screen, screw, seafood, search, seashore, seaside, secondly, section, security, seed, seek, seldom, select, selection, self, selfish, senior, sensible, sensitive, serious, seriously, setting, settle, sexual, shame, sharply, shave, shelf, shell, shopkeeper, shy, sickness, sigh, signature, silently, simply, sincere, sincerely, singing, situation, sketch, sketchbook, skill, slave, slice, slight, slightly, slope, smart, softly, soil, somehow, sometime, somewhat, sore, soul, sour, southern, specialist, specially, specific, speedy, spice, spin, split, spoil, sportsman, spy, stadium, staff, statement, statue, steady, stewardess, stiff, stock, stocking, stolen, stove, stress, strict, string, stroke, structure, studio, suck, suffering, sufficient, suggestion, suitable, sum, sunny, sunrise, supply, supporter, suppose, surface, surprising, surround, survive, suspect, swear, sweatshirt, sweep, swell, swimmer, sympathy, tablecloth, tailor, tale, talent, tank, tap, target, teaching, teacup, teammate, teapot, technical, technique, technology, telegram, telescope, temper, temperature, temporary, tend, terribly, theory, therefore, thread, threaten, throughout, thunder, thus, tightly, timetable, tin, toast, tone, toss, totally, tough, tradition, traditional, transfer, translate, transport, trap, traveler, tray, treasure, treat, trend, trial, triangle, trousers, truly, trunk, tune, twist, typewriter, typical, ugly, underground, underneath, unexpected, unfortunate, union, unique, unit, universe, unknown, unlucky, unusual, upset, useless, user, vague, variety, various, vase, vast, vehicle, vest, victim, victory, vinegar, violence, violinist, visa, vision, visual, vitamin, volume, wage, wagon, waist, waiting, walking, wallet, watermelon, wax, weakness, wealthy, weapon, weekday, weep, whale, whatever, wheat, whenever, wherever, whichever, whistle, whoever, widely, wildly, winner, winning, witness, worm, wound, wrap, wrist, written, yacht, yell, yogurt, zone

Level 4

aboard, absolutely, absorb, abstract, abuse, acceptable, acceptance, accessory, accomplish, accord, accurate, accuse, ache, achievement, acid, acquaintance, acquire, acre, acting, actively, adapt, adjust, adjustment, administration, admiration, admission, advanced, advertisement, affection, aged, agricultural, agriculture, alien, alter, alternative, amateur, amaze, amazing, ambition, ambitious, amuse, amusement, amusing, analyze, ancestor, anchor, ancient, anniversary, annual, antique, anxiety, apologize, apology, apparent, apparently, appetite, appreciate, appropriate, approval, apricot, apt, aquarium, artificial, artistic, ash, ashtray, asking, aspect, ass, assert, associate, association, assume, assure, athlete, athletic, atmosphere, attraction, automatically, await, award, awfully, ax, bamboo, ban, banking, barely, barrel, basically, basin, beam, beaver, bedside, beggar, behavior, beloved, berry, betray, billion, bite, bitterly, blade, bleed, blend, blessing, bloody, bloom, blossom, blush, bodyguard, boiler, bolt, bond, bonus, booklet, bother, boundary, brandy, brass, breakdown, breeze, bride, brief, briefcase, briefly, bud, budget, bulldozer, burden, butcher, buyer, cabin, cabinet, calculate, camel, campaign, canal, cancer, capable, capacity, capture, cardigan, catalog, category, cattle, caution, cave, celery, cement, characteristic, charity, charm, cheat, cheerleader, chef, chemist, chemistry, chess, chew, chiefly, childish, chill, chop, chosen, christian, circuit, circumstance, civil, clap, classical, clip, closet, coach, cock, code, collapse, colony, column, combine, comedy, command, commerce, commission, commit, comparison, compete, competitor, complicated, component, composer, compound, concentrate, concentration, concerned, concerning, conclude, conclusion, conference, confess, confession, confident, conflict, congress, conquer, conscience, consciousness, consequence, consideration, consist, constant, constantly, constitution, construct, construction, contain, contest, context, contrary, contrast, contribution, convenience, convention, conventional, convince, convinced, cooperation, cop, cord, corporate, corporation, correctly, cosmos, cottage, council, counter, countryman, county, coward, craft, crawl, creep, crisis, critical, criticism, criticize, crossing, crossword, crow, cruelty, crystal, cultural, curiosity, curious, current, cute, cutting, dam, darling, dash, deadly, dealer, debate, debt, decade, decay, deceive, declare, decline, decorate, deed, define, definite, definitely, definition, delicate, delivery, demonstrate, depart, departure, dependent, deposit, descend, desirable, despair, despite, dessert, destination, destruction, detailed, detective, determination, determined, developing, differ, digest, digital, disadvantage, disagree, disaster, discipline, discourage, distinct, distinguish, distribute, dive, diver, division, doorbell, doorway, dot, draft, drag, dragon, dressing, dried, drift, drinker, driving, dumb, dusty, dynamic, echo, edition, editor, efficiency, efficient, elderly, electrical, electrician, electronic, emerge, emergency, emotional, emperor, emphasis, emphasize, empire, enable, enclose, encounter, endless, endure, engage, engaged, engagement, enjoyable, enjoyment, enormous, enterprise, enthusiasm, enthusiastic, entry, envy, episode, era, essence, essentially, establishment, estate, estimate, eve, eventually, evident, excess, exhibit, exhibition, existence, existing, expand, expectation, explode, explosion, expose, extend, extension, extent, external, extraordinary, extreme, factor, fade, faint, faithful, fallen, fame, farming, farthest, fasten, fatal, fate, favorable, fearful, fiction, filter, finding, finishing, fist, fitting, flame, flavor, flee, flesh, flying, focus, fold, forecast, formation, formerly, fort, founder, frankly, freely, frequent, frequently, frier, frontier, frost, fundamental, gallery, gamble, gangster, gardener, gay, generous, genius, gesture, ginger, globe, glory, glow, goddess, goodness, govern, gradual, grain, grandparent, grasp, greedy, grief, grocer, gross, guarantee, guidance, guidebook, guilt, gulf, halfway, handbook, handful, hanging, harmful, harsh, harvest, haste, hatred, heal, heating, heater, heavily, helping, heroic, hesitate, hidden, hiding, hillside, historical, hockey, holding, hollow, homeless, honestly, honesty, honeymoon, hood, hop, horseback, hostess, household, humanity, humble, hunting, hut, identity, idle, ignorance, ignorant, illegal, illustration, imitate, immense, imperial, impose, impressive, impulse, incident, increasingly, independence, indicate, inevitable, infant, inherit, initial, injure, injured, inn, innocent, inspire, instance, instinct, institute, instruct, insult, intellectual, intense, intent, interfere, interior, internal, interpreter, interval, invade, invention, invest, investigate, investigation, investment, invisible, involve, involved, jealousy, jewelry, journalism, joyful, judgment, jumper, justify, keeper, kidnap, kindergarten, kneel, knight, knot, knowing, lace, landscape, latter, laughter, launch, laundry, layer, leap, learner, legislation, liar, liberal, lifeless, lifelong, lifetime, limb, limited, linen, lipstick, liquid, literary, lively, lobby, locate, lodge, log, logic, logical, luckily, luxury, lying, machinery, madness, magical, magician, magnet, maid, maintenance, making, manual, manufacture, marble, marine, marked, marvelous, mast, mature, maximum, mayor, meadow, meanwhile, measurement, mechanical, mechanism, medium, mend, mercy, mere, merrily, mess, messenger, mighty, mill, millionaire, minimum, minority, miracle, miserable, misery, mist, mistress, misunderstand, mixed, mode, modest, monitor, monument, muddily, multiply, mutual, namely, nap, nasty, nationality, nearby, necessarily, negotiation, nevertheless, newly, normally, northeast, northwest, notion, nowadays, nuclear, nursing, oak, oasis, obedient, obey, obtain, obviously, occasional, occasionally, occupation, oily, openly, opposition, organize, origin,

originally, outcome, outdoors, outer, outline, output, outstanding, outward, overall, overcome, overlook, overseas, owl, ox, oxygen, packet, panel, panic, paragraph, parallel, parliament, parrot, partial, passing, passive, pavement, peasant, peculiar, penalty, perceive, personally, persuade, philosophy, physician, pine, pioneer, pit, pitch, planner, plot, poisonous, pollution, poorly, popularity, porter, portion, portrait, possession, postal, poster, postpone, potential, poverty, preach, precise, preparation, preserve, pressing, previously, primary, primitive, priority, privacy, privilege, procedure, proceed, profitable, prolong, promote, promotion, pronounce, pronunciation, proportion, prose, prospect, prosperity, proudly, province, publication, publicly, puppy, purchase, purely, pursue, pursuit, quantity, quit, radical, rage, rating, rattle, razor, readily, realistic, rear, rebel, recall, receiver, reception, recognition, recommendation, recording, recovery, reduction, reference, regarding, region, regularly, rejoice, related, relatively, relaxed, remark, remarkable, remote, repay, repeated, replacement, representative, republic, reputation, requirement, rescue, resemble, residence, resident, resist, resistance, resolution, resolve, resort, resource, restore, restrain, restraint, retain, retired, reveal, revenge, reverse, rewrite, rifle, ripe, ruling, rural, sacrifice, sadness, saint, salmon, salty, satisfaction, satisfied, scandal, scarcely, scare, scared, scatter, scenery, scent, scheme, scholar, scholarship, scold, scout, scratch, seal, searching, secondary, secretly, sector, secure, seize, sensation, session, settlement, severe, sew, shallow, shelter, shepherd, shield, shift, shocked, shortage, shortly, sidewalk, significant, sin, site, skier, skillful, skip, sleeve, slim, slipper, smash, snack, snap, software, solution, sooner, sorrow, source, southeast, southwest, spade, spark, species, spectacle, spill, spiritual, spite, splendid, spokesman, sponge, sponsor, spoonful, spray, squeeze, stable, stake, stall, stare, starve, status, steamer, steep, stem, stew, sticky, sting, stir, stormy, strain, strangely, strictly, striking, strip, strongly, stylist, submit, substance, suburb, summit, sunflower, surrender, surrounding, survey, sword, sympathetic, tablespoon, tame, task, technological, telling, temptation, tendency, tender, tense, tension, territory, terror, thickly, thirst, thorough, thoroughly, thousandth, thrill, tide, tidy, token, tomb, trace, tractor, trail, trainer, translation, transportation, treatment, treaty, tribe, triple, triumph, tropical, turning, tutor, uncertain, unclear, uncomfortable, underline, undoubtedly, unfortunately, unite, united, universal, unkind, unlikely, unnecessary, upright, upward, urge, urgent, vain, van, vanilla, vanish, variation, vary, venture, verse, version, vessel, via, vice, villager, virtue, visible, volunteer, voyage, wander, warmly, warmth, weaken, weave, web, weed, welfare, whip, whisper, wicked, width, wilderness, wildlife, willingly, windy, wink, wisdom, worn, worrying, worthy, yawn, yearly, yield, youngster, youthful

