AN INVESTIGATION INTO THE ENGLISH VOCABULARY PROFICIENCY IN A NATURAL SCIENCE CONTEXT OF FIRST YEAR ARTS AND SCIENCE ORIENTED UNIVERSITY STUDENTS

PANITDA REANJAROENSUK

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF ARTS (APPLIED LINGUISTICS)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY

1999

ISBN 974-662-091-6

Thesis

entitled

AN INVESTIGATION INTO THE ENGLISH VOCABULARY PROFICIENCY IN A NATURAL SCIENCE CONTEXT OF FIRST YEAR ARTS AND SCIENCE ORIENTED UNIVERSITY STUDENTS

Panitda Reanjaroensuk.
Miss Panitda Reanjaroensuk
Candidate

Boosakorn Vijchulata
Assoc.Prof. Boosakorn Vijchulata, Ph.D.
Major-advisor

Niramol Pa
Niramol Pachinburavan, Ph.D.
Co-advisor

Kenneth M. Roshong, M.A.
Co-advisor

Liangchai Limlomwongse,
Ph.D.
Dean
Faculty of Graduate Studies

Boosakorn Vijchulata
Assoc.Prof. Boosakorn Vijchulata, Ph.D.
Chairman
Master of Arts Programme
in Applied Linguistics
Faculty of Science

Thesis

entitled

AN INVESTIGATION INTO THE ENGLISH VOCABULARY PROFICIENCY IN A NATURAL SCIENCE CONTEXT OF FIRST YEAR ARTS AND SCIENCE ORIENTED UNIVERSITY STUDENTS

was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Arts (Applied Linguistics)

on

March 12,1999

Panitda Reanjaroensuk.
.....
Miss Panitda Reanjaroensuk
Candidate

Boosakorn Vijchulata
.....
Assoc.Prof. Boosakorn Vijchulata, Ph.D.
Chairman

Niramol Pachi
.....
Niramol Pachinburavan, Ph.D.
Member

Montip Tiensuwan
.....
Assoc.Prof. Montip Tiensuwan, Ph.D.
Member

Kenneth M. Roshong
.....
Kenneth M. Roshong, M.A.
Member

Liangchai
.....
Prof. Liangchai Limlomwongse,
Ph.D.
Dean
Faculty of Graduate Studies
Mahidol University

P. Matangkasombut
.....
Prof. Pornchai Matangkasombut,
Ph.D, M.D.
Dean
Faculty of Science
Mahidol University

ACKNOWLEDGEMENT

I would like to express my deepest gratitude to the chairman of the thesis committee, Associate Professor Dr. Boosakorn Vijchulata, for her patience, encouragement, great kindness, valuable guidance and careful supervision of the thesis.

A special debt of gratitude is expressed to my two visiting professors, Mr. Timothy Jervis for his patience in assisting in formulating test questions and Mr. Kenneth M. Roshong, for his valuable time and effort in reading and editing my language. I am also deeply grateful to Dr. Niramol Pachinburavan for her constructive suggestions and valuable insight.

I would also like to thank Associate Professor Dr. Montip Tiensuwan, who served as an external examiner and Dr. Sompoad Srikosamatara, who sacrificed his precious time to advise me about scientific matters.

Special appreciation is further extended to all lecturers of the Departments of English at Chulalongkorn University, Mahidol University, Silpakorn University and Kasetsart University for their great cooperation and generosity and to all my subjects in this thesis for their courage and cooperative participation.

I am particularly indebted to my friends at Mahidol University, especially Kaysinee Bumroongthai who always helped me get through thick and thin and to Noppan, Nuanpan and Nakorn who gave me inspiration, support and encouragement.

Finally, my grateful indebtedness goes to my parents and my three brothers (Prasert, Prasith and Prasan) for their love, understanding, sympathy, support and encouragement.

Panitda Reanjaroensuk

3636026 SCLG/M : MAJOR : APPLIED LINGUISTICS ; M.A. (APPLIED LINGUISTICS)
KEY WORDS : VOCABULARY PROFICIENCY / VOCABULARY TEST / NATURAL SCIENCE CONTEXT / SEX DIFFERENCES

PANITDA REANJAROENSUK: AN INVESTIGATION INTO THE ENGLISH VOCABULARY PROFICIENCY IN A NATURAL SCIENCE CONTEXT OF FIRST YEAR ARTS AND SCIENCE ORIENTED UNIVERSITY STUDENTS. THESIS ADVISORS: BOOSAKORN VIJCHULATA, Ph.D., NIRAMOL PACHINBURAVAN, Ph.D., KENNETH M. ROSHONG, M.A. 76 p. ISBN 974–662–091–6

The main purpose of this study is to investigate and compare English vocabulary proficiency in a natural science context of first year university students from an arts or science background.

The subjects were 615 first year university students who were randomly selected from the faculties of Medical Science, Arts and Science at Chulalongkorn University, Mahidol University, Kasetsart University and Silpakorn University in the 1997 academic year.

The instruments used in this study were a multiple choice English vocabulary in a natural science context test, a short background questionnaire and a set of interview questions.

The results of test administration were statistically analyzed by using the SPSS PC+ computer program. One-Way ANOVA, t-test and the Student–Newman–Keuls procedure were employed. The findings follow.

Among the three groups of studcnts, the test mean score of the Medical Science group (38.5202) was the highest; the test mean score of those from the Arts group (31.4675) was second; the test mean score of those from the Science group (23.6765) was the lowest.

There was a significant difference in vocabulary proficiency among the three groups of students (from the Faculty of Medical Science, the Faculty of Science and the Faculty of Arts) at P-value<0.01.

There were no significant differences in vocabulary proficiency between male and female students within each faculty. On the contrary, when the test mean scores of male and female students of all three faculties taken as a whole were compared, there was a significant difference in vocabulary proficiency between them at P-value<0.01. The test mean score of male students (32.6308) was higher than that of female students (30.1446).

3636026 SCLG/M : สาขาวิชา : ภาษาศาสตร์ประยุกต์ ; ศศ.ม. (ภาษาศาสตร์ประยุกต์)

พนิตดา เหรียญเจริญสุข : การศึกษาความรู้ทางด้านคำศัพท์ในบริบททางวิทยาศาสตร์ของนักศึกษาชั้นปีที่1ที่มีพื้นฐานความรู้จากสายวิทยาศาสตร์และสายศิลปศาสตร์(AN INVESTIGATION INTO THE ENGLISH VOCABULARY PROFICIENCY IN A NATURAL SCIENCE CONTEXT OF FIRST YEAR ARTS AND SCIENCE ORIENTED UNIVERSITY STUDENTS). คณะกรรมการควบคุมวิทยานิพนธ์ : บุษกร วิชชุลดา,Ph.D.,นิรมล ปาจีนบูรวรรณ์, Ph.D., Kenneth M. Roshong,M.A. 76 หน้า. ISBN 974-662-091-6

งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาและเปรียบเทียบความรู้ทางด้านคำศัพท์ในบริบททางวิทยาศาสตร์ของนักศึกษาที่มีพื้นฐานความรู้จากสายวิทยาศาสตร์และสายศิลปศาสตร์

ตัวอย่างประชากรในการวิจัยคือนักศึกษาชั้นปีที่1รวมทั้งหมด 615 คนจากคณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัยและมหาวิทยาลัยมหิดล คณะอักษรศาสตร์ จุฬาลงกรณ์มหาวิทยาลัยและมหาวิทยาลัยศิลปากร คณะวิทยาศาสตร์ มหาวิทยาลัยมหิดลและมหาวิทยาลัยเกษตรศาสตร์ ปีการศึกษา 2540