Level 5

abandon, abandoned, abolish, absurd, abundance, abundant, academy, accidental, accommodation, accomplished, accomplishment, accordingly, accurately, accused, accustomed, acquainted, acquire, acquisition, acute, adventurer, adventurous, advertise, advertising, aggressive, agony, agreeable, aisle, alert, alliance, alligator, allowance, ambassador, animation, annoy, antenna, anticipate, apparatus, appreciation, approximately, arcade, arched, architect, architecture, arena, arithmetic, armed, armor, ascend, aspirin, assemble, assembly, assign, assignment, assumption, assurance, astonish, astonishing, attain, attendant, auto, awareness, awe, awkward, ballet, ballpoint, bang, barn, barrier, beaten, beating, beetle, behalf, belly, belonging, bent, biological, biologist, biology, blaze, blond, blueberry, boredom, borrower, boyhood, bra, bracelet, bravely, breadth, breaker, breathing, brim, broadcasting, broke, bronze, brutal, bug, bulb, bulk, bump, bundle, bureau, burglar, burning, calculation, calf, calorie, candidate, canvas, cape, capitalism, capitalist, carelessly, caring, carve, catcher, cathedral, catholic, cautious, cease, cereal, challenging, chamber, championship, chaos, charming, charter, chat, chip, chorus, christianity, cider, circular, civilian, civilization, civilize, clay, click, climax, clover, clue, coconut, coffeehouse, colleague, colonial, colonist, combat, comedian, commander, commitment, commonly, communist, competitive, compose, comprehension, compromise, conceal, conceive, concentrated, concept, concrete, condemn, condense, conductor, confine, confront, confuse, confused, confusing, confusion, congratulations, conqueror, conquest, consensus, consent, consequently, conservation, conservative, considering, consistent, constitute, consult, consultant, consume, consumer, consumption, contemporary, contempt, continuous, contribute, convert, convey, conviction, cooker, cope, copper, core, corridor, coupon, courageous, cradle, creamy, creativity, cricket, critic, crocodile, crossroad, crosswalk, crucial, cube, cucumber, cultivate, cunning, currency, currently, dairy, daisy, damn, damp, daring, darken, darkly, daylight, deadline, dealing, dearly, decided, declaration, decoration, defect, delightful, democrat, demonstration, dense, depression, deprive, derive, desperate, desperately, despise, destiny, destructive, detect, developed, developer, devote, devotion, dignity, diligent, dim, dine, dinosaur, dip, diplomatic, disappointed, discharge, disco, disgrace, disguise, disgust, disgusting, dishwater, disorder, dispose, dispute, dissolve, distinction, distinctly, distinguished, distress, disturb, divorce, dock, dolphin, dominant, dominate, donkey, doorstep, doubtful, doubtless, dove, downward, drain, drawn, dread, dresser, dressmaker, drier, drip, dwell, dye, dying, eagerly, eagerness, earnest, earning, earthly, easter, economical, economist, edit, educated, educator, effectively, elective, electronics, elegant, elementary, elite, embarrass, embarrassing, embassy, emotionally, enlarge, ensure, entertainer, entitle, environmental, equality, erase, erect, errand, esteem, eternal, ethnic, evaluate, evaluation, evidently, evolution, exaggerate, exceed, excessive, exclaim, exclude, executive, exhaust, expansion, expedition, experienced, experimental, exploration, exposure, extensive, exterior, facial, facility, fairness, faithfully, famine, fantastic, fantasy, farewell, farmhouse, fascinating, fastener, feast, federal, ferry, fertile, fetch, fiber, fierce, fighter, finely, flashlight, flatter, flexible, flourish, flu, fluent, foam, folder, follower, footprint, footstep, forbid, forbidden, forced, forehead, forgetful, format, freeway, frequency, freshman, frightening, frown, frozen, fruitful, frustration, fulfill, furnish, gallop, garbage, garment, gaze, gear, generously, genuine, graffe, gleam, gloomy, glorious, golfer, gown, grab, graceful, graduation, graph, graphic, greenhouse, griev, grim, grin, grind, groan, grocery, guideline, guitarist, gun, hairdresser, halt, handling, hanger, hardness, hardware, harmless, harmonica, hasten, hastily, hasty, hay, heading, headline, headphone, headquarters, heap, heaven, hedge, heir, herd, heroine, highlight, hike, hilltop, historian, historic, hitchhike, homesick, honorable, horizontal, horseman, housekeeper, housekeeping, howl, hug, humorous, hurricane, iced, icy, ideally, idiot, illusion, illustrate, imaginary, imaginative, imitation, immensely, immigrant, impatient, imperfect, implement, imply, incline, inclined, incredible, independently, indirect, industrious, infection, inferior, inflation, influential, inhabit, inhabitant, initially, input, inquire, insider, inspect, inspector, inspiration, install, instantly, instructor, insure, interpret, interviewer, invasion, inventor, investor, inward, irony, isolated, ivory, jealousy, jog, keyword, killer, knitting, laboratory, laborer, lame, lantern, lark, lastly, leadership, legally, legend, lick, lighter, lighting, likewise, limitation, liquor, listing, literally, liver, lobster, loneliness, loosely, lounge, lump, magnificent, majesty, makeup, mango, manufacturer, marathon, margin, marker, marketing, marking, massive, mat, mathematical, mattress, mechanic, medieval, memo, memorial, mentally, microwave, mid, midday, milkman, millionth, minus, mischief, misfortune, missile, mission, mitten, mixture, moan, moderate, modify, moist, moisture, monarch, morally, moss, motive, motorbike, motorist, mourn, multiple, mummy, murmur, myth, negotiate, neutral, nicely, nickel, nightdress, nightgown, nightmare, nonstop, noted, noticeable, noun, novelist, nude, numerous, nursery, nylon, oar, obedience, objective, obligation, oblige, observer, offensive, offering, officially, omit, onward, opponent, optimistic, oral, organic, organism, organist, organized, oriental, originate, ornament, ounce, outlet, outlook, overflow, overhead, oversleep, overtake, overwhelming, oyster, packaging, packing, pad, painfully, pal, pamphlet, pansy, paperback, parasol, participate, particle, partnership, passionate, password, pasta, paste, pastime, pasture, patiently, patron, peal, peer, perception, performer, perfume, perish, pessimistic, petrol, phase, phenomenon, philosopher, physically, pierce, pillowcase, pinch, plainly, playmate, plead, pleasing, plow, plunge, plural, pocketbook, pointer, poll, pony, pope, portable, portray, powerless, precisely, predict, prefecture, preference, prejudice, prescription, presentation, presently, presidential, prevail, prevention, primarily, prime, printing, privately, procession, proclaim, productive, productivity, profile, progressive, prohibit, prominent, prompt, promptly, prosper, prosperous, protective, proven, proverb, provider, provincial, provision, prudent, psychological, psychologist, psychology, publicity, publisher, publishing, pullover, punch, punctual, pyramid, qualify, quote, racial, racing, rag, raindrop, raisin, random, raspberry, rational, react, reasonably, recess, recession, recipe, recruit, recycle, refine, reflection, refresh, refuge, refugee, refusal, regardless, regional, register, regulate, relaxation, relieve, relieved, reluctant, remarkably, remedy, removal, renaissance, renew, rental, reproduce, republican, researcher, reservation, reserved, resign, respectable, restrict, restriction, resume, retirement, retreat, revival, revive, revolutionary, rib, riches, rider, ridiculous, riding, rightly, rinse, rising, risky, riverside, roar, robbery, rocky, romance, rosy, routine, rudely, rugby, sacred, saddle, salesclerk, salespeople, salesperson, sandy, satellite, satisfactory, satisfying, scar, scarce, scary, schoolbook, schoolhouse, schoolmaster, schoolroom, schoolteacher, scrap, sculpture, seemingly, senate, sentiment, separately, separation, seriousness, severely, sexy, shed, shilling, shiny, shipping, shocking, shoemaker, shorten, shoval, shrink, sightseeing, significance, similarity, similarly, singular, situated, skilled, slap, slender, slippery, snatch, sneeze, soar, sob, soften, sole, solely, solidly, solitude, solo, someday, sow, sparkle, sparrow, specialize, specifically, spectator, sphere, sporting, sprinkle, squirrel, stain, standing, startle, statesman, steadily, steer, stern, stimulate, stitch, stomachache, strap, strategy, stretcher, strengthen, stride, stripe, strive, stubborn, stumble, stylish, substantial, substitute, sue, sufferer, suicide, summertime, summon, sunglasses, superior, supposed, supreme, surfing, surgeon, surgery, surprisingly, survival, survivor, suspend, suspicion, suspicious, sustain, swift, symphony, talented, tease, technically, tempt, tenderly, terrific, terrorist, testing, thanksgiving, theme, thermometer, thinker, thinly, thorn, thoughtful, thriller, thrilling, throne, tighten, tights, timeless, tissue, tolerate, toothache, topping, torch, touching, tournament, trader, trading, tragedy, tragic, transform, transition, tread, trendy, trim, trombone, troop, tub, turtle, twilight, twinkle, typhoon, typically, ultimate, unacceptably, unaware, unbelievable, uncertainty, uncommon, uncover, undergo, undergraduate, undertake, unemployment, unexpectedly, unfair, unfamiliar, unimportant, unity, unjust, unlike, unpleasant, unusually, unwilling, urban, utter, utterly, vacuum, veil, veranda, verb, victorious, viewpoint, vigor, vine, violate, violently, vital, vivid, volcano, vow, waken, ward, warming, warrior, wartime, wholly, widespread, widow, wineglass, wireless, wit, witch, withdraw, woodland, workshop, worldwide, zebra, zipper

Level 6

abortion, abrupt, accessible, accidentally, accommodate, accountant, accounting, accumulate, accuracy, accusation, ace, acknowledge, activist, adequate, adjective, administrative, administrator, admirable, admirer, adverb, advertiser, aftercare, aha, airliner, alas, alcoholic, alley, ally, almighty, alongside, alphabetical, aluminum, ample, analyst, annoying, anticipation, ape, applaud, applause, applied, architectural, armchair, ascent, assess, assessment, asset, astonishment, astronaut, astronomer, astronomy, athletics, attendance, attentive, attribute, authorize, babe, backbone, bacteria, badminton, bald, banish, bankrupt, banner, banquet, barbecue, bargaining, bazaar, beak, beater, beforehand, beneficial, betrayal, bilingual, biography, biting, bitterness, blast, bleach, blessed, blot, blueprint, bodily, boiling, boldness, booking, boom, boost, booth, bounce, boycott, bravery, breaking, bribe, brighten, brightness, brilliance, brook, broom, buddhism, buddhist, builder, burial, businesslike, buzz, calculator, caller, calmness, campground, cannon, canyon, capability, caress, cargo, carrier, cartoon, cashier, casually, cell, cemetery, certainty, certificate, chairperson, challenger, changeable, characterize, cheaply, cheapness, checkup, chilly, choke, circulation, cite, clash, classification, classified, classify, clause, clearing, clearness, climatic, cloak, closing, cluster, coarse, coating, collective, colored, coloring, combined, comeback, comet, conical, commence, commodity, comparable, comparative, comparatively, compass, compel, compensation, competent, competing, completion, complexity, complicate, complication, compliment, composed, comprehend, compulsory, conception, conditional, condom, congratulate, considerably, constructive, consultation, contentment, continental, continual, continually, continuously, controversial, controversy, conversational, convict, convincing, coolness, cooperate, cooperative, coordinate, cork, correction, correspond, correspondent, corrupt, corruption, cosmetic, costly, couch, councilor, council, counseling, counselor, counterpart, countless, courtesy, coverage, cowardly, cozy, cracker, craftsman, crane, creator, crisp, crook, crouch, cuckoo, cue, cupful, curiously, curriculum, curse, cycling, cyclist, dart, database, daybreak, deceit, decent, deception, dedicate, dedicated, deepen, defendant, defender, defensive, deficit, defy, deliberate, deliberately, delicately, demerit, demonstrator, denial, dental,

dependence, depress, depressed, depressing, deputy, descendant, descent, deserted, devise, devoted, dew, diagram, dialogue, digestion, dime, dimension, diminish, diplomat, disagreement, disappointing, disapproval, disapprove, disclose, discrimination, dishonest, dishonestly, displeas, dissatisfy, distinctive, distrust, disturbance, disturbed, disturbing, ditch, diverse, diversity, divine, dizzy, documentary, donation, dreadful, driveway, dropout, drunken, duke, dullness, dump, dwarf, dwelling, earnestly, economically, economics, eggplant, ego, elaborate, electron, eliminate, embarrassed, encouragement, endeavor, endurance, energetic, enormously, entertaining, envious, equation, equip, equivalent, eternally, ethical, ethics, everlasting, evolve, exaggeration, examiner, exceedingly, excellence, exceptional, exclusive, exclusively, excursion, execute, exhaustion, exploit, explosive, exporter, extract, fable, facsimile, faculty, fake, familiarity, faraway, farmland, fascinate, fatigue, fearless, federation, feeble, feminist, financially, fireproof, firework, fitness, flatten, fleet, flexibility, fling, fluid, flutter, folding, folly, forgiveness, formality, formula, fortnight, fossil, foster, foul, fowl, fraction, fragment, framework, freshly, frustrate, fuck, fucking, fulfillment, funding, furthermore, fuss, fuzzy, gallon, gasp, gateway, gathering, gem, gene, generate, generosity, genetic, geometry, glide, glider, glimpse, glitter, gorgeous, grammatical, gratitude, gravity, graze, grill, grouping, grove, grower, guarded, gunman, habitual, hail, hallway, handicap, handicapped, harden, hardship, hardy, hateful, haunt, headlight, headmaster, hence, herb, heritage, hesitation, highland, hilly, holder, holiness, hospitality, hostile, hostility, hum, hymn, idealize, identification, ideology, idiom, idleness, immature, immortal, impatience, impolite, importantly, impossibility, imprison, inadequate, incapable, inclination, incorrect, indication, indifference, indifferent, individually, inevitably, inexpensive, infect, infectious, infinite, inflict, informed, ingredient, inheritance, initiate, initiative, innovation, inquiry, insert, insight, insistence, insistent, inspection, inspiring, institutional, instructive, instrumental, insufficient, intellect, intended, intensity, intermediate, interpretation, interruption, intervention, intimate, involvement, irregular, irresponsible, irritate, irritating, irritation, islam, isle, isolate, isolation, jerk, jolly, juicy, junk, jury, justification, kit, lacking, lad, lasting, leak, lest, lever, librarian, liking, liner, lining, lodging, lone, loosen, loser, loudspeaker, lumber, magnetic, maiden, mainland, mammal, manhood, manly, manuscript, marketplace, marvel, massage, masterpiece, mathematician, mellow, melting, memorize, metallic, metaphor, microscope, midst, mildly, milky, mingle, mini, miniature, mining, mislead, mister, misunderstanding, mock, moderately, moderation, modestly, modesty, mold, molecule, momentary, monetary, monopoly, morality, mortal, motivate, motorcar, motorway, mouthful, multimedia, multitude, murderer, muslim, mutter, mutton, narration, narrative, nationalist, naughty, naval, navigation, neatly, needy, neighboring, newcomer, newscaster, newsletter, nightclub, nobility, nobleman, noiseless, noisily, nomination, nonetheless, noodle, nuisance, nun, nutrition, oat, objection, obscure, obstacle, octopus, odor, offender, offshore, offspring, opener, optional, orbit, orchard, orient, originality, ornamental, orphan, orthodox, outbreak, outbid, outskirt, oval, overthrow, overtime, overweight, overwhelm, ownership, pant, paradox, parliamentary, parlor, partially, participant, participation, pastry, patent, paw, peacefully, peacock, peck, peculiarity, peculiarly, pedal, peep, penetrate, penetration, penniless, pension, perch, perfection, peril, persist, persistent, personnel, perspective, photographic, physicist, pillar, pint, plague, planetarium, plantation, pledge, plentiful, plug, poetic, popularly, positively, postage, precaution, prediction, pregnancy, pregnant, preliminary, premise, preschool, preservation, pretense, prey, priceless, prick, probability, probe, proceeding, proficient, profound, prominence, promoter, proposition, protector, protestant, provided, providing, provoke, puff, puppet, purity, qualification, quest, queue, quietness, rack, radar, radish, ragged, rainfall, rally, ram, rape, ratio, realm, reap, reasoning, reassurance, rebellion, rebuild, receptionist, reckless, recreation, reel, reflective, refreshing, refreshment, regain, registration, regularity, rehearsal, reign, rejection, relaxing, relevant, reliable, remanufacture, remembrance, render, reopen, repeatedly, repetition, replay, reverse, representation, reproduction, resemblance, resent, resentment, reside, residential, respectful, restless, restoration, restructure, retail, revenue, revise, revolt, revolve, rhythmic, riddle, rigid, rip, ritual, roam, rubbish, rust, salaried, salon, salute, satan, savage, scenario, schooling, scooter, scope, scorn, scramble, scrape, script, seaport, searchlight, seaweed, secondhand, sect, seminar, senator, sender, sensitivity, sequence, sewing, shady, shameful, shark, sharpen, sharpness, shatter, sheer, shinto, shit, shiver, shrine, shutter, sideways, signify, simplicity, simultaneously, sincerity, skyscraper, slam, slavery, sleepless, slogan, smoky, snowstorm, snowy, soak, soapy, sober, socialist, sociology, solar, solemnly, solitary, sophisticated, spacecraft, span, spread, spectacular, speculation, spicy, spinach, spit, sporty, springtime, stability, stack, stagger, staircase, stale, stalk, standpoint, startling, starvation, statistics, steamship, stillness, stimulus, stony, stool, stoop, storage, storyteller, storytelling, straighten, strait, stray, strife, structural, stump, stupidity, subtle, succession, successive, successor, sufficiency, summary, supervision, supplement, suppress, surf, surname, suspense, swamp, sway, sweetheart, sweetly, sweetness, swimsuit, syllable, symbolic, sympathize, symptom, systematic, tablet, tackle, tag, tasty, taxation, taxpayer, teamwork, teaspoonful, technician, telegraph, tempo, tenant, tenderness, terminal, terrace, terrify, thankful, thankfully, theatrical, theft, therapy, thickness, thrust, tick, timid, tiring, topical, torment, tortoise, torture, tourism, transaction, transformation, translator, transmission, transmit, transparent, trash, treasury, tremble, tremendous, triangular, trivial, trophy, troublesome, trusting, trustworthy, truthful, tuck, tuna, ultimately, umpire, unarmed, unavoidable, unbearable, unconscious, undo, undoubted, undress, uneasy, unemployed, unfold, unhappy, universally, unlocked, unlock, unmarried, unmistakable, unnatural, unpaid, unreasonable, unsatisfactory, unseen, unselfish, unsteady, unsuccessful, unsuitable, untidy, unwise, unworthy, usefulness, utility, utilize, utmost, vacant, valid, valueless, vanity, varied, velvet, vicious, viewer, vigorous, villa, violation, virgin, virtual, virus, vitality, vocal, voltage, voluntary, voter, vowel, walnut, warrant, wasteful, watchdog, watchful, watchman, watercolor, waterfall, waterproof, weakly, whereas, whirl, whiteness, widen, withdrawal, woolen, workman, worldly, worship, worthless, worthwhile, wrinkle, wrongdo