เครื่องมือที่ใช้ในการวิจัยได้แก่แบบทดสอบความรู้ทางด้านคำศัพท์ในบริบททางวิทยาศาสตร์แบบสี่ตัวเลือก ((Multiple-choice Test)พร้อมแบบสอบถามข้อมูลส่วนตัวและการสัมภาษณ์

ข้อมูลทั้งหมดได้ถูกนำมาวิเคราะห์เชิงสถิติโดยใช้ One-way ANOVA, t-test และ Student-Newman-Keuls procedure ในโปรแกรมSPSSPC+ ได้ผลสรุปดังนี้

คะแนนเฉลี่ยของนักศึกษากลุ่มคณะแพทยศาสตร์อยู่ในระดับสูงสุดคือ 38.5202 รองลงมาเป็นคะแนนเฉลี่ยของกลุ่มคณะอักษรศาสตร์ คือ 31.4675 และ คะแนนเฉลี่ยของกลุ่มคณะวิทยาศาสตร์ คือ 23.6765

นักศึกษาทั้งสามกลุ่มมีความรู้ทางด้านคำศัพท์แตกต่างกันอย่างมีนัยสำคัญทางสถิติที่ P-value<0.01

ความรู้ทางด้านคำศัพท์ของนักศึกษาเพศชายและเพศหญิงภายในแต่ละกลุ่มไม่มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ ในทางตรงกันข้ามเมื่อรวมนักศึกษาทั้งสามกลุ่มเข้าด้วยกันแล้วศึกษาเปรียบเทียบระหว่างเพศชายและเพศหญิงพบว่าความรู้ด้านคำศัพท์มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติที่ P-value<0.01 โดยคะแนนเฉลี่ยของนักศึกษาเพศชาย(32.6308)สูงกว่าคะแนนเฉลี่ยของนักศึกษาเพศหญิง (30.1446)

CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

1.1. Background Information

English is considered to be the most worldwide used language. English also has a great importance in political and culture aspects. Moreover, people learn English to keep up with the major trends and developments in the world.

In Thailand, English is regarded as an important medium for communication between Thais and non–Thais in politics, tourism, economics as well as other fields.

English also plays an important role in Thai education, to which will be attested. In Thailand, the school–system (based on the *1992 National Scheme of Education*) is divided into four levels: pre–school education, primary education, secondary education and higher education. Secondary education is further divided into two levels: lower secondary education and upper secondary education.

Lower secondary education (Mathayomsuksa 1–3: aged 12–14) aims to promote learners' knowledge, ability and skills beyond the primary level; to enable them to identify their needs and interests and to be aware of their aptitude both in general and vocational education; and to develop their ability for work and occupational practices relevant to their age.

Upper secondary education (Mathayomsuksa 4–6: aged 15–17) aims to enable learners to progress according to their aptitude and interests and acquire the basis either for continuing to higher education or for working and pursuing a career suitable for their aptitude both as entrepreneurs and workers; to promote moral, ethics, and social skills necessary for working, pursuing a career and leading peaceful social lives.

To reach the educational goal of each level, English learning is emphasized by administrators, teachers and students at every level, especially the upper secondary level (Mathayomsuksa 4–6) and the university level. Students at the upper secondary level have to prepare their English for the university entrance examination whereas students at university level have to expand their knowledge in order to read their textbooks, journals and academic materials which are mostly written in and translated into English.

English is considered an important subject for all Thai students in any field of study at all levels, particularly the upper secondary level (Mathayomsuksa 4–6). At this level, students are channeled into two tracks which are the science track and the arts track based on their proficiency and interest. The students who have high scores in basic science and are interested in science and mathematics will have the opportunity to choose to study in a **Science Program** and their studies will emphasize science subjects, such as biology, chemistry, physics, mathematics, and so on which continue up to the university level. At the same time, the students who have low scores in mathematics or basic science but are interested in learning foreign languages and literature will choose to study in an arts program. Then, their studies will stress languages. Apart from English, some of them may select another foreign language

such as French, German, Japanese, etc., subject to what is available at their schools. Such an arts program is called a **Language–Arts Program**. Hence, they will be geared to study in the fields of languages and social sciences. Furthermore, some arts students can select a **Math–Arts Program**. In this program, they will learn mathematics and English so that they can study accounting, economics, languages, or social sciences at the university level.

According to the Ministry of Education (1991), English is not a compulsory subject at either primary school level or secondary school level in the present curriculum. However, in practice, all schools offer English courses for students at the secondary school level in order to prepare students for their tertiary education level as English is an important subject for their academic life and also for their future professional life.

Vocabulary is an important fundamental element for learning English. In order to develop good language skills, it is necessary for students to have sufficient knowledge of vocabulary. As Long and Richards (1987:305) point out: "vocabulary, like grammar, is an essential component of all uses of language." An ESL/EFL student who plans to read anything or substance in English needs to acquire as large a vocabulary as possible. Roloff, et.al. (1981) also agree that students need adequate vocabulary to be able to read textbooks effectively, to understand lectures, to be able to listen and understand TV and radio programs, to be able to analyze what has been heard and read in order to make sensible decisions, to understand clearly the terms of contrasts, and so on.

Tonjes states that knowing word meanings is essential to reading comprehension (Tonjes, 1991 cited by Vinotai, 1992). Consequently, insufficient vocabulary knowledge can cause difficulties in language learning for almost every skills, especially reading. Jordan(1981), Nuttal (1982), Cheng (1996), and Zimmerman (1997) all claim that the most crucial problem for language readers is that their vocabulary knowledge is not strong enough for the reading they have to do. Moreover, both Wallace (1982) and Silva (1993) report that they have noticed a growing dissatisfaction and frustration among students who lack a strong knowledge of vocabulary and cannot use the words that they need to communicate and cannot comprehend reading texts.

In Thailand, the most important problem that hinders students' English language learning, especially the reading skill, is an insufficient vocabulary knowledge of the students. According to Chonsatityoo (1971), Thuaycharoen (1982), Vinotai (1992) and Angsirikulthumrong (1994), the main weakness of students in reading comprehension is the lack of efficient strategies for extracting the meanings of the vocabulary. Moreover, Kulsirisawad (1985) indicates that the students' interest and motivation are both likely to deteriorate when students encounter new items of vocabulary while reading and they will eventually complain that the text is too difficult and finally give up reading.

Vocabulary learning is very important in education but it had been neglected because many teachers assume that their students have learned words incidentally in the past. Gairns and Redman (1986) and Tassana–ngam (1994) mentioned that in the past, vocabulary learning and teaching seemed to be neglected but grammar or

syntactic structure was greater emphasized.

According to the results obtained in other studies of second language learning (e.g. Farhady, 1982; Larsen–Freeman and Long, 1991; Maccoby and Jacklin, 1994), the superiority of vocabulary knowledge of female students over of male students was expected. Moreover, Wen and Johnson's research (1997) also confirms that sex differences have direct effects on English achievement, that is, in Chinese universities, female students performed better on language tests and language studies than male students because more successful male students tended to be attracted to other areas of study such as general reasoning and arithmetic reasoning.

In Thailand, there is little research that examines whether or not sex differences have direct effects on English proficiency and English achievement.

1.2. Statement of the problem

Although vocabulary is very important in learning English for all four skills (reading, writing, listening, and speaking), university students are not generally equipped with sufficient vocabulary. Their vocabulary size is usually small. This is especially so for the science–oriented students as compared to the arts–oriented students. This may be a somewhat strong claim but the researcher is curious about the vocabulary size of the Thai science–oriented students when they encounter reading in a science context. Hence, the researcher is interested in investigating the vocabulary proficiency of first year university Science students by comparing them to first year Medical Science students and Arts students in order to find out whether vocabulary is a problem for Science students or not. With respect to the problems of vocabulary, the

researcher is interested in exploring whether sex differences will have any impact on the vocabulary proficiency among these groups of students. In this study, the following research questions are explored:

1. Which group of students will obtain the highest test mean score?

2. Are there any significant differences in vocabulary proficiency among these three groups of students?

3. Are there any significant differences in vocabulary proficiency between male and female students within each group?

4 Are there any significant differences in vocabulary proficiency between male and female students of these three groups taken as a whole?