Level 7

abandonment, abbreviation, abnormal, abolition, abusive, accompaniment, accordance, adaptation, administer, admiral, adoption, adore, adorn, advancement, advantageous, advisory, affectionate, affirm, agenda, aggression, aide, aimless, airway, alarming, alcoholism, algebra, allege, allied, altar, alteration, alternate, altitude, amazed, amazement, amen, amend, amendment, ancestry, annoyance, anonymous, antarctic, anthropology, appendix, appetizer, appetizing, appliance, applicable, applicant, apprehension, apprentice, approximate, archaeology, arctic, armored, arouse, arrogant, ashore, assertion, atmospheric, attachment, attorney, auction, audition, auditorium, autobiography, avail, avoidance, axis, bachelor, backing, bait, ballot, bandage, bankruptcy, barbarian, barefoot, barley, barrack, barricade, bedding, behold, bellybutton, bestow, beverage, beware, bias, bid, bimonthly, binding, birthplace, blink, bliss, blunt, boastful, bosom, botanical, bough, bouquet, bowel, bracket, breathless, bridegroom, brisk, broadly, brochure, bruise, brunch, brute, buffet, bulletin, bureaucracy, burnt, bypass, calamity, calcium, campaigner, canary, cane, capsule, caption, captive, caravan, cardboard, cartridge, carving, catastrophe, cater, cellar, census, centered, ceremonial, certify, challenged, chancellor, chaotic, chap, chariot, chatter, cherish, chestnut, chick, chime, choir, chore, chuckle, churchyard, circulate, citizenship, civic, clarify, clatter, clergy, clergyman, cling, clinical, cloakroom, clockwork, clown, clumsy, clutch, coastal, coffin, coil, coincide, collision, colonel, columnist, comforting, commend, commissioner, commonplace, commonwealth, communicative, communism, commuter, compartment, compensate, competence, complement, comprehensive, comprise, comrade, concede, conceptual, concession, concise, cone, confer, confide, confidential, confirmation, conform, confrontation, consequent, console, consonant, conspiracy, constitutional, contemplate, contend, continuation, continuity, contraction, contractor, contradict, contradiction, contrive, controller, conversion, cordial, corps, corpse, correspondence, courteous, crab, cracked, creditor, creek, cripple, criterion, crude, crumb, crust, crutch, cultivated, cultivation, curly, cylinder, dazzle, deafen, dean, debut, deceitful, decidedly, decisive, deem, deficiency, delegate, delegation, den, density, dependency, descendant, desolate, destined, destroyer, detach, detergent, developmental, devour, diagnosis, dialect, diameter, dictate, dictation, differentiate, diligence, dining, diploma, diplomacy, directive, disagreeable, disappearance, disarmament, disastrous, disbelief, discard, disciple, discomfort, discouragement, disgusted, dishonor, dismal, dismay, dismissal, dispatch, displace, disposal, disposition, dissatisfaction, dissatisfied, distort, distorted, distract, distributor, divert, dividend, doctrine, dogmatic, domain, dome, donate, doom, dormitory, dose, drastic, dreamy, drowsy, duration, dusk, duster, dutiful, eastward, easygoing, eccentric, ecology, edible, editorial, elastic, elevate, eloquent, embark, embrace, emergence, eminent, emission, enchant, enclosure, enforce, enforcement, engaging, enhance, enrich, enthusiast, envelop, epoch, equator, erotic, err, escort, evenly, eventual, excel, exclamation, exclusion, execution, exert, exhausting, exile, existent, expend, expenditure, expertise, expressive, exquisite, eyelash, eyelid, eyesight, fabric, factual, fahrenheit, falsehood, fascination, fasting, faultless, feedback, feeder, feminine, feverish, fiery, fig, fingerprint, fiscal, flake, flap, flattery, flip, flush, foe, foggy, folklore, footpath, forbidding, forceful, forefather, foresee, formidable, formulate, forsake, forthcoming, forum, fraud, freight, friction, fright, frightful, fringe, functional, furious, furnace, furnished, fury, gardening, gargle, genre, geographical, geology, gigantic, giggle, given, glacier, glare, goldfish, gospel, gracious, gratify, grease, greed, groom, growl, grumble, guardian, gull, gunshot, hairy, halve, handicraft, handout, handshake, handwriting, hare, harmonious, hatch, haul, hazard, hearth, heartily, hearty, heed, heighten, hereafter, hijack, hind, hinder, hindrance, hiss, hive, homecoming, hoof, hopefully, horoscope, horseshoe, hostel, hound, hourly, householder, humid, humility, hurdle, hurl, hush, husky, hydrogen, hypothesis, idealistic, identical, identifiable, idol, illuminate, illumination, implore, imposing, imprisonment, improper, inability, inactive, incentive, incessant, incidence, incidentally, inclusion, inclusive, inconvenience, inconvenient, incorporate, indicator, indignant, indignation, indignity, indispensable, induce, indulge, inexperienced, ingeniously, inherent, injection, injustice, inland, innocence, innumerable, insane, insignificant, installation, instinctive, insulting, intact, intake, intelligible, intensify, intensive, intentional, interaction, interference, intersection, intrude, invalid, invariably, ironical, itch, jeweler, jockey, jug, junction, kernel, kim, knob, knowledgeable, knuckle, lament, landlord, lapse, lash, latitude, lavatory, lawful, leaflet, lease, lecturer, leftover, legislative, legitimate, lengthen, leopard, lessen, liability, liable, lieutenant, lifeboat, lighten, lighthouse, limp, linear, linger, linguistic, livelihood, lizard, locomotive, lofty, lonesome, longtime, loop, lorry, lotion, lottery, luncheon, luxurious, madly, magnify, magnitude, mainstream, malice, manifest, mansion, mantle, maple, marsh, marshal, masculine, maturity, mediator, meditate, meditation, melancholy, memorandum, menace, mentality, merchandise, merciful, mercury, messy, metropolis, metropolitan, mileage, miner, miraculous, misplace, modification, monarchy, monk, monotonous, monstrous, mortality, mortgage, motionless, motivation, mover, municipal, muse, mustache, mute, nationalism, nationalize, navigate, navigator, negligence, nominate, notable, notwithstanding, nourish, oath, obstinate, occurrence, oddly, omission, operating, oppress, oppression, optimism, orderly, ordinarily, outfit, outgoing, outing, outrage, overturn, overview, pail, panorama, papal, paralyze, parsley, partake, pastor, pathetic, pathway, patriot, patriotic, pave, payable, payer, pebble, pedestrian, peg, peninsula, perpetual, perplex, persuasion, persuasive, pessimism, pessimist, petition, pharmacist, picturesque, piercing, pious, pipeline, pitiful, planetary, plaster, playful, pluck, plumber, plump, poisoning, polar, potluck, pottery, pouch, precede, precision, predecessor, preface, preferable, premier, prescribe, preside, prestige, presumably, presume, prevailing, prevalent, prior, profess, projection, pronoun, prop, propaganda, prophet, prospective, prune, pulse, punctuality, quaint, qualified, quart, queer, quicken, quotation, raid, rake, ranch, rash, rationality, rationalize, realization, reappear, rebellious, recite, reckon, recollect, recollection, reconcile, reconciliation, reed, referee, refinement, refrain, regime, regrettable, rehabilitation, rein, reinforce, relay, reluctance, renewal, reorganize, repent, reprint, reproach, reptile, resistant, respective, respectively, responsive, restrictive, revealing, revelation, reverence, rhetoric, ridicule, rim, riot, ripen, roller, rooster, rot, rotation, rotten, roundabout, rouse, royalty, rug, rugged, rustle, safeguard, saloon, sane, sanitary, satire, scandalous, scanty, scarlet, scoop, scornful, seam, seaman, seasonal, seasoning, seeker, selective, semifinal, sensational, senseless, sentimental, sergeant, sermon, serpent, setup, sexuality, shabby, shadowy, shaft, shawl, sherry, shining, shriek, shrub, shrug, silky, simplify, simultaneous, sip, situate, skim, skinny, skyline, slang, slant, slay, sleeper, slot, slug, slumber, sly, smog, snail, snare, snore, socialism, sociologist, soloist, soothe, sophomore, sorrowful, souvenir, sown, sparkling, spear, specimen, spike, splash, splendor, spoke, sponsorship, spontaneous, spotted, sprung, spruk, squash, stab, stance, staple, stapler, static, stationery, statistical, steadfast, steward, stiffen, stopper, storehouse, storekeeper, stout, straightforward, strand, strider, stylistic, subdue, subjective, sublime, submarine, submission, subscription, subsequent, subsequently, subsidiary, subsidy, subtract, sullen, summarize, sunbeam, sunk, superb, supernatural, superpower, superstition, supervise, supplier, supportive, suppression, surpass, surplus, suspension, swarm, sweeten, sweetie,

swelling, symbolize, symposium, takeover, talkative, tan, tanker, tariff, tasteful, tearful, tedious, telecommunications, teller, temperate, tempest, temporarily, territorial, testify, textile, texture, thaw, theoretical, thereafter, thesis, thicken, thicket, thigh, thoughtless, threshold, thrive, thunderstorm, tidal, tile, timber, timer, timing, tireless, tiresome, toil, tolerable, tolerance, tolerant, toll, tradesman, trainee, traitor, tram, tramp, trample, tranquil, traveling, treasurer, tribute, tricky, trifle, trustee, tumble, turnover, twig, tyranny, tyrant, unanimous, unchanged, understandable, undertaking, undesirable, unhealthy, uniformity, unofficial, unpopular, unpredictable, unskilled, unsure, update, uphill, uphold, usage, utensil, utterance, vacancy, vaguely, valve, vapor, variable, vein, verbal, vertical, vibrate, victor, virtually, virtuous, vocation, vulgar, wallpaper, wanderer, ware, warfare, warring, washcloth, watering, waver, weary, weird, westward, wheelchair, wholesale, wholesome, willow, wintertime, wither, withstand, witty, wreath, wreck, wrestling, wretched, wring, yarn, zeal, zealous, zip