1.3. Purpose of the study

The purpose of this study is to investigate and compare English vocabulary proficiency in a natural science context of first year university students from an arts or science background. The subjects of the study were randomly selected from four top government universities: Chulalongkorn University, Mahidol University, Silpakorn University and Kasetsart University. The Science students were selected from the Faculties of Medical Science at Chulalongkorn University and Mahidol University and the Faculties of Science at Mahidol University and Kasetsart University. The Arts students were selected from the Faculties of Arts at Chulalongkorn University and Silpakorn University in the 1997 academic year. The subjects were given a test with an attached short questionnaire which were constructed and administered by the researcher. Apart from the test, an interview was conducted with some students from

the three faculties to gain more information on the students' strategies in developing vocabulary knowledge and problems mostly found in their vocabulary learning. The test scores were calculated and analyzed by using SPSS PC+ computer program to answer the research questions aforementioned.

1.4. Variables of the study

The independent variables are the male and female subjects from different fields of study: Medical Science, Science, and Arts. The dependent variables are the subjects' scores obtained from the test constructed and administered by the researcher.

1.5. Significance of the study

It is expected that the findings of this study will be useful for English teachers and syllabus designers to develop English courses and appropriate teaching materials both at secondary and tertiary education levels in Thailand. They will also serve as a reference for English teachers to select supplementary reading texts for their students. Furthermore, the findings are expected to make English teachers aware of the importance of the students' background exposure in vocabulary learning for a better improvement of the four major skills: reading, writing, listening, and speaking.

1.6. Scope and limitations of the study

1. Subjects of this study are first year Medical Science, Science and Arts students from government universities (Chulalongkorn University, Mahidol University, Silpakorn University, and Kasetsart University) in the 1997 academic year.

2. This study focuses on decoding lexical knowledge only in vocabulary recognition level not in vocabulary production level.

3. The vocabulary items used in the test are extracted from an authentic text, Environment written by Raven, Berg, and Johnson, 1995 version as recommended by Dr. Sompoad Srikosamatara, a scientist from the Biological Department, the Faculty of Science, Mahidol University.

1.7. Basic assumptions

In this study, it is assumed that all subjects gave valid data when they answered the questionnaire and the interview questions. Moreover, it is also assumed that all subjects thoughtfully answered all items in the test.

1.8. Definition of terms

1. **Vocabulary** is defined as words or phrases selected from the textbook entitled Environment written by Raven, Berg, and Johnson., 1995.

2. **Proficiency** refers to the degree of skill and knowledge with which a person can use a language, such as how well a person can read, write, speak, or understand the language.

3. **Receptive Recognition Vocabulary**, according to *A handbook of English Language Teaching Terms and Practices* (1982), is when the learner understands the words' meaning in either oral or written contexts without being able to reproduce it himself/herself. A person's passive vocabulary is always larger than his/her active vocabulary even in his/her native language.

4. **Natural Science** based on the definition in the *Oxford Advanced Learner's Dictionary* (1995), includes the sciences used in the study of the physical world, e.g. chemistry, biology, physics, botany, and geology.

5. **A Science Program** is a program in the Thai secondary school education system in which students are prepared to study in scientific fields at the university level. It includes subjects such as biology, chemistry, physics, mathematics, English, Thai, etc.

6. **A Language–Arts Program** is a program in the Thai secondary school education system in which students are prepared to study in languages or social sciences fields at the university level. It includes subjects such as English, Thai, French, German, Japanese, social studies, moral education, etc.

7. **A Maths–Arts Program** is a program in the Thai secondary school education system in which students are prepared to study in business, English or social studies at the university level. It includes subjects such as English, Thai, mathematics, accounting, social studies, moral education, etc.

8. **A Medical Science Student** is a student who studies in the field of medicine.

Organization of the study

The presentation of this study is divided into six chapters as follows:

Chapter I presents an introduction to the study, background information, purpose of the study, statement of the problem, variables of the study, significance of the study, scope and limitations of the study, basic assumptions and definition of terms.

Chapter II reviews the research and literature related to the study.

Chapter III describes and explains the research methodology.

Chapter IV reports the findings of the study.

Chapter V presents a discussion and interpretation of findings as well as implications of the study.

Chapter VI contains the conclusion of the study and recommendations for further studies.

CHAPTER II

REVIEW OF RELATED LITERATURE AND RESEARCH

This chapter reviews the literature and research which are relevant to the study. They are presented as follows:

2.1. The Importance of Vocabulary

2.2. The Role of Schema Theory and Contextual Clues

2.2.1. Schema Theory

2.2.2. Contextual Clues

2.3. Vocabulary Test

2.4. Direct Effects of Sex Differences in English Achievement

2.5. Review of Related Research

2.5.1. Related Research into the Effects of Sex Differences in Language Learning

2.5.2.Related Research into English Vocabulary Proficiency of Different Groups of Thai Students.

2.1. The Importance of Vocabulary

The extent of vocabulary knowledge can indicate the degree of intelligence (Fisher, 1964). Bernard (1965) also agrees that superiority in vocabulary is a prominent characteristic of a successful person. Funk and Lewis (1942) also support

that if vocabulary is limited, the chances of success are limited; that one of the easiest and quickest ways to get ahead is by consciously building up knowledge of words.

Bromberg and Gale (1979) claim that a knowledge of words and the ability to speak and write with proficiency are essential to one's intellectual development, achievement and enjoyment. Students must know words in order to understand their teachers and texts. They must also have a command of words in order to write clearly on examinations and reports. The outstanding students are the students who know a subject and who have the ability to express their knowledge in well-chosen, logically articulated words.

In academic life, the central aim of language learning is to enable learners to acquire a sufficient amount of language to function at some level in the target language and to understand the ideas that are presented in spoken or printed forms, whether as single words or in sentences. Thus, learning a language involves many aspects of linguistics features which are interconnected such as structures, function, pronunciation and vocabulary (Pranprem, 1995).

Fundamentally, vocabulary is essential in developing the four language skills (reading, writing, speaking and listening) due to its importance in creating meaningful information. Rivers (1983) states that it is essential to have adequate vocabulary because it will help the learners to communicate more comprehensibly. Wilkins (1972) also agrees that there is not much value in being able to to produce grammatical sentences if one has not got the vocabulary that is needed to convey what one wishes to say.

Vocabulary is crucial to reading comprehension as Weiner and Bazerman (1978) agree that one basic way to better reading is to build up vocabulary. The more words one recognizes and understands, the easier it will be for him/her to read without stopping and wondering.

Karlin (1975) also stressed that the importance of vocabulary development as a factor which enhances comprehension includes other factors needed for comprehension in reading.

According to Krashen (1982), teachers are able to help students understand messages containing structures that are beyond them by emphasizing vocabulary. While knowledge of vocabulary may not be sufficient for understanding all messages, there is little doubt that an increased vocabulary helps the learner understand more of what is heard or read. Thus, more vocabulary should mean more comprehension of input, and more acquisition of grammar.

Vocabulary knowledge is the most important area of second language competence regarding academic achievement. To be successful in vocabulary learning means the students are able to retain and recall vocabulary at will (Wallace, 1982). Moreover, vocabulary learning and teaching relate to both reading, with its receptive understanding of language, and writing with its productive use. According to Nattinger (1988), vocabulary comprehension relies on strategies that permit one to understand words and store them, that is to commit them to memory, while production concerns strategies that activate one's storage by retrieving these words from memory, and by using them in appropriate situations. These are two main factors that facilitate one to detect word meanings: schema theory and contextual clues.

2.2. The Role of Schema Theory and Contextual Clues

2.2.1. Schema Theory

It is now generally accepted that background knowledge does affect reading comprehension. Yet, vocabulary is the most important factor that has the strongest effect on reading ability (Nation and Coady, 1988). One psychological theory involving an active organization of background knowledge, past experiences or past reactions connected by a common interest such as sport, literature, history, arts science, philosophy and so on that enhances language comprehension is called schema theory.

Schema theory is defined by Rumelhart (1980:33) as follows;

> A schema theory is basically a theory about knowledge. It is a theory about how knowledge is represented and about how that representation facilitates the use of knowledge in particular ways. According to schema theories, all knowledge is packaged into units. These units are schemata. Embedded in these packets of knowledge is, in addition to the knowledge itself, information about how this knowledge is to be used.

According to schema theory, knowledge is stored not in lists, but in hierarchies. Within these hierarchies are schemata which are embedded in other schemata, and which themselves contain subschemata. These schemata differ in their levels of abstraction, and represent all sorts of knowledge, such as objects, academic topics, rules, events, routines, and social situations. They represent knowledge rather than definitions, so they are not language based, but are symbolic representations of knowledge which may be used for understanding language. Schemata can be changed according to the input and new schemata can be developed by the process of

accommodation, that is, the modification of previous schemata in the light of new information (Clapham, 1996; Bransford, 1979).

Carell and Eisterhold (1983) mentioned that the role of background knowledge in language comprehension has been formalized as schema theory which has one of its fundamental principles that a text, either written or spoken, does not by itself carry meaning. Rather, a text only provides directions for readers or listeners on how to retrieve or construct meaning from their own previously acquired knowledge. Eskey (1988) also supports that comprehending words, sentences, and entire texts does not involve only one's linguistic knowledge but also the ability to relate background knowledge and experience to the textual material.

Carell (1983) describes a distinction between formal schemata and content schemata in that the former is the background knowledge of the formal, rhetorical organizational structures of different types of texts and the latter is the background knowledge of the content area of a text. Based on Thorndyke (1977), stories consist of several unique components (setting, theme, plot and resolution) which are conceptually separable, and are organized by narrative syntax rules which are independent of the linguistic content of the story. If people are able to match a particular story to a previously learned organizational framework, they will be able to use that framework to help them understand the text.

In conclusion, a set of schemata enables language learners to acquire language comprehension that relates to the lexical system, syntactic system and semantic system. Generally, schemata can be adjusted to accommodate new information, but if the learner's schemata is inadequate because of a lack of the appropriate background

knowledge, then comprehension might break down (Clapham, 1996). Apart from schemata that allow a language learner to acquire language comprehension, contextual clues are also essential especially for the comprehension of unknown vocabulary (Adam, 1982; Hudson, 1982).

2.2.2. Contextual Clues

Contextual clues are important in vocabulary learning because what a word means on any given occasion can be mediated by the many contexts in which it is used as Labov (1973) states that words have a habit of changing their meanings from one context to another.

According to Carter and McCarthy (1991: 102):

> Context can be viewed as morphological, syntactic and discourse information in a given text which can be classified and described in terms of general features. This is the context within the text. But the reader also has background knowledge of the subject matter of a given text, i.e. the general context.

The surrounding text (context) is a technique that can always be used to help learners learn the word meaning incidentally by using contextual clues to guess the meaning of words. Carter and McCarthy (1991) also support that learning vocabulary through context must be the major way of increasing vocabulary knowledge. According to Gairns and Redman (1986), contextual guesswork is the making use of the context to deduce meaning from the item itself. The ability to guess word meaning from context is an important skill that builds word power because being aware of the meaning from the context helps the students retain and recall more words rather than being concerned with only the individual words (Wallace, 1982). Nuttal (1982) also

agrees that training students to infer meaning from context gives them a powerful aid to comprehension. Meaning of an unknown word can be inferred from context and in order to infer meaning from context, contextual clues are needed. Fox (1987) presents various types of contextual aids as follows:

1. **Word elements such as prefixes, suffixes and roots.** The ability to recognize component parts of words, word families and so on is probably the single most important vocabulary skill for the students to encounter and increase their control of lexicon.

2. **Pictures, diagrams, and charts.** The students can use the given illustration to gain the ability to find word meaning.

3. **Clues of definition.** The student must be taught to notice the many types of highly useful definition clues. Among these are:

a. *Parentheses or footnotes*, which are the most obvious definition clues.

b. *Synonyms and antonyms*, which usually occur along with other clues: *that is, is* clauses, explanation in parentheses and so on.

4. **Inference clues**: from discourse, which are usually not confined to one sentence:

a. *Example clues*: where the meaning for the word can be inferred from an example, often use physical clues such as *i.e., e.g.* and *for example.*

b. *Summary clues*: from the sum of the information in a sentence or paragraph, the students can understand the word.

c. *Experience clues*: the reader can get meaning from a word by recalling a similar situation he/she has experienced and making the appropriate inference.

5. **General aids**, which usually do not help the student with specific meaning, but they only narrow the possibilities. These include the function of the word in question, i.e., noun, adjective, etc., and the subject being discussed.

In order to be successful in guessing word meaning from context, a strategy was proposed by Clarke and Nation (1980). The strategy presented a procedure where learners can ensure that they are making good use of the available context clues. There are five steps in this strategy as follows:

1. Finding the part of speech of the unknown word.

2. Looking at the immediate context of the unknown word and simplifying this context as necessary.

3. Looking at the wider context of the unknown word. This means looking at the relationship between the clauses containing the unknown word and the surrounding clauses and sentences. These relationships include cause and effect, contrast, generalization—detail, exclusion (on the contrary, instead), explanation (in other words, that is), time (before, subsequently, finally), and arrangement (in the first place, secondly).

4. Guessing the meaning of the unknown word.

5. Checking that the guess is correct. There are several ways of checking the guess:

5.1. Check that the part of speech of the guess is the same part of the unknown word.

5.2. Break the unknown word into parts and see if the meaning of the parts related to the guess.

5.3. Substitute the guess for the unknown word. Does it make sense in the context?

5.4. Consult a dictionary.

If vocabulary knowledge is accepted as a fundamental component of second language proficiency, one of the primary goals of language testing will be to assess whether learners know the meanings of the words they need to communicate successfully in the second language (Read, 1996).

2.3. Vocabulary Test

Vocabulary is an important component in language learning as Hughes (1989) states that clear knowledge of vocabulary is essential to the development and demonstration of linguistic skills and a vocabulary test section is an essential part of many language tests. English teachers can use a published test of vocabulary or construct their own vocabulary test.

In vocabulary testing, a multiple–choice test is usually set out in such a way that the examinee is required to select the answer from a number of given options, only one of which is correct (Weir, 1990). According to Hughes (1989), the advantages of using a multiple–choice test are that the scoring can be done quickly, with reliable results. There are no problems of inter–raters or intra–raters and the examinee is familiar with this test method. The multiple–choice test is also practical to administer and it can cover more vocabulary. On the other hand, certain disadvantages and limitations of a multiple–choice test are that it is difficult to test productive knowledge of the vocabulary because students do not produce the responses

themselves. Moreover, guessing may have a considerable but unknown effect on test scores. It is difficult to write successful items because multiple–choice items require effective distracters. Furthermore, cheating may be facilitated because the responses on a multiple–choice test (a, b, c, d) are so simple that one examinee can communicate them to other examinees nonverbally. However, in vocabulary testing, a multiple–choice test is almost always chosen especially in testing word recognition skill.