Level 8

abnormality, aboriginal, abound, absorbing, absorption, accelerate, accumulation, acknowledgment, acutely, adaptable, adapter, addict, addiction, adhere, adjustable, adolescence, adolescent, adverse, advisable, advocate, aerial, aerospace, aesthetic, affectionately, affirmative, afflict, aging, agitation, agonize, allegation, alleged, allegedly, allocate, alpha, alternatively, ambiguity, ambiguous, amid, amused, analog, analogy, analytic, analytical, anatomy, ancestral, anguish, annoyed, anti, antibody, apparel, appreciative, arbitrary, arc, archaic, arise, aristocracy, aristocrat, aristocratic, array, arrogance, artisan, ascertain, ascribe, aspiration, aspire, assassinate, assault, assorted, assuming, attainment, attic, audit, authentic, authoritative, autonomy, aviation, avocado, babble, badge, bail, balanced, ballad, baron, barren, bass, batch, batter, bearer, bearing, bewilder, bewilderment, biased, biographer, biographical, birthrate, bishop, blackmail, blacksmith, bleak, blur, borderline, botany, brace, breach, breakthrough, breakup, brew, bribery, brink, broker, brood, brownie, buckle, buddy, buffalo, bulky, bully, bum, bumper, bungalow, burglary, buttonhole, calling, cancellation, captivity, carnival, casino, casualty, categorical, celebrity, centigrade, charcoal, charitable, checklist, childcare, chirp, chord, clarity, clasp, claw, cleanse, cleanser, cleanup, clench, clerical, cleverly, clone, closure, cloudless, coalition, cockpit, coeducation, coherent, coincidence, collide, colonize, comma, commentary, commentator, communion, commute, compassion, compatible, compelling, compile, comply, composite, compress, compute, computerize, con, conceit, conceivable, conclusive, condominium, confinement, confirmed, conflicting, congregation, congressional, conscientious, conserve, considerate, consistency, consolidate, consolidation, conspicuous, conspire, constraint, contagious, contaminate, contented, contributor, cookery, coordination, correlation, corresponding, cosmopolitan, countenance, coup, courtyard, cram, cramp, crater, craze, credible, creed, critique, crooked, cruelly, cruiser, crusade, crushing, cubic, cursed, curved, custard, custody, customary, dagger, dandelion, deathbed, decency, decimal, decorative, dedication, defective, degradation, delete, delicacy, delta, demo, demon, deodorant, depict, deprivation, descriptive, deserved, designate, designing, desktop, desperation, detached, detachment, devastate, dice, dictator, dignity, dilemma, directory, disability, disabled, disarm, discern, disciplinary, disciplined, discontent, discontinue, discredit, discretion, discriminate, disdain, disillusion, disinterested, disobedience, disobey, dispense, displacement, displeasure, disposable, disregard, disrupt, disruption, dissolution, distraction, diversion, divided, divinity, documentation, dodge, dominance, domination, don, donor, dough, downhill, dramatist, dramatize, drawback, driven, duly, dummy, dumping, durable, dweller, dynamics, dynamite, eccentricity, ecological, ecologist, ecstasy, eel, electoral, elegance, elimination, eloquence, embroider, emigrate, emigration, emit, emphatic, emphatically, encouraging, encyclopedia, endanger, endorse, endow, endowment, enduring, enlightenment, enlist, enroll, entangle, enterprising, entity, entrepreneur, epidemic, equilibrium, equity, eruption, escalate, estimated, estimation, eternity, etiquette, exalt, exceptionally, exhaustive, exotic, expanse, expel, expire, explanatory, explicit, exploitation, expressway, extinct, extinguish, extravagant, eyeball, eyewitness, facilitate, faction, fad, fading, faintly, falter, fanciful, farmyard, fascism, fatality, favored, fellowship, feminism, fertility, fertilize, fertilizer, festive, festivity, fillet, filling, filmmaker, filthy, fingernail, finished, finite, fishery, foil, footlight, forefront, forestry, formulation, fragile, fragrance, frail, frantic, freelance, friendliness, frustrating, fullness, galaxy, gale, gauge, gender, generalization, generalize, genuinely, glaze, gloom, godfather, goodwill, gourmet, governing, governmental, grader, groundwork, guerrilla, gulp, guru, gush, gut, gymnasium, habitat, habitually, hangover, harassment, hardworking, harmonize, hazelnut, heavyweight, hemisphere, hereditary, heroin, hesitant, hierarchy, hinge, hitch, hitobit, homeland, homosexual, honorary, hoop, horrified, horrify, hose, hospitalize, hostage, humanitarian, humidity, humiliate, humiliation, hurrah, hybrid, hypocrisy, hysterical, idealism, ideological, ignition, illiterate, illustrated, imagery, imaginable, imbalance, immerse, immigrate, immigration, immoral, immortality, impeachment, impersonal, implication, implicit, implied, impractical, imprint, improbable, impulsive, inaccessible, inaccurate, inadequacy, incoming, incomplete, incomprehensible, inconsistent, incorporated, individuality, indulgence, indulgent, industrialize, ineffective, inefficient, inequality, infancy, inferiority, infinitely, inflexible, informative, inhibit, initiation, inject, innately, innkeeper, inscription, inseparable, integral, integrate, integrated, integration, integrity, interact, interactive, intercept, interchange, intercourse, interface, intervene, intimacy, intolerable, intricate, introductory, intruder, intrusion, intuition, invader, invaluable, inventive, investigator, invoice, involuntary, ironic, irrational, irrelevant, ivy, jellyfish, jingle, jobless, joyous, judicial, jurisdiction, juvenile, keenly, kinship, landlady, landmark, landowner, laptop, lawsuit, layout, leafy, legacy, legendary, lender, lesser, liberate, liberation, licensed, lightweight, likelihood, likeness, limousine, literacy, literal, litterate, litter, locality, locally, lodger, longing, lookout, luminous, lunar, lunatic, lure, lurk, lust, lyric, magistrate, majestic, mammoth, manifestation, manor, manpower, mar, marginal, marketable, marmalade, mastery, materialism, materialize, maze, meaningful, meaningless, meddle, mediate, medication, melodrama, memorable, merciless, merge, merger, mesh, metric, midway, migrate, migration, millennium, minimize, mint, mischievous, misleading, missionary, misty, mob, mobile, mobility, mockery, module, moody, mop, moth, motto, mound, mourning, movable, mow, multiplication, mum, mumble, mutually, mystical, narrator, narrowly, nationalistic, nationwide, necktie, negligent, negligible, nightfall, nightly, northward, notably, notify, nourishment, novelty, novice, numeral, nurture, obscene, obscurity, observance, obsess, occupational, offset, ongoing, online, operational, oppressive, organizational, orientation, ostrich, outlaw, overdo, overlap, overpower, ozone, paddle, par, parable, parachute, paradoxical, paraphrase, parental, parting, passerby, pastoral, pavilion, pending, perilous, periodical, permanence, persecute, persecution, perseverance, persistence, pest, pharmacy, philosophical, pickpocket, pier, pilgrim, pirate, placement, plaintiff, plank, planter, platinum, plea, pleasantly, poach, pollute, populate, pornography, portfolio, postgraduate, posture, postwar, potentiality, potentially, practitioner, pragmatic, prairie, preacher, predictable, prehistoric, premium, presenter, presidency, prestigious, pretension, pretentious, preventive, prickly, privatize, pro, problematic, processor, proficiency, profoundly, progression, prologue, propel, prophecy, proportional, prosecute, prosecution, prosecutor, prostitute, protein, purposely, quake, quarterly, query, questionnaire, quilt, quiver, quota, radiation, radiator, radium, raft, raised, ranger, rap, rapidity, rapture, rarity, rave, reactor, readiness, realism, realist, recede, recipient, recital, recognizable, reconsider, reconstruct, reconstruction, recount, recreate, recruitment, reddish, redefine, redesign, reduced, redundant, refill, reformation, reformer, reinforcement, relevance, reliance, relic, relish, reminiscent, removed, repel, reportedly, resentful, resignation, resolute, restricted, retailer, retort, revision, ripple, rite, rivalry, rotate, rouge, rumble, runway, rusty, rye, sanity, sarcastic, scan, scant, scarcity, scenic, screening, screwdriver, scroll, scrub, sculptor, secrecy, segment, sensibility, sensor, sensuous, serene, serial, server, settled, seller, shameless, shareholder, shellfish, shelve, shipment, shooting, shoreline, shove, shrewd, shrill, shudder, sicken, sideboard, siren, skeleton, skid, slash, slaughter, slum, slump, smack, smuggle, smuggler, snapshot, sneak, sneer, sniff, snort, sociable, socialize, socket, solemn, sophistication, southward, sovereign, spa, spacious, spatial, specialty, speculate, spine, spotlight, spouse, sprawl, stabilize, stamina, stammer, standardize, starlight, starter, stationary, stature, statute, sterile, sticker, stimulation, strangle, strategic, streak, stressful, striped, still, subconsciously, submerge, subordinate, subsidize, substantially, substitution, suburban, suffice, sufficiently, superficial, superiority, superstitious, supervisor, supposedly, suspiciously, swirl, symbolism, syndicate, tack, takeover, tar, tavern, tech, temperament, tempting, terrifying, terrorism, testament, testimony, theorist, therapist, thrift, tickle, tilt, tonic, tornado, tow, toxic, trademark, trailer, trait, transcript, transparency, transplant, traverse, treacherous, trench, tribal, trigger, trio, triumphant, trot, trout, tug, turmoil, turnip, unborn, unbroken, unconditional, uncontrollable, underestimate, underlie, underlying, underwater, undisturbed, unending, unequal, unethical, uneven, unfavorable, unfinished, unfit, unforgettable, unfriendly, unify, unreal, unrelated, unreliable, unsafe, unsettled, unstable, unsuspecting, untie, untrue, unwanted, upgrade, uplift, uproot, urgency, vegetarian, velocity, vent, versus, veteran, vibration, victimize, volcanic, vomit, voucher, vulnerable, wag, waltz, wandering, wardrobe, warehouse, warp, warship, washer, wasp, waterfront, waterway, weaver, wicket, windmill, withhold, workaholic, workplace, worsen, wrapper, wrongdoing, yearn, zoom

Level 9

abbreviate, abort, abstraction, absurdity, acceleration, acoustic, activate, actuality, addicted, addictive, adequacy, adherence, adjacent, admittance, admittedly, adorable, adornment, adversity, aerobic, afar, affected, affirmation, affix, affluent, aggravate, aggressor, agitate, agonizing, ailment, akin, alienate, alienation, allergic, allergy, allocation, allot, aloof, alpine, alternately, amenity, amiable, amplify, analogous, anarchist, anarchy, anecdote, angelic, animate, animated, antiquity, anytime, apathy, apiece, apprehend, apprenticeship, aptitude, aquatic, archbishop, armful, artful, assassin, assassination, assertive, assimilate, astray, astronomical, attest, auditor, authoritarian, automate, automotive, avalanche, avert, awesome, badger, banjo, barbarism, barometer, barter, battlefield, beet, behavioral, bellboy, beta, billiards, bin, binder, biotechnology, bitch, bizarre, blacken, blizzard, blooming, boarder, boarding, bog, bomber, bondage, bonfire, boon, botanist, bottomless, boulevard, boulevard, bowler, bran, breeder, briefing, broadcaster, browse, buck, burdensome, bust, butler, cameraman, camouflage, canon, captivate, carefree, caretaker, carol, carp, casting, caterpillar, cauliflower, ceaseless, cedar, celestial, censor, censorship, centralize, champagne, chant, chauffeur, cheeky, cheery, childbirth, childless, cholesterol, chronic, chronicle, chunk, circumstantial, cleanliness, clearance, clog, coastline, cocaine, coherence, coke, collaborate, collaboration, colon, commemorate, commercialism, commune, communicator, compassionate, complacent, comprehensible, compulsion, compulsive, computing, conceited, condemnation, conditioner, conditioning, conformity, confound, congenial, congestion, conjecture, connected, consolation, constable, constituency, constituent, contaminant, contamination, contemptuous, contentment, contestant, contour, contradictory, converse, conversely, copyright, cosmic, cowardice, crave, credibility, crescent, crest, crimson, crumble, crunch, cuddle, cuisine, cult, cultivator, curb, curfew, cynical, dabble, daffodil, damned, darn, daze, debatable, deceptive, decree, deduct, deduction, defenseless, deform, degrade, denote, denounce, deposition, depot, designation, desirous, detain, detection, deter, deteriorate, devalue, devoid, devotee, diabetes, dictatorship, differential, diffuse, digit, dilute, din, dioxide, disclosure, disconnect, discord, discourse, discoverer, discreet, disfigure, disobedient, disruptive, dissent, distasteful, distill, distortion, distracted, diverge, dogma, downfall, downstream, doze, dreamer, dreary, droop, drought, dub, dubious, duchess, duplicate, dynasty, earthworm, ebb, eclipse, ecstatic, effortless, egoist, egoistic, elaboration, elasticity, electrify, elemental, embody, emigrant, empower, empress, encircle, endorsement, enlargement, enlighten, enmity, enrage, enrichment, enrollment, entice, entrust, environmentalist, epic, erroneous, erupt, ethic, evacuate, evacuation, evade, evaporate, eventful, evergreen, evoke, evolutionary, exceeding, excerpt, exempt, exemption, exertion, extended, extinction, extravaganza, fabulous, faithless, fatherland, feat, feudal, fictional, fingertip, fishy, fixture, flair, flashing, flaw, flea, floating, footnote, forcible, fore, forearm, forefinger, foreground, foreseeable, foretell, fragrant, freak, freezing, freshen, frivolous, frontal, frugal, fusion, futile, gaily, generator, generic, gentry, geological, germ, gifted, glisten, godmother, gorge, granddad, grandeur, grasshopper, gratification, gravel, gravestone, gravy, grotesque, gunpowder, gust, gutter, ha, handmade, harass, harness, haven, hazardous, haze, hazy, headdress, heath, hectic, heirsch, herald, heredity, heroism, herring, highness, hippie, hoe, holly, holocaust, homosexuality,

honk, hoot, hormone, horrid, hospice, hospitable, hover, humane, humanist, hygiene, hypocrite, icon, idealist, idly, illegitimate, illiteracy, illogical, immeasurable, immune, immunity, impair, impeach, imperfection, imperialism, impotent, imprudent, inappropriate, inborn, incidental, incoherent, incompatible, inconceivable, inconclusive, inconsistency, incur, indecent, indefinitely, individualism, inefficiency, inescapable, inexplicable, infer, inference, inflammation, infrastructure, infrequent, infuriate, infuse, ingenuity, inhuman, inning, insecure, insecurity, insensitive, insincere, instantaneous, interim, intermission, intern, interrogate, interviewee, intestine, intimidate, intolerance, intolerant, intricacy, intrigue, intrinsic, intuitive, inventory, irrelevance, irresistible, irrigate, irrigation, italic, jack, jackpot, janitor, jest, jigsaw, jointed, jot, judiciary, juggle, justifiable, kidney, kindle, kiosk, knockout, laborious, lamppost, laser, latch, lavish, layman, layoff, ledge, legislature, legitimacy, lengthy, lesbian, lethal, liberalism, lifelike, lighthearted, lime, linguist, linguistics, lioness, loaded, loading, localize, longevity, lordship, lovable, loyalist, lucrative, lukewarm, lyrical, madden, malicious, maneuver, manifesto, manipulate, manipulation, mare, marijuana, marital, martial, massacre, materialistic, maternal, matrix, maxim, maximize, mayonnaise, meager, mechanics, median, mediocre, meek, merchandising, messrs., metro, midweek, milestone, militant, mimic, mindless, misbehavior, misdirect, miser, misfit, misguided, mistrust, misuse, mobilize, modem, modernize, momentum, monologue, monopolize, monotony, moor, morale, mosaic, motherhood, motif, mountaineering, mournful, muffin, multinational, munch, muscular, myriad, mystify, mythology, naive, negotiable, negotiator, neutrality, neutralize, nick, nip, norm, northeastern, northwestern, noteworthy, notional, notorious, nucleus, nudity, nutrient, nutritious, objectivity, obligatory, oblivion, observatory, obsession, obsolete, obstruct, obstruction, occidental, occupant, oddity, operative, opt, optical, orchestral, ordeal, ore, organizer, outnumber, outrageous, overdue, overestimate, oversee, oversight, overt, packed, pact, pagan, painstaking, pane, pang, parasite, parish, partipicple, partition, passable, patriotism, peat, pedestal, peek, penguin, pensioner, periodic, perpetuate, persevere, pervade, perverse, pester, pesticide, petroleum, petty, phenomenal, phonetic, photocopy, pickle, pickup, piety, pinnacle, pinpoint, placard, placid, plaque, plateau, platicone, playwright, plume, plummet, ply, pointless, poke, polished, pollutant, ponder, populous, porridge, posterity, potent, poultry, prank, precarious, precedent, predicate, predominant, premature, preoccupation, preparatory, pretext, preview, prewar, principally, privileged, programmer, prohibition, prone, propeller, protocol, prototype, providence, pry, psychiatrist, psychiatry, psychic, publicize, puddle, pulp, punctuate, punctuation, purge, purify, puzzling, quartz, racism, racist, radiant, radioactive, radius, ramp, rascal, ravage, readable, rearrange, rebuke, recapture, receivable, receptor, reciprocal, recreational, rectangle, rectangular, rectify, recur, recurrence, redden, redeem, redemption, rediscover, redundancy, reef, reenter, reestablish, refund, regiment, rehearse, reindeer, reluctantly, reminder, reminiscence, remnant, renewable, renounce, renown, renowned, repentance, replica, repress, repression, repressive, reproductive, repute, reservoir, residue, resourceful, respectfully, respondent, retention, retrace, retrieve, retrospect, retrospective, reunion, reversal, revolver, rig, righteous, rigorous, rink, roadside, robin, robust, rocker, rogue, runaway, rustic, ruthless, sage, salvation, sampling, sanction, sanctuary, sap, sarcasm, sardine, scholarly, scripture, scrutiny, secular, seduce, seeming, segregate, segregation, seizure, semiconductor, sensory, separable, sequel, setback, severity, sewer, shaped, sherbet, sheriff, shipbuilding, shoelace, shoplift, shopper, showroom, showy, shun, sibling, sickly, siege, sift, signing, signpost, silhouette, silicon, silvery, simulation, sinister, sinner, skeptical, skepticism, slab, slack, sled, sliding, show, smelt, snow, snowball, snub, snug, soaked, socioeconomic, sociological, solicit, solicitor, sonata, southeastern, southwestern, sovereignty, soybean, spank, specialized, specification, speck, spectrum, speculative, speechless, spinner, spinning, spiral, splinter, spokesperson, spontaneity, spreadsheet, squad, squarely, squeak, stairway, starch, steamboat, steeple, stepfather, stepmother, stepotype, stifle, stimulant, stink, stirring, stun, sturdy, subcommittee, subdued, subgroup, submissive, subscribe, subscriber, subtlety, suggestive, suicidal, suite, sunken, superintendent, superionic, superstar, supplementary, supremacy, surge, surgical, surmise, sustainable, swap, swollen, swoop, syllabus, syndrome, synonym, synthesize, synthetic, tabloid, taboo, tact, tactics, taint, takeoff, tangible, taper, tart, tasteless, tattoo, temperance, temporal, tentative, terminate, thereby, thermal, thermostat, thong, thou, throng, thrush, thump, thunderous, toothpick, torrent, townspeople, transcribe, transfusion, transit, transitional, transmitter, treble, tribunal, trickle, trillion, trolley, trump, tuition, tumor, tumult, turbulent, turf, tutorial, twitch, tyrannical, unavailable, unbutton, unconcerned, unconventional, undeniable, undermine, undone, unidentified, unification, unintentional, uninterrupted, unleash, unloved, unnoticed, unpack, unprecedented, unprepared, unrest, unsettle, unsold, unveil, unwelcome, upland, uranium, utopia, utopian, vaccine, validate, validity, valuation, variously, vegetation, vendor, verdict, verge, verify, villain, visualize, vocational, vogue, void, wail, waistcoat, wanting, warranty, watertight, watery, watt, whatsoever, whereby, widower, willingness, wiring, woe, woodwork, wording, workable, ye, yearning, yeast, yielding, yoke, yolk, zigzag