2.4.Direct Effects of Sex Differences in English Achievement

Although, there is no study that has systematically investigated the rate of second language acquisition in females versus males, it is generally accepted in L1 acquisition that females obtain a higher rate, initially at least (Larsen–Freeman and Long, 1991). There are few studies that have reported sex–related differences in second language acquisition. Farhady (1982) found that female subjects performed significantly better than male subjects on a listening comprehension test in his study of 800 university students who took the placement test. Eisenstein (1982) also found that females performed significantly better than males on a dialect discrimination task and in the extent to which they could recognize greater dialects. Gass and Veronis (1986) reported that men dominated the conversation, however, since women initiated more meaning negotiation than men, women may have benefited from receiving more comprehensible input.

2.5. Review of Related Research

2.5.1. Related Research into the Effects of Sex Differences in Language Learning.

Dali and Sami (1996) compared English reading comprehension, English vocabulary recognition and English writing ability for two groups of Arabic–speaking students: (a) those who started learning EFL between the ages of five and six years and (b) those who started learning EFL between the ages of ten and eleven years. The research problem was to examine the effects of gender, type of school, and educational district on English vocabulary recognition, English reading comprehension, and English writing ability. Findings showed that there were some significant differences in terms of the interaction of gender and educational districts. It was found that boys sometimes differed from girls in aspects of English achievement which indicated an interaction of gender only within particular districts and types of schools.

Potaski (1996) investigated the academic and demographic variables that predicted the English Grade Early Warning Tests. The results of the study showed that it is possible to use grade 5, 6, and 7 California Achievement Test scores, student demographics, and student grades to obtain a multiple regression equation that will predict student scores on the New Jersey Grade 8 Early Warning Tests. An unexpected finding was that the boys in this population outperformed the girls on the language, mathematics and reading subtests of the California Achievement Tests and the mathematics, reading and writing subtests of the Grade 8 Early Warning Tests. The boys also received higher grades than girls in the subject areas of language, mathematics and reading.

Cinko and Elisabeth (1993) investigated the issue of gender differences in computer–based foreign language activities. The software–based pretest and posttest were composed of two parts: (1) vocabulary pertaining to description of people and (2) geographical knowledge. The analysis of subscores revealed that females outperformed males significantly at P–value<0.05 in learning vocabulary pertaining to description of people whereas males outperformed females numerically in learning geographical facts.

Wen and Johnson (1997) studied L2 learner variables and English achievement by using a standardized English proficiency test to prove sixteen learner variables which affect English achievement. They found that one variable which has a direct effect on English achievement is sex. Female students performed better than male students on English achievement tests. The difference between them is statistically significant at P–value<0.05.

2.5.2. Related Research into English Vocabulary Proficiency of Different Groups of Thai Students

Tuaycharoen (1972) studied the problems of second year students of Srinakarintharaviroj Prasanmitr and Prathoomwan Campuses in reading English texts. She found that in reading English texts, vocabulary was the area that students mostly made mistakes in.

Narue-Domkul (1984) studied the oral proficiency of first year Medical students at Mahidol University. She found that the students' vocabulary knowledge was inadequate for even the simplest conversation. Their vocabulary was limited to basic personal and survival areas and inadequate for the discussion of some common

professional and social topics. Moreover, students had problems in choosing the right word for a certain context.

Prawanpath (1984) studied the general English vocabulary knowledge of Pre–Medical Science students at Mahidol University during the 1983 academic year. The instruments consisted of two vocabulary test forms. Test Form I measured general vocabulary knowledge in English textbooks whereas Test Form II measured general vocabulary knowledge in Scientific contexts. She found that the test mean scores of the students were higher than one-half of the total score in Test Form I. This indicated that, in general, the Pre–Medical Science students at Mahidol University in that academic year had quite a fair command of the general English vocabulary when it appeared in a daily-life context. On the contrary, the test mean scores of the students in Test Form II were lower than one–half of the total scores. This showed that the Pre–Medical Science students, in general, still had problems with general English vocabulary appearing in the kind of context used in English textbooks or English teaching materials for their fields of study at the university level.

In conclusion, according to the related research, sex differences have effects on language achievement. However, there are no exact answers whether male or female students have better vocabulary proficiency.

CHAPTER III

RESEARCH METHODOLOGY

This chapter describes and explains the following aspects:

3.1. Population and Samples

3.2. Research Methodology and Procedure

- 3.2.1. Instruments
- 3.2.2. Test Construction
- 3.2.3. Pilot Study
- 3.2.4. Test Administration
- 3.2.5. Scoring Procedure
- 3.2.6. Interview

3.3. Analyses of Data and the Statistical Devices

- 3.3.1. Arithmetic Mean
- 3.3.2. KR-21
- 3.3.3. Item Analysis
- 3.3.4. Standard Deviation
- 3.3.5. T - Test
- 3.3.6. Analysis of Variance (ANOVA)

3.1. Population and Samples

The population of this study was first year government university students from the Faculty of Medical Science, Chulalongkorn University and Mahidol University; the Faculty of Science, Mahidol University and Kasetsart University; the Faculty of Arts, Chulalongkorn University and Silpakorn University. Table 1 presents the population of each group of subjects, the sample size and its percentage.

Table 1: Population Size, Sample Size and Percentage of Subjects.

Subjects of the Study	Population Size	Sample Size	(%)
Medical Science Students	700	223	31.9
Science Students	650	238	36.6
Arts Students	400	154	38.5

Based on Kajornsilp (1996:71), as shown in Table 2, the sample size of this study was appropriate since the sample size of each group was above 25% of the total.

Table 2: Standard Criteria of Determining Sample Size.

Population Size	Sample Size (% of the population)
1 - 999	25 %
1,000 - 9,999	10 %
10,000 - 99,999	1 %

(Kajornsilp, 1996:71)

The total number of subjects of this study was 615 first year university students in three fields of study at four universities. Each field of study was represented by students from two of the four universities as shown in Table 3. They took the researcher's vocabulary test in the second semester of the 1997 academic year. All subjects were volunteers who participated from a whole range of classes of different abilities in various majors of study. They were not the same students who took the pilot test. They were native Thai speakers, both male and female, who studied English for 8 - 14 years in primary and secondary schools and took an English course offered by their universities during the first semester. Therefore, their duration of studying English at university was the same.

Table 3: The Source of the Sample.

Subjects of the study	University	
Medical Science Students	Chulalongkorn	Mahidol
Science Students	Mahidol	Kasetsart
Arts Students	Chulalongkorn	Silpakorn

Table 4: Proportion of Male and Female Subjects.

Subjects / Sex	Medical Science Students		Science Students		Arts Students		Total	
	Number	%	Number	%	Number	%	Number	%
Male	121	54.26	76	32.93	17	11.03	214	34.80
Female	102	45.74	162	68.07	137	89.97	401	65.20
Total	223	100.00	238	100.00	154	100.00	615	100.00

Table 4 shows the proportion of male and female students from each field of study. The percentage of the female students is higher than that of the male students because the majority of Arts students are female.

3.2. Research Methodology and Procedure

3.2.1 Instruments

The instruments used in this study were a multiple choice English vocabulary test, a short questionnaire and a set of interview questions. The test and the questionnaire were both constructed by the researcher and approved by the committee advisors from the Department of Foreign Languages, Faculty of Science, Mahidol University. The actual test consisted of 60 items and took 60 minutes to complete. The short questionnaire provided the students' personal information such as sex, age, duration of studying English and educational background. The reliability of the test was established by using the KR–21 formula.

3.2.2 Test Construction

The following are criteria used for developing the vocabulary test.

1. The resource book for selection of vocabulary items was Environment, written by Raven, Berg and Johnson (1995), as recommended by a scientist from the Biological Department, the Faculty of Science, Mahidol University. It is an authentic text that includes a range of scientific topics in several fields. In selecting the book about the environment, the concepts of the topics in the book were expected to be familiar to the students.

2. The vocabulary to be tested was selected for the following reasons: a) the

vocabulary was at the appropriate level of difficulty, b) it was used in high frequency, c) it was not technical terminology. Sentences which included the vocabulary item with appropriate contextual clues were also chosen from the book. These sentences sometimes were slightly modified, either for grammatical purposes or content appropriateness.

3. Three effective distracters were prepared for each item of vocabulary so that the correct answer could be selected with the knowledge of the vocabulary in context. Distracters were made grammatically compatible with the vocabulary item being tested and also not totally out of context. They were never substitutes or possible correct answers.

4. The answer key was prepared by giving an equal proportion of the right answer to each choice of a, b, c and d.

5. The test and the answer key were reviewed and approved by the committee advisors and an expert in the field of science .

3.2.3. Pilot Study

A pilot study was conducted to ensure the quality of the test. It consisted of 100 multiple-choice items and took 100 minutes to complete. The subjects of the pilot study were 120 first year university students from the Faculty of Medical Science, the Faculty of Science, and the Faculty of Arts who studied in the first semester of the 1997 academic year.

An item analysis was applied to determine the index of difficulty and the index of discrimination power. According to Wongsothorn (1996), the index of difficulty should range from 0.20 to 0.80 with the index of discrimination power at a minimum

of 0.3. Based on these criteria, the number of items of the pilot test was reduced to a final of 60 items. The reliability of the test was estimated by using KR–21 formula. The reliability of the pilot test was 0.74. However, the reliability of the actual test was 0.85. Based on Lado (1961), the reliability coefficient 0.70 to 0.99 is acceptable for a language test.

3.2.4 Test Administration

The actual test was administered to the three groups of first year students by the researcher during the second semester of the 1997 academic year. All students took the same test in their own classroom in a formal test environment and with the same duration time of 60 minutes.

3.2.5 Scoring Procedure

The answers of the test were hand-scored by the researcher. The right and wrong answers were marked according to the approved answer key. The answer was considered right when it was exactly the same as the key. Each right answer was worth 1 point, whereas each wrong answer was worth 0 points. This scoring procedure was applied to all items.

3.2.6. Interview

After the test, the students were interviewed in order to gain more information about their strategies in developing vocabulary proficiency and any problems found in their vocabulary learning. The interview was conducted with two groups of the students: 1) top students from each group among the three fields who obtained the highest test scores and 2) "other" Science students who obtained low test scores. The top students were asked about their favorite subjects, interest areas, favorite journals,

hobbies, their English "problem" skills, their techniques in completing the test and their strategies in developing vocabulary proficiency. Furthermore, they were asked to express their opinions about either English proficiency or science background knowledge had a greater impact in completing the vocabulary test. On the contrary, the "other" Science students were asked to express their opinions of the test, the English skill which is most important to them, their vocabulary problems and opinions of their English courses. The two groups of students were interviewed with different sets of questions in order to focus on the information most relevant to each group. The top students (with few vocabulary problems) were questioned about their vocabulary learning strategies, their techniques used in completing the vocabulary test and other factors that enhanced their vocabulary learning. But the "other" Science students (those with the most problems in vocabulary learning) were asked about their vocabulary problems and their opinions of their English courses.

3.3. Analyses of Data and the Statistical Devices

All of the results from the actual test were calculated and analyzed by computer using the SPSS PC+ program. The following statistical formulae were employed to test the hypotheses of this study:

3.3.1. Arithmetic Mean

The arithmetic mean score (the average score) is the sum of all the scores divided by the number of scores.

3.3.2. KR–21

The KR–21 is a way to estimate the reliability of the test. This formula is

based on the mean of samples and the number of items.

3.3.3. Item Analysis

Item analysis is a procedure used in summarizing the results for each item of a test. The purposes of item analysis are to evaluate instructional effectiveness and to improve test quality by discovering defective and ineffective items so that such items may be replaced and improved for future use. Item analysis techniques include the computation of two statistical indexes which are:

3.3.3.1. Index of Difficulty

3.3.3.2. Index of Discrimination Power

3.3.4. Standard Deviation

Standard deviation is the average variability of all the scores around the mean; all the scores are taken into account. The larger the standard deviation, the more variability from the central point in the distribution. The smaller the standard deviation, the closer the distribution is to the central point.

3.3.5. T–Test

A t–test is a statistical test that is used to test a difference between two means.

3.3.6. Analysis of Variance (ANOVA)

Analysis of Variance (ANOVA) is a statistical test that is used to test a difference between two or more means.

CHAPTER IV

FINDINGS

This chapter reports the findings of the study obtained from the scores of the Vocabulary in a Natural Science Context test. The test was taken by three groups of first year university students from the Faculty of Arts, the Faculty of Science and the Faculty of Medical Science. The results were analyzed by computer using SPSS PC+ program package in order to answer the research questions set out in Chapter One. The findings are presented as follows:

4.1. **General Information** presents the personal information of the subjects (e.g., sex, age, students' secondary education, students' graduation at secondary level by taking the government equivalency examination, students' types of secondary schools, students' duration of studying English, students' taking extra English courses and their English grades at secondary level).

4.2. **Finding One** presents the results of the test scores of the three groups of the students.

4.3. **Finding Two** illustrates the differences in vocabulary proficiency among those three groups of students.

4.4. **Finding Three** reports the effect of sex differences on vocabulary proficiency within each group of the students.

4.5. **Finding Four** reveals the effect of sex differences on vocabulary proficiency of the three groups of students taken as a whole.

4.6. **Results from the Interview** illustrate the students'problems in learning English and vocabulary.

4.1. General Information

The general information of the subjects was obtained from the attached questionnaire of the test. The data are shown in Table 5.

Table 5: Description of General Information of Three Groups of Students.

General Information	Faculty of Arts		Faculty of Science		Faculty of Medical Science	
	No.	(%)	No.	(%)	No.	(%)
1. Sex						
Male	17	11.03	76	32.93	121	54.26
Female	137	89.97	162	68.07	102	45.74
2. Age (years)						
16	1	0.65	1	0.42	5	2.24
17	29	18.83	35	14.71	89	39.91
18	87	56.49	117	49.16	96	43.05
19	32	20.78	70	29.41	29	13.00
20	4	2.60	12	5.04	2	0.90
21	—	—	2	0.84	—	—
Not Answered	1	0.65	1	0.42	2	0.90
3.Secondary Education						
Language–Arts Program	100	64.93	—	—	—	—
Science Program	21	13.64	238	100.00	223	100.00
Maths–Arts Program	33	21.43	—	—	—	—
4.Students' Taking the Government Equivalency Examination						
Yes	57	37.01	164	68.91	146	65.47
No	97	62.99	74	31.09	77	34.53

Table 5: Description of General Information of Three Groups of Students (Continued).