Level 10

abdomen, abide, abortive, abstain, accelerator, acclaim, accommodating, accompanist, accountability, accountable, additive, adept, adherent, adhesive, adoration, advent, adversary, advocacy, aesthetics, affidavit, affiliate, affiliation, affinity, affluence, afresh, aftermath, aggregate, airman, airship, ale, alibi, alight, allegiance, allotment, alloy, allude, allure, aloft, alto, amass, amber, ambush, ammonia, ammunition, amnesty, anchorage, antagonism, antagonist, anthropologist, antibiotic, antonym, apologetic, appalling, appropriation, archaeologist, archer, archive, ardent, arduous, armament, aroma, arsenal, artery, articulate, artillery, asphalt, assured, asthma, astound, atrocity, attempted, attributable, audible, authenticity, autograph, autonomous, aversion, awakening, aye, backfire, backup, bacterial, baffle, baptism, baptize, barge, bash, basil, bastard, batsman, bead, beasty, beckon, beige, below, beneficiary, benevolent, benign, beset, besiege, bibliography, billboard, bingo, biochemistry, birthright, blackout, bladder, bland, blinding, bloc, block, blunder, bolster, bony, booster, borrowing, bourgeois, bout, boutique, boyish, brag, braid, brewer, brewery, bridal, brigade, briskly, bristle, broth, brutality, buff, buildup, bulge, bumpy, bureaucrat, bureaucratic, burnout, bustle, butt, caddie, calculating, camper, candid, carbohydrate, cardinal, caricature, cascade, casserole, catastrophic, categorize, causal, cavity, cellular, censure, centralization, ceramic, cerebral, ceremonious, chic, childbearing, chisel, christen, chuck, churn, clam, clamor, clam, clarinet, cliché, clockwise, clothesline, clothespin, coax, cobweb, cod, coexist, coexistence, cognitive, cohesion, colloquial, colossal, coma, commencement, commoner, communal, complementary, complexion, compliance, complimentary, composure, compression, concealment, concord, concur, confidentiality, configuration, conjunction, connector, consecutive, consign, consortium, constrain, construe, consul, consulate, contemplation, contender, continuance, convene, converge, convertible, convoy, coral, coronation, countdown, contract, counterclockwise, courier, courtroom, covenant, covet, crafty, crank, creditable, creepy, crib, crossed, crucify, culminate, culprit, cumulative, custodian, cutlery, dainty, dangle, debris, debtor, debase, deceased, deduce, default, defer, defiance, defiant, deficient, definitive, deflect, delinquent, delude, demise, demolish, demim, deplore, deploy, derivative, deserving, detector, detention, deterrent, devastating, devout, dexterity, diagnose, diarrhea, diesel, dietary, digestive, diminutive, disable, disadvantaged, discernible, discrepancy, disgraceful, dishonesty, disintegrate, dismantle, disorderly, dispel, disperse, disquiet, dissident, diversify, divisional, dominion, dormant, dripping, dropping, drummer, dual, duckling, duet, duo, dusky, dwindle, economize, eerie, egocentric, egotistic, eject, electorate, elevated, elicit, eligible, elude, elusive, embargo, embed, embryo, eminence, empirical, emulate, enact, encompass, endangered, engrave, engulf, enigmatic, ensue, entail, entitlement, envisage, envision, envoy, enzyme, equalize, eradicate, erection, erode, erosion, erratic, exaltation, exasperate, exemplify, existential, exodus, expectancy, expectant, exposition, expressly, expulsion, extraction, fabricate, facade, facet, facile, facing, fanatic, fateful, fatty, faulty, feasible, feign, ferocious, ferret, fervor, feudalism, fidelity, figurative, fineness, firing, fixing, flank, flare, flattering, flawless, flick, flicker, flint, flirt, flooring, flop, floppy, flowering, focal, foothold, foremost, foresight, forge, fortify, fortress, fracture, fragmentary, franchise, fraternity, fraught, fray, frenzy, freshwater, fret, frill, frosty, fruitless, fugitive, fumble, fume, fundraising, fungus, furnishing, fuse, gadget, gag, gallant, gape, gastric, gee, generality, genial, geometric, ghostly, gig, gin, gingerly, glamorous, gland, gloss, glossary, glossy, granite, graveyard, gravitation, greasy, grenade, greyhound, grievance, grimace, groove, groundless, guild, guiltless, gymnastics, hack, hale, hamper, handiwork, haughty, haunted, havoc, headteacher, headache, heartache, heartless, heave, hectare, helm, herbal, hideous, hierarchical, hoard, hog, homely, homestead, huddle, hue, hype, hysteria, iceberg, imminent, immovable, impediment, impending, imperative, imperialist, impetus, implicate, improvise, inadvertently, inaugural, inaugurate, inauguration, incense, incomparable, incompetent, inconspicuous, incumbent, indefinite, indict, indictment, indigenous, indigestion, indistinct, inducement, inertia, infamous, infantry, infinity, inflammatory, inflate, influenza, influx, ingratitude, inhibition, injurious, inmate, innermost, instability, installment, insulate, insurer, interdependent, intermediary, interrogation, intriguing, invalidate, invariable, invert, investigative, invincible, invoke, ion, jargon, jeopardize, jolt, jumbo, lag, lamentable, lance, larva, latent, lather, laughable, laurel, lawmaking, lax, leaning, legality, legislator, leverage, levy, liaison, liberalize, lilac, lineup, liquidity, livestock, locust, loft, logo, longstanding, loom, loot, lousy, hull, magnificence, mainframe, malignant, malt, manageable, managerial, mandate, mandatory, mania, maniac, mantelpiece, manure, margarine, maritime, martyr, matching, maternity, mediation, melodramatic, mentor, mermaid, methodical, methodology, meticulous, microscopic, midland, midsummer, midwife, migrant, militia, millstone, mince, minimal, minutely, misconception, misconduct, mishap, modernism, modernist, moisten, molecular, momentous, monastery, monotone, monumental, moratorium, mortar, mosque, motel, motherly, mountaineer, muddle, mug, multicultural, mundane, muster, mutation, mystic, mythical, narcotic, naturalist, necessitate, neglectful, neon, neurotic, neutron, newsagent, niche, nomadic, nominee, noonday, nostalgia, notch, nuance, numb, nymph, oatmeal, objectionable, obliterate, oblivious, observant, occult, octave, onset, opportune, ordain, ornate, orthodoxy, ous, outburst, outcast, outcry, outright, outset, outweigh, overcrowd, overgrown, overhaul, overhear, overload, overpay, overpopulation, override, overrun, overstate, pacifist, padding, pageant, paradigm, paralysis, parameter, paramount, parch, parenthesis, parody, particularity, partisan, pastel, paternal, pawn, payoff, peacekeeping, peacetime, penal, pendant, pendulum, penis, pep, performing, peripheral, perplexity, perspiration, pertain, pertinent, pervasive, pervert, petticoat, phoenix, phony, piss, pitiless, plausible, plaything, pleasurable, plight, plunder, poise, poker, politic, polytechnic, porcelain, possessed, potter, powdery, practicable, praiseworthy, prawn, preclude, predator, predictive, predominantly, premiere, preoccupied, preoccupy, presumable, presumption, primal, procure, prod, projector, proliferation, promenade, proponent, proportionate, propriety, protectionism, proverbial, provisional, provocative, prowl, proximity, proxy, psychiatric, pulpit, punk, purport, pygmy, quarrelsome, quarry, questionable, quid, racecourse, radiate, ramble, ratify, ration, raven, reactive, reassurance, rebate, rebirth, rebound, receptive, recharge, recitation, reclaim, recourse, recurrent, reelect, referendum, refurbish, refute, regulator, regulatory, rehabilitate, relational, relativity, relegate, relent, relentless, reliant, remittance, repeal, repertoire, repetitive, repository, resell, reset, resin, resonance, restart, resumption, retard, retarded, rethink, retiring, retrieval, reunite, reverse, reversible, revert, reviewer, revolutionize, rhyme, rift, rotary, royalist, rubble, ruby, rung, sabotage, safari, saga, sandstone, saturate, savor, scapegoat, scorch, scrawl, screaming, scribble, scrutinize, scurry, seamless, sear, secretarial, secretive, sedan, selector, semblance, semester, semicircle, seniority, sensual, sesame, sever, shaggy, sham, sheepish, shimmer, shipwreck, shortcoming, shorthand, showcase, showdown, shred, shroud, shuffle, shuttle, simmer, simplistic, simulate, skeptic, skull, slate, slick, sloppy, sluggish, smear, smock, smother, snowflake, snuff, socialization, solemnity, solidarity, soot, sorely, sparing, spasm, spawn, speculator, sperm, spout, sprout, spurt, stark, statutory, sterling, stingy, stipulate, stoke, stopover, stoppage, strenuous, strut, stub, stud, stunning, subculture, subdivide, subdivision, subsidize, substantive, suitor, sulfur, sunburn, superfluous, supposition, surmount, surveillance, surveyor, suspender, sustenance, swerve, symmetrical, symmetry, synthesis, syrup, tab, tactful, tactic, tactical, tangle, tee, televise, tenure, termination, terminus, thee, theology, theoretically, therapeutic, throb, timidity, tingle, tinker, tint, toddler, toothless, topple, tract, trance, tranquility, transact, transcend, transcontinental, transient, transistor, trauma, treachery, treatise, trek, trespass, trimming, turbulence, ulcer, ultraviolet, unaccountable, unambiguous, unauthorized, unbeaten, uncompromising, uncontrolled, undercover, underside, underway, underwrite, unforeseen, unionist, unorthodox, unparalleled, unprofitable, unspoken, unthinkable, untouched, upheaval, uprising, upside, urine, usable, usher, utilitarian, variant, varnish, vault, veal, venerable, ventilate, venue, versatile, veto, vex, viable, vicar, vile, vintage, visibility, visionary, vista, volatile, volley, wade, wager, warlike, wary, wedge, wee, weighty, weld, wharf, whim, wig, wince, wistful, woo, wooded, wreckage, wrench, wrestle, wrestler, wretch, wry, yoga, zoological