General Information	Faculty of Arts		Faculty of Science		Faculty of Medical Science	
	No.	(%)	No.	(%)	No.	(%)
5. Types of Secondary School						
Bangkok Public School	95	61.69	137	57.56	169	75.79
Bangkok Private School	22	14.28	20	8.40	9	4.04
Provincial Public School	31	20.13	77	32.36	41	18.39
Provincial Private School	3	1.95	4	1.68	2	0.89
Not Answered	3	1.95	—	—	2	0.89
6. Duration of Studying English						
1-7 years	13	8.45	34	14.29	40	17.94
8-14 years	140	90.90	189	79.41	178	79.82
Over 15 years	—	—	13	5.46	5	2.24
Not Answered	—	—	2	0.84	—	—
7. Taking Extra English Courses						
Yes	118	76.62	121	50.84	146	65.47
No	35	22.73	109	45.80	70	31.39
Not Answered	1	0.65	8	3.36	7	3.14
8. Secondary Level English Grade						
A	61	39.61	46	19.33	131	58.74
B	70	45.45	101	42.44	59	26.46
C	18	11.69	71	29.83	26	11.66
D	1	0.65	11	4.62	3	1.35
Not Answered	4	2.60	9	3.78	4	1.79

The data from Table 5 shows that there were more female students than male students in the Arts group and the Science group. The students' ages ranged from 16 to 21 years old but the age of the majority of students is 18. All Medical Science and Science students were science-oriented students whereas Arts students were mixed together with the students from the Language–Arts Program, the Science Program and the Maths–Arts Program at the secondary school level. Over fifty percent of

both Science and Medical Science students (68.91% and 65.47%) graduated from their secondary school level by taking the government equivalency examination compared to only 37.01% of Arts students. A large proportion of the students from these three faculties graduated from public schools located in Bangkok but the next largest percentage of Science students (32.36%) graduated from provincial public schools existing all over country. More than 80 percent of the students from these three faculties had studied English for 8 to 14 years and most of them had taken extra English courses before taking the entrance examination but the number of science students taking extra English courses is smaller than that of the other groups. When comparing the English 'A' grade obtained from the secondary school level among the three groups of students, Medical Science rank the highest (58.74%); Arts students rank second (39.61%) and Science students rank third (19.33%). By the same token, a majority of both Arts and Science students obtained 'B' grade; however, a large proportion of Science students obtained 'C' grade compared to Arts and Medical Science students.

4.2.Finding One

***Research Question One**: Which group of students will obtain the highest test mean score?*

To answer this research question, the mean score, standard deviation, maximum score and minimum score of each group were calculated (see Table 6).

Table 6: Mean, Standard Deviation, Maximum and Minimum Scores of Each Group.

Group	Number	Mean	S.D.	Maximum Score	Minimum Score
Arts Students	154	31.4675	8.1739	52	15
Science Students	238	23.6765	6.9142	48	8
Medical Science Students	223	38.5202	7.4009	55	18

The data from Table 6 indicates that the test mean score of the Medical Science group (38.5202) is the highest followed by the test mean scores of the Arts group (31.4675) and the Science group (23.6765).

4.3. Finding Two

Research Question Two: *Are there any significant differences in vocabulary proficiency among the students from the Faculty of Arts, the Faculty of Science and the Faculty of Medical Science?*

Statistical Hypothesis:

H_o : *There are no significant differences in vocabulary proficiency among the students from the three faculties.*

H_1 : *There is a significant difference in vocabulary proficiency among the students from the three faculties.*

To answer this research question, One–Way ANOVA was applied to test the differences among the three test mean scores from three groups of the students (see Table 7). Furthermore, the Student-Newman-Keuls procedure was used to compare these three mean scores in order to indicate which pair of groups are different (see Table 8).

Table 7: Analysis of Variance for Scores of the Tests from Three Faculties.

Source	Degree of Freedom	Sum of Squares	Mean Squares	F-Ratio	F-Prob.
Between Groups	2	25,409.8564	12,704.9282	230.6418	0.0000
Within Groups	612	33,712.0851	55.0851		
Total	614	59,121.9415			

The data in Table 7 shows the results from analysis of variance with the F-Probability (P-value) is equal to 0.0000. It is interpreted that there is a significant difference in vocabulary proficiency among these three groups of students (from the Faculty of Arts, the Faculty of Science and the Faculty of Medical Science) at P-value < 0.01.

Table 8: Pairs of Groups with Significantly Different Mean Scores.

Group	Mean Difference
Science and Arts	7.791*
Science and Medical Science	14.8437*
Arts and Medical Science	7.0527*

* significant at P-value<0.05.

The data in Table 8 indicates that there is a significant difference at P–value<0.05 between the test mean scores of the Arts group and the Science group. In addition, there is a significant difference at P-value<0.05 between the Science group and the Medical Science group. It also shows a significant difference at P-value <0.05 between the Medical Science group and the Arts group.

4.4. Finding Three

Research Question Three: *Are there any significant differences in vocabulary proficiency between male and female students within each group?*

Statistical Hypothesis:

H_o : There are no significant differences in vocabulary proficiency between male and female students within each group.

H_1 : There is a significant difference in vocabulary proficiency between male and female students within each group.

To answer this research question, t-test was applied to analyze the significant difference between the mean scores of male and female students of each group (see Tables 9-11).

Table 9: Mean Comparison of Vocabulary Proficiency between Male and Female Arts Students.

Sex	Number	Mean	S.D.	S.E.	t-value	2-Tail Prob.
Male	17	31.1765	9.488	2.301	-0.16	0.877
Female	137	31.5036	8.035	0.686		

The data from Table 9 indicates that there are no significant differences in the vocabulary proficiency between male and female Arts students.

Table 10: Mean Comparison of Vocabulary Proficiency between Male and Female Science Students.

Sex	Number	Mean	S.D.	S.E.	t- value	2-Tail Prob.
Male	76	23.6053	7.682	0.881	-0.11	0 .914
Female	162	23.7099	6.548	0.514		

The data from Table 10 shows that there are no significant differences in the vocabulary proficiency between male and female Science students.

Table 11: Mean Comparison of Vocabulary Proficiency between Male and Female Medical Science Students.

Sex	Number	Mean	S.D.	S.E.	t-value	2-Tail Prob.
Male	121	38.5041	7.519	0.684	-0 .04	0.972
Female	102	38.5392	7.295	0.722		

The data from Table 11 shows that there are no significant difference in the vocabulary proficiency between male and female Medical Science students.

4.5. Finding Four

Research Question Four: *Are there any significant differences in vocabulary proficiency between male and female students of these three groups taken as a whole?*

Statistical Hypothesis:

H_o *:There are no significant differences in vocabulary proficiency between male and female students of these three groups.*

H_1 *: There is a significant difference in vocabulary proficiency between male and female students of these three groups.*

To answer this research question, t-test was applied to analyze the significant difference between the mean scores of male and female students from these three groups (see Table 12).

Table 12: Mean Comparison of Vocabulary Proficiency between Male and Female Students of All Three Groups.

Sex	Number	Mean	S.D.	S.E.	t-value	2-Tail Prob.
Male	214	32.6308	10.403	0.711	3.01	0.003
Female	401	30.1446	9.382	0.469		

The data from Table 12 shows that there is a significant difference in vocabulary proficiency between male and female students among these three groups at P-value<0.01.

In sum, there are no significant differences in vocabulary proficiency between male and female students within each field of study. However, there is a significant difference in vocabulary proficiency between male and female students among the three fields of study.

4.6. Results from the Interview

These are the results from the interview that was conducted with seven top students of the three groups and ten Science students (with lower ability).

A: Top students

The favorite subjects of the top Science and Medical Science students include biology, chemistry, mathematics and English while the top Arts students favor English.

The interest areas of the top Science and Medical Science students include research, technology, pharmacy, chemistry and even pyramids, the supernatural and paranormal while those of the top Arts students are languages, poems and novels.

The favorite journals of the top Science and Medical Science students include *Nation Junior, Reader's Digest, Update*, and other Science journals while those of the top Arts students are *Seventeen* and *Elle*.

The hobbies of the top Science and Medical Science students include playing computer games, playing sports, playing music instruments and watching TV while those of the top Arts Students include reading novels and poems.

The English "problem" skills of the top Science and Medical Science students are writing, listening, vocabulary and terminology while those of the top Arts Students are vocabulary and writing.