Level 11

abbey, aberration, abet, abiding, ablaze, abrasive, abstinence, abyss, accomplice, accrue, acquit, acquittal, acronym, acumen, adamant, adjoining, admonish, adrift, adultery, affable, affiliated, aggrieved, ailing, airborne, alias, align, alleviate, alluring, allusion, altruism, alumnus, ambivalent, amply, anemia, anesthesia, anesthetic, anew, animosity, annex, annuity, annul, anomaly, ante, anthem, antidote, antipathy, antiquated, apocalypse, apostle, appease, apprehensive, arbor, arcane, archipelago, aria, arid, ark, arson, arthritis, ascendancy, aspen, assortment, asteroid, astute, asylum, attrition, audacious, audacity, aura, austere, austerity, autocratic, avenge, avid, backdrop, baker, backlash, baggy, balk, bane, banter, barbed, bard, baroque, barrage, bask, bastion, battalion, beacon, bedrock, beguile, belligerent, bemoan, benchmark, benefactor, bidder, bigotry, biopsy, birch, blatant, blight, blister, bluff, blurt, boardroom, bogus, boisterous, bombard, bombardment, boomer, booty, booze, botch, bounty, bower, brandish, brash, bravado, brawl, brazen, breathtaking, brethren, brittle, buffer, bullish, bun, buoyant, burgeon, burly, burnish, burrow, butters, buyout, cache, cadet, calculus, caliber, canine, canny, capitalize, capitulate, carcass, cardiac, cardiovascular, cartel, caste, catalyst, catapult, caucous, centennial, centerpiece, chaplain, charred, chasm, chasten, chide, choreographer, chromosome, circumvent, citation, civility, clamor, clamp, clandestine, cleric, clientele, clinch, clot, clout, clutter, coalesce, cobble, coffer, cohort, collateral, colt, comatose, combo, comer, commandment, commando, communique, compilation, complacency, complicity, comptroller, concerted, concerto, concoct, condone, confederate, confiscate, conflagration, conglomerate, conjure, connoisseur, conservationist, consummate, containment, contemplative, contentious, contingence, contingent, continuum, contraception, contraceptive, contrition, conundrum, convent, convergence, cooper, cornerstone, coronary, corporal, corpus, corroborate, corrosive, cortex, counterfeit, courthouse, courtship, covert, coy, crackdown, crackle, crap, crate, crosby, crumple, cub, cuff, culinary, cull, culmination, cumbersome, curator, curt, curtail, cutback, cynic, cynicism, czar, daunting, dearth, debacle, debase, debilitate, decipher, decor, defamation, defection, deference, deflate, deft, defunct, degenerate, deity, deluge, delve, demeanor, dementia, demographic, demolition, demur, denomination, dent, deplete, deport, deportation, depose, deride, derision, destitute, deterioration, devaluation, devious, devolve, diabetic, diaper, dictum, dire, disdain, discretionary, disgruntled, disintegration, disparage, dispartate, dispart, disparity, disproportionate, distraught, divulge, doctorate, doe, dogged, dolly, dope, dour, downplay, downright, drab, drape, drawl, dredge, drench, drone, duct, duel, eclectic, edifice, efficacy, elf, eligibility, emanate, embodiment, embroil, empathy, enactment, enclave, endear, endemic, enigma, ensemble, entourage, entreat, entrench, epicenter, epitaph, eschew, espionage, espouse, etch, ethereal, ethos, euphemism, euphoria, euthanasia, evangelical, evasion, evasive, evocative, exacerbate, exacting, excise, exemplary, exhale, exhilarate, exhort, expatriate, extol, extradition, extremist, exuberant, exult, falcon, farce, fathom, fawn, ferment, ferocity, fervent, fetus, feud, fiasco, fiat, fickle, fiddle, fin, financier, finesse, firearm, flagrant, flagship, flamboyant, flaunt, fledgling, fleeting, flex, flimsy, flirtation, flounder, fluke, fluorescent, flurry, flux, fondle, footage, footing, foray, forcing, foreman, forensic, forestall, forgo, forlorn, forthright, fragmentation, fraternal, fraudulent, frigid, frolic, funk, funnel, furor, furrow, gala, gall, galvanize, gariand, garner, garrison, gauntlet, genealogy, genesis, genetics, genital, genteel, ghasly, ghetto, giddy, gild, glean, glee, glib, glimmer, gloat, glowing, glut, glut, gnaw, goad, goldsmith, gouge, gouge, graffiti, grandiose, grapple, gregarious, grid, grit, grope, grouse, grudge, grudging, gruesome, grunting, guise, hallmark, hallucination, halo, handcuff, hapless, harrowing, harry, hassle, headlong, heady, hearten, heather, hefty, hegemony, hepatitis, heresy, heterosexual, heyday, hiatus, hilarious, hindsight, hoax, homage, homicide, hone, horde, horrendous, hub, hulk, hull, humiliating, hump, hunch, hurtle, hustle, hyperbolic, hypertension, idiosyncratic, idyllic, ignite, illicit, impart, impasse, impeccable, impede, implacable, implant, imposition, impoverished, impromptu, impunity, incarnation, incendiary, incest, incite, incompetence, incriminate, indelible, inept, inexorable, inferno, inflame, informant, infrared, infringement, infusion, inhale, injunction, innocuous, inoculation, insatiable, insidious, insinuate, insolvent, instill, insurgent, insurrection, inter, intestinal, intractable, intravenous, intrepid, introspective, inundate, irate, jab, jagged, jay, jeopardy, jettison, jubilant, jumble, junta, knack, labyrinth, lama, languish, laud, launder, laureate, leach, legion, leisurely, leukemia, lewd, lexicon, libel, liken, lineage, lingerie, litigation, loathe, log, logging, loophole, lore, ludicrous, lurch, lurid, lush, luster, magnolia, makeshift, malaise, malign, mannerism, marquee, marrow, mason, masterly, maverick, meander, measles, meltdown, menopause, metabolism, metaphysical, meteor, microbe, middleman, milieu, mirage, miscarriage, misdemeanor, misgiving, mitigate, mole, morbid, moribund, mortify, motley, mounting, mule, mull, mural, murky, mutant, nag, narrate, nasal, nausea, nestle, neural, neuron, nibble, nimble, nipple, nitrogen, nominal, nudge, null, nuptial, nutty, obese, obnoxious, obscenity, obsessive, omen, ominous, onslaught, ooze, opaque, opium, optic, opus, oracle, ordinance, orgy, outspoken, outstrip, ovation, overblown, overdose, overly, overriding, overshadow, overture, palatable, palpable, pamper, panther, paranoia, parity, parochial, pathology, patriarch, patrician, patronage, patronize, payroll, peddle, pedigree, penchant, perennial, perimeter, perjury, perk, perky, pernicious, perpetrate, persona, petal, pew, phantom, pharmaceutical, philanthropy, picket, pilgrimage, pimp, pitfall, pivot, pivotal, placate, placebo, plagiarism, platoon, plaza, pleading, plush, plywood, pneumonia, pod, poignant, poised, pollen, pore, portal, posh, precinct, precocious, precursor, predatory, predicament, prelude, preposterous, primate, pristine, probation, procurement, prodigious, prodigy, profane, proffer, proliferate, prolific, pronounced, proprietary, proprietor, prostitution, protagonist, prowess, pseudo, pseudonym, psyche, pun, puncture, pundit, punitive, putative, putt, quadruple, quagmire, quantum, quash, quell, quintessential, quip, quirk, rabid, raider, rampant, rampart, rancor, ransom, rant, rapport, rapprochement, rationale, raucous, reactionary, rebuff, recalcitrant, reconnaissance, recoup, rectitude, reflex, regal, regimen, registry, reinstate, relapse, relinquish, remorse, rendezvous, rendition, renege, renovate, replenish, replicate, reprimand, requisite, resilient, resonant, respectability, respiratory, respite, resurrect, resurrection, retaliate, retaliation, retina, retribution, revamp, reverberate, revile, revitalize, revoke, revulsion, rife, rigor, rivet, roach, rodent, romp, roster, rout, rove, rover, rowdy, rue, rueful, rupture, sag, salvage, sanctity, sanguine, sardonic, savior, scalp, scathing, schizophrenia, scoff, scour, scourge, screech, scrupulous, scuttle, seaweed, sectarian, sedative, seductive, seedy, seep, seismic, seminal, seminary, sewage, sexist, shackle, shear, sheen, shingle, shoddy, sickle, sideline, sierra, sire, sizable, skinner, skirmish, sleazy, sleek, sliver, slouch, sludge, slur, smirk, smite, smug, snag, snarl, sodium, solace, somber, sordid, sparse, spate, spearhead, specter, spinal, splice, spook, sporadic, spree, sprint, spurn, sputter, squabble, squadron, squander, squeal, squint, squirm, stagnant, stagnation, stalemate, stalwart, stately, staunch, stave, stealth, stein, stellar, stigma, stint, stockpile, strew, stricken, strident, stringent, stronghold, stunt, subversive, subvert, succumb, sumptuous, supplant, supple, surcharge, surrogate, susceptible, swaggar, sweeping, swoon, tacit, tally, tamper, tangled, tantalizing, tantrum, tarnish, taunt, taut, tawdry, teem, tenacious, tenet, tenor, tenuous, tepid, terrain, terse, testimonial, theological, throttle, thug, thwart, tier, tinge, tome, torpedo, torso, touchy, tout, towering, township, trajectory, translucent, treason, tremor, tribute, trooper, troupe, truce, trudge, tuberculosis, tumultuous, turner, turnout, ubiquitous, ultimatum, uncanny, unearth, unilateral, unravel, unruly, upbeat, upbringing, uproar, upshot, upstart, vandalism, vanguard, veer, vengeance, verification, veritable, vernacular, vibrant, vie, vigil, vigilant, vindicate, vindication, waive, waiver, wane, warden, warren, watershed, wayward, whack, whiff, whimsical, whine, whirlwind, whisk, whore, wield, windfall, withdrawn, wizard, wobble, womb, wrangle, wrath, writ, zealot, zinc

Level 12

abate, abdicate, abdominal, abhor, abhorrent, abject, abominable, abreast, accede, accession, acclamation, accolade, acorn, acquiescence, acreage, acrid, adage, adjourn, adjunct, admonition, aegis, affectation, affront, afield, afoot, aft, aggregation, agile, agrarian, ail, airtight, alderman, algae, alignment, ally, allegory, alteration, amalgamate, amble, amenable, amends, amity, amphibian, amphitheater, ancillary, angler, annexation, annihilate, anorexia, antagonize, antecedent, anteroom, antic, antigen, antiseptic, antithesis, anvil, aperture, apex, apparition, appraise, arable, arbitration, armistice, armipit, arousal, arsenic, articulation, artifice, assay, assessor, assimilation, astern, asunder, atheist, atone, attire, augment, auspicious, autism, auxiliary, avarice, averse, aviary, bale, ballast, balm, baloney, bandit, barrow, bashful, batten, beget, belie, benevolence, bequeath, bereaved, berth, beseech, biceps, bilateral, bile, billow, binary, binocular, bison, blanch, blasphemy, blemish, blithe, bode, borough, bountiful, bovine, breadwinner, brevity, bridle, bromide, bronchitis, brunt, brusque, buggy, bunk, buttock, cactus, cadence, callous, canopy, cant, canteen, canvass, caprice, capricious, carcinogen, carousel, casket, cataclysm, cataract, caustic, cavalier, cavalry, cavern, cessation, chaff, charlatan, chaste, chastise, chauvinism, chivalry, chlorine, chronology, chum, circumference, circumscribe, circumspect, cistern, citadel, claimant, clairvoyant, claustrophobia, cleavage, cleave, clump, coddle, coerce, coercion, cognition, colitis, collusion, combustion, complainant, compliant, compost, concave, conciliate, conciliatory, concomitant, concordance, condescend, condolence, confederation, confetti, confluence, congregate, connotation, consecrate, conservatory, consignment, constellation, consternation, constipation, constrict, consummation, contagion, contravene, convalescence, convulsion, coop, copious, cordon, corollary, coroner, corroboration, corrode, cot, cove, cover, creak, crease, crevice, cringe, crochet, crucifixion, crux, crypt, cryptic, curio, cursory, dab, daft, dally, daub, daunt, deafening, debit, decadence, decentralize, decimate, decorum, decoy, decrepit, deforestation, dejected, delineation, delinquency, delirious, delirium, deliverance, demarcation, demography, demoralize, demure, denunciation, depletion, deplorable, depraved, derelict, derivative, dermatologist, derogatory, despondent, despotic, destitution, deterrence, detest, detour, detract, detriment, detrimental, deviate, devolution, diabolic, diagonal, dialectic, dichotomy, diction, diffident, dike, dilapidated, dilate, dinghy, dingy, discerning, discomfiture, discrete, disheveled, dislodge, dispensary, dissect, disseminate, dissertation, dissipate, dissonance, distal, divergent, docile, doldrums, domicile, douse, downcast, dribble, drizzle, drudgery, duchy, dune, dung, earthen, eavesdrop, ecclesiastical, eddy, edify, efface, effervescent, egalitarian, elation, ellipse, elucidate, emancipate, embankment, embellish, embezzle, embroidery, embryonic, emissary, encroach, engender, enjoin, enshrine, enunciate, environs, ephemeral, epilepsys, epitome, epitomize, equestrian, escapade, esophagus, esoteric, evict, eviction, ewe, exasperation, excavate, exchequer, exemplar, exhortation, exorbitant, exorcise, expedient, expeditive, exponent, expound, extemporaneous, extradite, extricate, extrovert, exude, fabrication, facetious, fallacy, fastidious, fauna, feasibility, fern, fiend, filial, filth, finery, fir, fission, fissure, fitful, flabby, flail, fleece, flinch, flippant, flit, flora, fluctuate, fluff, fluffy, fluoride, foliage, foolhardy, foolproof, forage, foreclose, forfeit, forgery, forte, fortitude, foundry, foyer, friar, frock, froth, frugality, fudge, functionary, furlough, furtive, fuselage, fussy, futility, galley, garish, garnish, gaunt, gentle, genus, germinate, gill, gilt, gird, glacial, glint, glucose, glutton, goblin, gradient, graphite, grate, gratuitous, gratuity, groin, grubby, gullible, gully, gurgle, gusto, hackneyed, haggard, hangar, haphazard, hark, harrow, hatchet, hearsay, hedgehog, hedonism, hem, hemorrhage, heretic, hermit, hiccup, hoarse, hoist, homogeneous, humdrum, husk, hypnosis, ignoble, illustrious, imbue, immaculate, immaterial, immemorial, immunize, impassive, impel, impersonate, impertinent, impetuous, impetuous, impinge, impudent, inadherent, incandescent, inception, incinerator, incongruity, incongruous, incredulous, incursion, indemnity, indolent, induction, illegible, inert, infallible, infatuation, infirm, infirmity, infringe, iniquity, inlaid, inlet, inuendo, inquisitive, inscribe, inscrutable, insecticide, insipid, insolent, insomnia, instigate, insular, insulation, insurmountable, intangible, interdisciplinary, interlock, interlude, interminable, intoxication, introspection, irks, irksome, irredeemable, irrevocable, itinerant, itinerary, javelin, jeer, jostle, jovial, jubilee, judicious, jut, juxtaposition, keel, kerosene, keynote, kickback, kiln, kindred, kinetic, knell, lagoon, lair, laity, languid, lateral, latte, lattice, laudable, lava, leaden, ledger, leech, legible, lenient, lesion, lethargic, ligament, liquidate, list, listless, litigant, lobe, locus, lotter, longitude, lubricate, lucid, lunge, lusty, lynx, mackerel, maggot, magnate, malady, malevolent, mane, manipulator, matrimony, matron, membrane, memento, menial, mercenary, merriment, mirth, miscellaneous, mite, moat, modulate, molding, molest, monastic, mood, morose, mortuary, muck, muffle, mumps, municipality, mutilate, mutiny, muzzle, narcissus, naught, nave, negate, nettle, neurosis, nil, nitrate, nocturnal, node, nomad, nonchalant, nondescript, nook, nostril, noxious, nullify, obituary, oblique, obstetrician, obtrusive, ode, offshoot, ointment, omnipotent, omniscient, omnivorous, oneness, onerous, onlooker, onus, opinionated, optimal, optimum, orator, orchid, oscillate, ostensible, ostentatious, ostracism, otter, outlay, outfit, ovary, overbearing, overrate, overtone, oxide, pacify, padlock, pall, panacea, panhandle, parson, passbook, pathological, patter, peal, pedagogy, pedantic, peddler, peevish,

pellet, pelt, pelvis, penance, pensive, peppery, perfunctory, periphery, periscope, permeate, perpendicular, persimmon, pert, peruse, petulant, pheasant, phosphorus, physiology, piecemeal, pigment, pike, pilfer, pillage, pique, plaintive, plebiscite, plenary, plethora, plod, plumage, plumb, polarize, polemic, polyglot, pomp, pompous, ponderous, poppy, porous, posthumous, postulate, potassium, pounce, pout, precedence, precept, precipice, precipitation, precipitous, predisposition, premonition, preponderance, prerequisite, prerogative, presage, prim, primordial, privy, procrastinate, prodigal, profusion, prognosis, projectile, promiscuous, promontory, propagate, propensity, prosaic, proscribe, prospectus, prostrate, protrude, proviso, psalm, puberty, pungent, purr, quail, quarantine, quaver, quay, quench, quorum, rabies, ramification, ransack, rapt, rasp, ratification, raze, rebuttal, recluse, recoil, recompense, recrimination, recuperate, redress, reimburse, reiterate, rejoinder, rejuvenate, reminisce, remission, reparation, repatriate, repellent, replete, reprieve, repudiate, repulse, rescind, residual, resplendent, restitution, resuscitate, retract, revel, reverie, rind, roost, rostrum, rotor, roundup, rudder, ruddy, rudimentary, ruffle, ruminant, rummage, rump, rut, sabbath, sabbatical, sacrilegious, sagacious, salient, saliva, salutary, satchel, saturation, schematic, schism, scowl, scrabble, scruffy, scruple, scuffle, scum, secession, seclude, secrete, sedate, sedentary, sediment, seethe, semantic, senile, sentry, sequester, serum, serviceman, servile, sewerage, sheath, shifty, shin, shoal, sieve, sinew, skipper, slacken, slander, slapstick, sleigh, slither, slough, slovenly, sluice, smolder, smudge, snip, snooze, sod, sodden, soggy, sojourn, solstice, solvent, sorcerer, sortie, spar, specious, spire, sprig, sprightly, sprite, spruce, spurious, squalid, squalor, squat, squatter, squeamish, squid, squirt, stag, stagnate, stallion, stead, stealthy, stench, stenographer, sterilize, stocky, stow, stratum, stricture, stubble, stuffy, stupendous, stupor, subjugate, subsistence, substantiate, subterranean, subversion, succinct, succulent, suffocate, suffrage, sulk, sultan, sultry, sundry, superimpose, supersede, surly, susceptibility, swindle, swine, synod, synopsis, syntax, tableau, tadpole, talisman, talon, tantalize, tardy, tarry, tempestuous, tenancy, tenement, tentacle, terminology, terrestrial, tetanus, tether, thatch, therein, thesaurus, thimble, thoroughbred, thoroughfare, thrash, threadbare, thrifty, thud, tithe, toad, tongs, topography, totter, tranquilize, transitory, tremulous, trident, trite, tropic, trough, truant, turnpike, twitter, typhoid, uncouth, underpin, undue, unequivocal, unfurl, ungainly, unkempt, unobtrusive, unscathed, unscrupulous, untenable, upholstery, upmarket, urbane, urn, usurp, vacate, vagabond, vale, valiant, valor, vane, vanquish, vantage, variegated, vat, vector, vehement, venom, venomous, ventilation, vested, vestige, veterinarian, vicinity, vindictive, virile, visage, vivacious, vociferous, volition, voluble, voluptuous, vouch, vulgarity, vulture, waft, wand, wanton, warble, wart, wavelength, wean, welter, wheedle, wheeze, whet, whimper, whirlpool, whisker, whitewash, wicker, wont, wrest, wriggle, writhe, xenophobia, zenith, zest, zodiac

IV. The Usage of the WCVL System.

1. Creating of Account.

Before using the WCVL system, the user is required to create a personal account and password as a following :

1.1 System accessibility via <https://www.txtanalyse.com>.

1.2 Select the "Create Account" button.

1.3 Enter Email, Name, Surname, and Password. Repeat the Password, then choose the native language (Japanese or Thai)

1.4 After selecting Japanese as the user's native language, register with the user's university or school email.

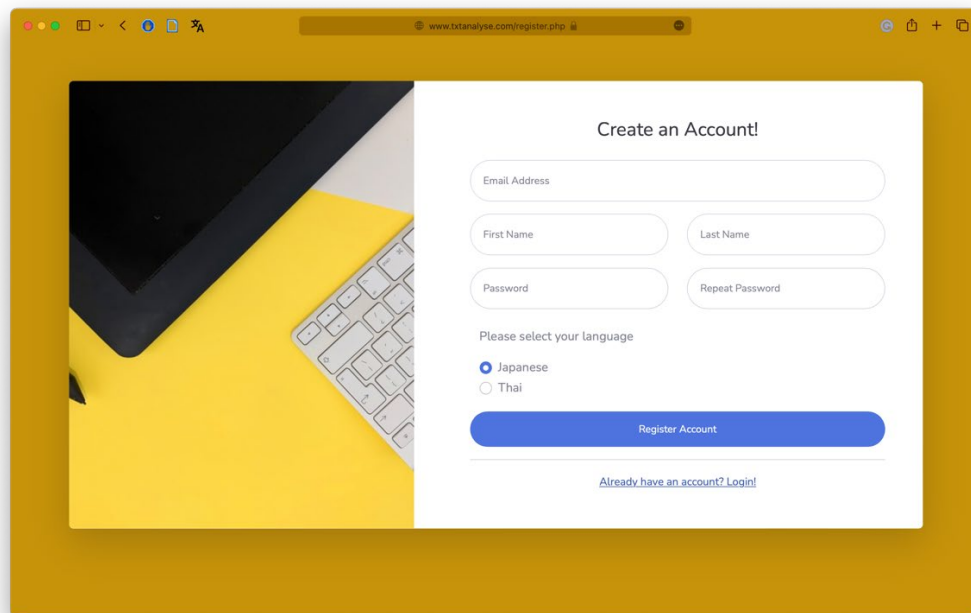
Example: 22xxx02@ms.dendai.ac.jp

The minimum password length is four digits.

1.5 To register, click the "Register Account" button.

1.6 After registering, enter the user's Email address and password to log in.

1.7 The following user interface is displayed after login.



The screenshot shows a web browser window with the URL www.txtanalyse.com/register.php. The page title is "Create an Account!". The form contains the following elements:

- Email Address
- First Name
- Last Name
- Password
- Repeat Password
- Language selection: Japanese, Thai
- Register Account button
- Link: [Already have an account? Login!](#)

2. Morphological Analysis

2.1 To begin, select a sentence in English and copy the text. Then, paste it into the system-provided text box. Alternatively, the user may use the paste button above the text box.

2.2 Select the language (Japanese, Thai, or both) where the meaning should be displayed following morphological analysis. Then, select from the level drop-down menu one of the 12 levels depending on ALC 12000.

2.3 Click the Submit button.

2.4 After clicking the Submit button, the system displays the selected level and words of a higher level (Unknown Words) and a table of Known Words for words of a lower level. The shown tables include word level, word, part of speech, and meaning. In addition, the user can listen to an audio of the word's pronunciation.

Text Analyzer

Kamal Baha

Paste

Text1 Text2

Much of today's business is conducted across international borders, and while the majority of the global business community might share the use of English as a common language, the nuances and expectations of business communication might differ greatly from culture to culture. A lack of understanding of the cultural norms and practices of our business acquaintances can result in unfair judgements, misunderstandings and breakdowns in communication. Here are three basic areas of differences in the business etiquette around the world that could help stand you in good stead when you next find yourself working with someone from a different culture.

Level: Level 4 Language: Thai

Submit New

Words count (Level/words)

| Level | Words Count |
|----------|-------------|
| level 1 | 38 |
| level 2 | 13 |
| level 3 | 7 |
| level 4 | 5 |
| level 5 | 1 |
| level 6 | 1 |
| level 7 | 1 |
| level 8 | 1 |
| level 9 | 1 |
| level 10 | 1 |
| level 11 | 1 |
| level 12 | 1 |

3. Accessing the Exercises

There are three access methods for the exercises.

3.1 The first method is to select the words the user wants to practice one at a time from the Unknown Words table and then press the Play button located directly below the table. The Play button offers six types of exercise options.

3.2 The second method involves navigating to the user's Unknown Words page. Nonetheless, the Unknown Words page merely provides a table of unrecorded words. The user can select the level of English words the user wishes to learn and the desired activities from this page. The user can also select the number of words to study or utilize the Random button to study English words randomly.

3.3 The third method is the six exercises on the left side of the screen can also be accessed directly. Then, the system will generate five random English word exercises if the user accesses them directly.

The screenshot shows a web browser window with the URL www.txtanalyse.com/index.php. At the top, there is a progress bar for levels 3 through 12. Level 3 is at 7, level 4 at 5, and levels 5 through 12 are at 1. Below this is a table titled "Unknown words" with columns for level, word, read status, type, and meaning. A "Show more" button is below the table. To the right of the table is a dropdown menu with options: Spelling, Dictation, Multiple Choice, Matching, true/false, and flashcard. Below the dropdown are "Play" and "save" buttons. At the bottom, there is a section titled "Outside ALC" with a search bar containing "english" and "judgement".

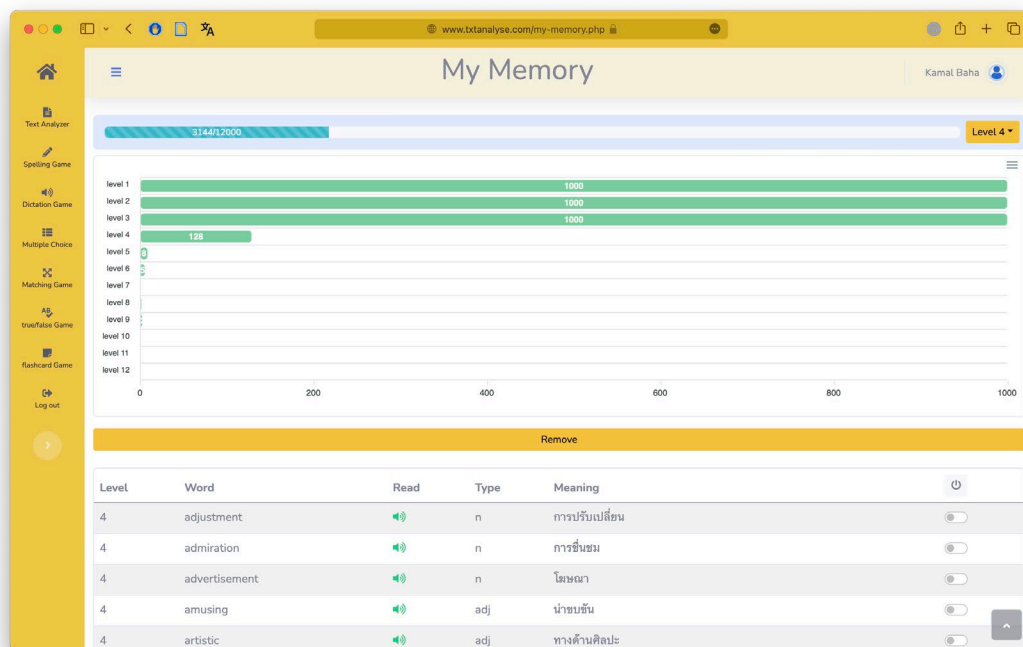
| level | Word | Read | Type | Meaning |
|-------|--------------|------|------|---------------------------------------|
| 4 | acquaintance | | n | คนรู้จัก, ความรู้ |
| 5 | unfair | | adj | ซึ่งไม่ยุติธรรม |
| 8 | etiquette | | n | มารยาท |
| 10 | nuance | | n | ความแตกต่าง(เล็กน้อยมาก, สิ่งละเอียด) |
| 12 | stead | | n | ตัวแทน, ผู้ช่วย, มีประจำใจ |

4. Save Memorized Vocabulary

4.1 If a known word shows in Unknown Words after morphological analysis, the user can choose and save it directly.

4.2 Alternatively, once the user has studied the vocabulary and answered all questions correctly, the system will display a save button, allowing the user to save his or her progress.

4.3 On the user's "My memory page," the saved vocabulary data will be shown as a graph.



V. The Code Part of Dictation Exercise with JavaScript

```
// JSON Data From Database

// let questions = [
//   {
//     meaning: '[名] 収集',
//     answer: 'collection'
//   },
//   {
//     meaning: '[名] 間違い',
//     answer: 'error'
//   },
//   {
//     meaning: '[動] 説明する',
//     answer: 'explain'
//   },
//   {
//     meaning: '[副] 永遠に',
//     answer: 'forever'
//   },
//   {
//     meaning: '[名] 巨人、大男',
//     answer: 'giant'
//   }
// ];

let allQuestionNumber = questions.length;
let rightAnswerCount = 0;
let wrongAnswerCount = 0;
let doneQuestionCount = 0;

let answerTime = 1;

startPage();

function startPage(){
  createQuestion(0);
  qs("#q-0-a").setAttribute('placeholder', "Type answer here.");
  qs("#q-0-a").focus();
  for(let i = 1; i < allQuestionNumber; i++){
    createQuestion(i);
    ca("#q-"+i, "d-none");
  }

  //set number to question-number-bar
  qs("#question-number-bar").innerHTML = '0/' + allQuestionNumber;

  for(let i = 0; i < allQuestionNumber; i++){
    // qs("#q-"+i+"-btn").setAttribute("onClick",
    responsiveVoice.speak(""+questions[i].answer+", 'US English Female');");
    qs("#q-"+i+"-btn").setAttribute("onClick", "ReadAgain(this.id)");
    qs("#q-"+i+"-a").setAttribute('onkeyup', "checkAnswer(event,this.id,this.value)");
    qs("#q-"+i+"-btn-check").setAttribute('onClick', "(checkAnswerWithButton(this.id))");
    qs("#q-"+i+"-a").setAttribute('autocomplete', "off");
  }

  //the play the first word auto
  responsiveVoice.speak(questions[0].answer, 'US English Female');
}

function ReadAgain(btnId){
  let questionNumber = btnId.split('-')[1];
  responsiveVoice.speak(questions[questionNumber].answer, 'US English Female');
  qs("#q-"+questionNumber+"-a").focus();
}
```

```

function checkAnswerWithButton(btnId){

    let questionNumber = btnId.split('-')[1];
    let id = "q-"+questionNumber+"-a";
    let value = qs("#q-"+questionNumber+"-a").value.toLowerCase().replace(" ", "");

    if(value === questions[questionNumber].answer){ // if answer was right

        //set progressBar
        rightAnswerCount = rightAnswerCount + 1;
        doneQuestionCount = doneQuestionCount + 1;

        let rightAnswerPercent = rightAnswerCount * 100 / questions.length;
        let doneQuestionCountPercent = doneQuestionCount * 100 / questions.length;

        qs("#right-count-bar").removeAttribute("style");
        qs("#right-count-bar").setAttribute("style","width:"+rightAnswerPercent+"%");

        qs("#question-number-bar").removeAttribute("style");
        qs("#question-number-bar").setAttribute("style","width:"+doneQuestionCountPercent+"%");

        qs("#question-number-bar").innerHTML = String(doneQuestionCount) + "/" +
String(allQuestionNumber);

        answerTime = 1;
        cd("#"+id, "is-invalid");
        ca("#"+id, "is-valid");
        cd("#"+id, "border-warning");
        cd("#"+id, "border");

        qs("#q-"+questionNumber+"-form").appendChild(
            ml('div',{class:'valid-feedback', id:'q-'+questionNumber+'-
feedback'},[questions[questionNumber].answer + ' : ' + questions[questionNumber].meaning])
        );

        //set to speak word
        responsiveVoice.speak(questions[questionNumber].answer, 'US English Female');

        setTimeout(function(){
            document.querySelector("#q-"+questionNumber).classList.add("d-none");

            let nextQuestionNumber = (parseInt(questionNumber)+1);

            if(nextQuestionNumber < allQuestionNumber){

                // set id to the dont know button
                qs('.btn-dont-know').id = 'q-'+nextQuestionNumber+"-btn"

                cd("#q-"+ nextQuestionNumber,"d-none");
                qs("#q-"+nextQuestionNumber+"-a").focus();

                //click the play sound auto
                document.getElementById("q-"+nextQuestionNumber+"-btn").click();

            }else{

                //save to database
                ca('#all-button-group',"d-grid");

                if(rightAnswerCount > 0 && rightAnswerCount == doneQuestionCount && wrongAnswerCount ==
0){

                    qs('#all-button-group').appendChild(
                        ml('button',{class:'btn btn-danger', id:'save-vocab-to-database'},['Save All to My
Memory'])
                    );
                    qs('#save-vocab-to-database').setAttribute('onClick', 'saveUnknownVocab()');
                }
            }
        });
    }
}

```

```

        console.log(playVocabId);
    }else{
        console.log('play again');
    }
}
}, 800);
//the answer was wrong at the first time
}else if(answerTime == 1){

    ca("#"+id, "is-invalid");
    cd("#"+id, "border-warning");
    cd("#"+id, "border");

    qs("#q-"+questionNumber+"-form").appendChild(
        ml('div',{class:'invalid-feedback', id:'q-'+questionNumber+'-
feedback'},[questions[questionNumber].meaning])
    );

    //the play the first word auto
    // responsiveVoice.speak(questions[questionNumber].answer, 'US English Female');

    qs("#"+id).select();

    console.log("please try again " + answerTime);
    answerTime = 2;

    //the answer was wrong at the second time
}else if(answerTime == 2){

    //set ProgressBar
    wrongAnswerCount = wrongAnswerCount + 1;
    doneQuestionCount = doneQuestionCount + 1;

    let wrongAnswerPercent = wrongAnswerCount * 100 / questions.length;
    let doneQuestionCountPercent = doneQuestionCount * 100 / questions.length;

    qs("#wrong-count-bar").removeAttribute("style");
    qs("#wrong-count-bar").setAttribute("style","width:"+wrongAnswerPercent+"%");

    qs("#question-number-bar").removeAttribute("style");
    qs("#question-number-bar").setAttribute("style","width:"+doneQuestionCountPercent+"%");

    qs("#question-number-bar").innerHTML = String(doneQuestionCount) + "/" +
String(allQuestionNumber);

    //make input disabled
    qs("#"+id).value = questions[questionNumber].answer;
    qs("#"+id).setAttribute("disabled","true");
    qs('#q-'+questionNumber+'-feedback').innerHTML = questions[questionNumber].answer + ' : ' +
questions[questionNumber].meaning;

    //set to speak word
    responsiveVoice.speak(questions[questionNumber].answer, 'US English Female');

    answerTime = 1;

    //set to show next question
    setTimeout(

        function(){ document.querySelector("#q-"+questionNumber).classList.add("d-none");

        let nextQuestionNumber = (parseInt(questionNumber)+1);

        if(nextQuestionNumber < questions.length){

            //set id to the dont know button
            qs('.btn-dont-know').id = 'q-'+nextQuestionNumber+"-btn"

```

```

cd("#q-"+ nextQuestionNumber,"d-none");
qs("#q-"+ nextQuestionNumber + '-a').focus();

//click the play sound auto
document.getElementById("q-"+nextQuestionNumber+"-btn").click();

}else{

//save to database
ca('#all-button-group',"d-grid");

if(rightAnswerCount > 0 && rightAnswerCount == doneQuestionCount && wrongAnswerCount ==
0){

qs('#all-button-group').appendChild(
    ml('button',{class:'btn btn-danger',id:'save-vocab-to-database'},['Save All to My
Memory'])
);
qs('#save-vocab-to-database').setAttribute('onClick', 'saveUnknownVocab()');
console.log(playVocabId);
}else{
console.log('play again');
}

}

}, 1200);

}

}

function checkAnswer(e,id,v){

let value = v.toLowerCase().replace(" ", "");

let questionNumber = id.split('-')[1];

if(e.keyCode === 13){

// if answer was right
if(value === questions[questionNumber].answer){

//set progressBar
rightAnswerCount = rightAnswerCount + 1;
doneQuestionCount = doneQuestionCount + 1;

let rightAnswerPercent = rightAnswerCount * 100 / questions.length;
let doneQuestionCountPercent = doneQuestionCount * 100 / questions.length;

qs("#right-count-bar").removeAttribute("style");
qs("#right-count-bar").setAttribute("style","width:"+rightAnswerPercent+"%");

qs("#question-number-bar").removeAttribute("style");
qs("#question-number-bar").setAttribute("style","width:"+doneQuestionCountPercent+"%");

qs("#question-number-bar").innerHTML = String(doneQuestionCount) + "/" +
String(allQuestionNumber);

answerTime = 1;
cd("#"+id, "is-invalid");
ca("#"+id, "is-valid");
cd("#"+id, "border-warning");
cd("#"+id, "border");

qs("#q-"+questionNumber+"-form").appendChild(
    ml('div',{class:'valid-feedback', id:'q-'+questionNumber+'-
feedback'},[questions[questionNumber].answer + ' : ' + questions[questionNumber].meaning])

```

```

);
//set to speak word
responsiveVoice.speak(questions[questionNumber].answer, 'US English Female');

setTimeout(function(){
  document.querySelector("#q-"+questionNumber).classList.add("d-none");

  let nextQuestionNumber = (parseInt(questionNumber)+1);

  if(nextQuestionNumber < allQuestionNumber){

    // set id to the dont know button
    qs('.btn-dont-know').id = 'q-'+nextQuestionNumber+"-btn"

    cd("#q-"+ nextQuestionNumber,"d-none");
    qs("#q-"+nextQuestionNumber+"-a").focus();

    //click the play sound auto
    document.getElementById("q-"+nextQuestionNumber+"-btn").click();

  }else{

    //save to database
    ca('#all-button-group',"d-grid");

    if(rightAnswerCount > 0 && rightAnswerCount == doneQuestionCount && wrongAnswerCount ==
0){

      qs('#all-button-group').appendChild(
        ml('button',{class:'btn btn-danger',id:'save-vocab-to-database'},['Save All to My
Memory']));
      );
      qs('#save-vocab-to-database').setAttribute('onClick', 'saveUnknownVocab()');
      console.log(playVocabId);
    }else{
      console.log('play again');
    }
  }
}, 800);

}else if(answerTime == 1){ //the answer was wrong at the first time

  ca("#"+id, "is-invalid");
  cd("#"+id, "border-warning");
  cd("#"+id, "border");

  qs("#q-"+questionNumber+"-form").appendChild(
    ml('div',{class:'invalid-feedback', id:'q-'+questionNumber+'-
feedback'},[questions[questionNumber].meaning])
  );

  //the play the first word auto
  // responsiveVoice.speak(questions[questionNumber].answer, 'US English Female');

  qs("#"+id).select();

  console.log("please try again " + answerTime);
  answerTime = 2;

}else if(answerTime == 2){ //the answer was wrong at the second time

  //set ProgressBar
  wrongAnswerCount = wrongAnswerCount + 1;
  doneQuestionCount = doneQuestionCount + 1;

  let wrongAnswerPercent = wrongAnswerCount * 100 / questions.length;
  let doneQuestionCountPercent = doneQuestionCount * 100 / questions.length;

```



```

    qs("#wrong-count-bar").removeAttribute("style");
    qs("#wrong-count-bar").setAttribute("style","width:"+wrongAnswerPercent+"%");

    qs("#question-number-bar").removeAttribute("style");
    qs("#question-number-bar").setAttribute("style","width:"+doneQuestionCountPercent+"%");

    qs("#question-number-bar").innerHTML = String(doneQuestionCount) + "/" +
String(allQuestionNumber);

    //make input disabled
    qs("#"+id).value = questions[questionNumber].answer;
    qs("#"+id).setAttribute("disabled",'true');

    console.log(questions);
    qs("#q-"+questionNumber+'-feedback').innerHTML = questions[questionNumber].answer + ' : ' +
questions[questionNumber].meaning;

    //set to speak word
    responsiveVoice.speak(questions[questionNumber].answer, 'US English Female');

    answerTime = 1;

    //set to show next question
    setTimeout(

        function(){ document.querySelector("#q-"+questionNumber).classList.add("d-none");

        let nextQuestionNumber = (parseInt(questionNumber)+1);

        if(nextQuestionNumber < questions.length){

            //set id to the dont know button
            qs(".btn-dont-know").id = 'q-'+nextQuestionNumber+"-btn"

            cd("#q-"+ nextQuestionNumber,"d-none");
            qs("#q-"+ nextQuestionNumber + '-a').focus();

            //click the play sound auto
            document.getElementById("q-"+nextQuestionNumber+"-btn").click();

        }else{

            //save to database
            ca('#all-button-group',"d-grid");

            if(rightAnswerCount > 0 && rightAnswerCount == doneQuestionCount && wrongAnswerCount ==
0){

                qs('#all-button-group').appendChild(
Memory'])
                    ml('button',{class:'btn btn-danger',id:'save-vocab-to-database'},['Save All to My
                    ]);
                    qs('#save-vocab-to-database').setAttribute('onClick', 'saveUnknownVocab()');
                    console.log(playVocabId);
                }else{
                    console.log('play again');
                }
            }

        }, 1200);
    }
}

function showAnswer(id){

```

```

console.log("dont know "+id);

let questionNumber = id.split('-')[1];

//set to speak word
responsiveVoice.speak(questions[questionNumber].answer, 'US English Female');

//set ProgressBar
wrongAnswerCount = wrongAnswerCount + 1;
doneQuestionCount = doneQuestionCount + 1;

let wrongAnswerPercent = wrongAnswerCount * 100 / questions.length;
let doneQuestionCountPercent = doneQuestionCount * 100 / questions.length;

qs("#wrong-count-bar").removeAttribute("style");
qs("#wrong-count-bar").setAttribute("style","width:"+wrongAnswerPercent+"%");

qs("#question-number-bar").removeAttribute("style");
qs("#question-number-bar").setAttribute("style","width:"+doneQuestionCountPercent+"%");

qs("#question-number-bar").innerHTML = String(doneQuestionCount) + "/" +
String(allQuestionNumber);

//set input box to red and make it disabled
ca("#q-"+questionNumber+"-a", "is-invalid");
cd("#q-"+questionNumber+"-a", "border-warning");
cd("#q-"+questionNumber+"-a", "border");
qs("#q-"+questionNumber+"-a").value = questions[questionNumber].answer;
qs("#q-"+questionNumber+"-a").setAttribute("disabled","true");

if(qs("#q-"+questionNumber+"-feedback")){
  qs("#q-"+questionNumber+"-feedback").innerHTML = questions[questionNumber].answer + ' : ' +
questions[questionNumber].meaning;
}else{
  qs("#q-"+questionNumber+"-form").appendChild(
    ml('div',{class:'invalid-feedback', id:'q-'+questionNumber+'-
feedback'},[questions[questionNumber].answer + ' : ' + questions[questionNumber].meaning])
  );
}

setTimeout(

function(){ document.querySelector("#q-"+questionNumber).classList.add("d-none");

let nextQuestionNumber = (parseInt(questionNumber)+1);

//set to speak word
responsiveVoice.speak(questions[nextQuestionNumber].answer, 'US English Female');

if(nextQuestionNumber < questions.length){

//set id to the dont know button
qs('.btn-dont-know').id = 'q-'+nextQuestionNumber+"-btn"

cd("#q-"+ nextQuestionNumber,"d-none");
qs("#q-"+ nextQuestionNumber + '-a').focus();

}else{

//save to database
ca('#all-button-group',"d-grid");

if(rightAnswerCount > 0 && rightAnswerCount == doneQuestionCount && wrongAnswerCount == 0){

qs('#all-button-group').appendChild(
  ml('button',{class:'btn btn-danger',id:'save-vocab-to-database'},['Save All to My
Memory'])
}
}
}

```

```

    );
    qs('#save-vocab-to-database').setAttribute('onClick', 'saveUnknownVocab());
    console.log(playVocabId);
  }else{
    console.log('play again');
  }
}
}, 1000);
}

function createQuestion(questionNumber){

  qs("#question-content").appendChild(
    ml('div', {id:'q-'+questionNumber}, [
      ml('div', {class:'mt-2 mx-2', id:'q-'+questionNumber+'-box'}, [
        ml('div', {class:'d-grid gap-2 col-12 mx-auto rounded',style:"background-
color:#DDE3F7;"}, [
          ml('button', {class:"btn btn-outline-warning text-dark border border-secondary py-3
",style:"font-weight:bold;"},type:"button",id:'q-'+questionNumber+'-btn'}, [
            ml('span', {}, [questionNumber+1+"."]),
            ml('span', {}, [' Play sound ']),
            ml('i', {class:"fas fa-volume-up", style:"color: #344482;"},[])
          ])
        ])
      ],),
      ml('div', {class:'m-3 rounded border border-light'},[
        ml('div', {class:'bg-light rounded'}, [
          ml('div', {class:'row px-2 py-2', id:'q-'+questionNumber+'-a+'-box'}, [
            ml('div', {class:'input-group', id:'q-'+questionNumber+'-form'}, [
              ml('div',{class:'input-group-prepend'},[
                ml('button',{class:'btn btn-outline-info btn-lg',id:'q-'+questionNumber+'-btn-
check',type:'button'},['Check'])
              ],),
              ml('input', {type:"text",id:"q-"+questionNumber+"-a",class:"form-control form-
control-lg border border-warning"})
            ])
          ])
        ])
      ],),
    ],),
  );
}

function shuffle(array) {
  var currentIndex = array.length,  randomIndex;

  // While there remain elements to shuffle...
  while (currentIndex != 0) {

    // Pick a remaining element...
    randomIndex = Math.floor(Math.random() * currentIndex);
    currentIndex--;

    // And swap it with the current element.
    [array[currentIndex], array[randomIndex]] = [
      array[randomIndex], array[currentIndex]];
  }

  return array;
}

function removeAllChildNodes(parent) {
  while (parent.firstChild) {
    parent.removeChild(parent.firstChild);
  }
}

```

```

function ca(classOrId, clList) {
  let el = document.querySelector(classOrId);
  return el.classList.add(clList);
}

function cd(classOrId, clList) {
  let el = document.querySelector(classOrId);
  return el.classList.remove(clList);
}

function cr(classOrId, oldClass, newClass) {
  ca(classOrId, newClass);
  cd(classOrId, oldClass);
}

function qs(classOrId) {
  return document.querySelector(classOrId);
}

function ml(tagName, props, nest) {
  var el = document.createElement(tagName);
  if (props) {
    for (var name in props) {
      if (name.indexOf("on") === 0) {
        el.addEventListener(name.substr(2).toLowerCase(), props[name], false);
      } else {
        el.setAttribute(name, props[name]);
      }
    }
  }
  if (!nest) {
    return el;
  }
  if (typeof nest === "string") {
    var t = document.createTextNode(nest);
    el.appendChild(t);
  } else if (nest instanceof Array) {
    for (var i = 0; i < nest.length; i++) {
      if (typeof nest[i] === "string") {
        var t = document.createTextNode(nest[i]);
        el.appendChild(t);
      } else if (nest[i] instanceof Node) {
        el.appendChild(nest[i]);
      }
    }
  } else if (nest instanceof Node) {
    el.appendChild(nest);
  }
  return el;
}

function saveUnknownVocab(){
  // playVocabId
  qs("#save-vocab-to-database").setAttribute("disabled", "");

  const xhttp = new XMLHttpRequest();
  xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {

      console.log(this.responseText);
      if(confirm("Would you like to play more or go back to home?")){
        window.location.href = "dictation.php";
      }else{
        window.location.href = "index.php";
      }
    }
  };
  xhttp.open("GET", "assets/php/save_unknown_vocab.php?unknownIndex="+playVocabId, true);
}

```

```

    xhttp.send();
}

function playWithOtherGame(gameName){

    let vocabId = playVocabId.split(',');
    let vocabIdLink = "";

    for(let i = 0; i < vocabId.length; i++){
        vocabIdLink = vocabIdLink + "checkbox%5B%5D=" + vocabId[i] + "&";
    }

    if(gameName == "sp"){
        window.location.href = "spelling.php?" + vocabIdLink;
    }

    if(gameName == "di"){
        window.location.href = "dictation.php?" + vocabIdLink;
    }

    if(gameName == "mu"){
        window.location.href = "multiple.php?" + vocabIdLink;
    }

    if (gameName == "ma") {
        window.location.href = "matching.php?" + vocabIdLink;
    }

    if (gameName == "tr") {
        window.location.href = "true-false.php?" + vocabIdLink;
    }

    if (gameName == "fl") {
        window.location.href = "flashcard.php?" + vocabIdLink;
    }
}

function playAgain(){

    removeAllChildNodes(qs('#question-content'));
    rightAnswerCount = 0;
    wrongAnswerCount = 0;
    doneQuestionCount = 0;

    qs("#right-count-bar").removeAttribute("style");
    qs("#right-count-bar").setAttribute("style","width:"+0+"%");

    qs("#wrong-count-bar").removeAttribute("style");
    qs("#wrong-count-bar").setAttribute("style","width:"+0+"%");

    qs("#question-number-bar").removeAttribute("style");
    qs("#question-number-bar").setAttribute("style","width:"+5+"%");

    cd("#all-button-group","d-grid");
    if(qs("#save-vocab-to-database")){
        qs("#save-vocab-to-database").remove();
    }

    startPage();
}

```