The techniques that the top Science and Medical Science students used in completing the test are: eliminating impossible choices, guessing word meanings from their roots and affixes, guessing word meanings by using contextual and grammatical knowledge, while those of the top Arts Students are: guessing word meanings from context and by using prefixes, suffixes and roots.

The strategies that the top Science and Medical Science students used in improving their vocabulary are: practicing guessing techniques, using contextual clues, memorizing vocabulary in sets (synonyms, antonyms, word origins) and trying to expose themselves to many reading texts while those of the top Arts Students are: memorizing various fields of vocabulary by composing them into poems or songs, testing their vocabulary knowledge everyday, reading widely in various subject areas and trying to guess the meaning of unknown words then confirming meanings in a dictionary.

The opinion of two top Science students in responding to "Which one has more impact on your test scores, your English proficiency or your science knowledge?" was that Science knowledge was more important than English proficiency. One top Science student said that Science knowledge was as important as English proficiency in

completing the test but top Medical Science students said that in completing this test, English proficiency is more important than Science knowledge. Top Arts Students said that English proficiency was more important than Science knowledge.

B: Other Science Students

The ten Science students in various majors felt that: the test was quite difficult, some vocabulary items were unfamiliar, the test contained a variety of vocabulary in the scientific field, the distracters were effective, and some test words were familiar but they did not know the exact meanings or they could not remember the meaning of the test words.

Nine of the ten Science students said that their most important English skill is reading. Only one said that her most important English skill is vocabulary because "one cannot understand the text without knowing the word meanings."

The vocabulary problems of these ten Science students include: misusing the confusing words, not having enough vocabulary knowledge, not remembering word meanings or not having enough time to memorize word meanings.

The opinion of these ten Science students towards their English courses is that the grammar teaching is sufficient but they want to practice some strategies and techniques in guessing word meanings. Some students want their teacher to use some movies and songs in English teaching. Some want their English teacher to teach in English so that they can practice their listening skill. At least, one student said that he wanted "fun" in the English classroom. Another wanted her teacher to teach more idioms. Lastly, one student wanted her English teacher to teach some phonetics and

pronunciation because she believed that she can automatically remember a word meaning if she can read and pronounce the word correctly.

CHAPTER V

DISCUSSION

This chapter presents a discussion and interpretation of findings and implications of the study.

Discussion and Interpretation of Findings

According to the research questions set forth in Chapter I, the findings are interpreted and discussed as follows:

Discussion of Finding One It was found that the test mean score of Medical Science students ranked highest (38.5202) among the three groups. Arts students' test mean score is second (31.4675) and that of Science students is third (23.6765). This means that Science students are the weakest in vocabulary proficiency among the three groups. There are reasons to explain this phenomenon.

Based on the background information from the questionnaire, a large proportion of Medical Science students (more than fifty percent) obtained grade 'A' for their English subjects from the Secondary school level, whereas a much smaller proportion of Science students (about nineteen percent) obtained grade 'A'. Arts students are in the middle since around forty percent obtained grade 'A' for their

secondary school English subjects. Hence, the researcher's finding is parallel with the students' background ability stated in the questionnaire.

According to the question about whether the students took any extra English courses during their secondary school studies, it was found that most of the Arts students did (more than seventy–five percent), compared to Medical Science students (about sixty five–percent) and Science students (about fifty percent). This supports the fact that both Arts students and Medical Science students are more well equipped in English than Science students.

As a Thai student herself, the researcher understood the nature and background of Thai students in general. Most secondary school students who want to pursue their tertiary education have to be well prepared for their subjects, especially science subjects and English subjects while students who want to pursue Arts have to be very good in English and/or other languages. However, students who pursue sciences in university are usually strong in science but somewhat weak in English.

From the questionnaire, it was also found that the percentage of Science students graduating from provincial public schools is higher than that of Medical Science and Arts students (32.36% compared to 18.39% and 20.13% respectively). Students who graduated from public schools in the provinces are not as strong in English as those from Bangkok public schools.

The researcher wanted to highlight the important fact that although Science students who are strong in science could not outperform Arts students in the researcher's test which are based on the natural science context. This is interesting. On the basis of science background knowledge, Science students should perform better

in the test than Arts students. Yet, they obtained lower scores. This reveals that English proficiency, especially vocabulary proficiency may be more important than science background knowledge itself.

Discussion of Finding Two It was found that there was a significant difference in vocabulary proficiency among the three groups of students (from the Faculty of Arts, the Faculty of Science and the Faculty of Medical Science) at P–value < 0.01. As already discussed in Discussion of Finding One, the vocabulary proficiency of these three groups of students is different. This may be due the fact that they have different fields of study, background knowledge, and interests. Concerning the interest of the subjects, Baldwin et al. (1985) mentions that there is a correlation between prior knowledge and interest. Learners tend to study what they are interested in and so they know more about it.

Discussion of Findings Three and Four It was found that there were no significant differences in vocabulary knowledge between male and female students within each faculty. This may due to the fact that the background knowledge and interest of the students within each faculty are quite the same based on their fields of study. Moreover, the students were screened and grouped by the National Examination according to their competency level. In contrast, when the test mean scores of male and female students of all three faculties taken as a whole were compared, it was found that there is a significant difference in vocabulary proficiency between male and female students of these three groups at P–value<0.01. The test mean score of male students (32.6308) is higher than that of female students(30.1446). However, this finding contrasts with the results obtained in other studies of second

language learning (e.g. Farhady 1982; Larsen-Freeman and long 1991; Maccoby and Jacklin 1994; Wen and Johnson 1997) is that female students performed better on language tests than male students. The reason why the results obtained in this study differ from the results of those studies may be because the context used in the tests is different. That is, those tests measured general English proficiency but the test in this study focused on the context in natural science subjects. Furthermore, there are more male students (121) than female students (102) in the Medical Science group which obtained the highest test mean score among there three groups. On the contrary, there are more female students (162) than male students (76) in the Science group which obtained the lowest test mean score.

In sum, there were no significant differences in vocabulary proficiency between male and female students within each faculty because their background knowledge and interests are almost the same according to their fields of study and competence. In contrast, there was a significant difference in vocabulary proficiency between male and female students of these three faculties taken as a whole at P–value<0.01. This may be due to the fact that the proportion of male and female students in each group is unequal. In the Medical Science group, male students are outnumbered by female students but female students are outnumbered by male students in the Science group.

Discussion of Results from the Interview It was found that there are some factors that show differences between science–oriented and arts–oriented students such as their favorite subjects, interest areas, favorite journal and hobby. For top Medical Science and Science students, their interests are in science and technology whereas top Arts students'interest include languages, poems and novels. Moreover, it seems

likely that top students obtained higher scores from this vocabulary test because they have good vocabulary proficiency and they may know some good strategies and techniques in vocabulary learning such as guessing word meaning by using the contextual clues like prefixes, suffixes and roots. Furthermore, they develop their own strategies to improve their vocabulary such as memorizing vocabulary in sets (synonyms, antonyms, word origins) or composing vocabulary and its meaning into poems, songs, etc. However, it was found that vocabulary is the important problem for Science students because they do not know good strategies and techniques to help them learn vocabulary. They focus their strategies on only memorizing which is less effective and in need of a great deal of effort. However, their English courses are in need of improvement as they mentioned in the interview. They want to practice some good strategies and techniques in guessing word meaning. They feel that they have enough grammar knowledge indicating that grammar teaching should be less emphasized in their English classes.

In sum, most of the students want to improve vocabulary knowledge and to learn and practice good strategies in guessing word meaning.

Implications of the Study

According to the findings of the study and the personal interview conducted after the test was given. Here are some suggestions which will be useful for English language teachers:

Most students, especially the students from the Faculty of Science, need improvement in their English vocabulary. In order to improve their vocabulary, the

English course for this group should be tailored to focus more on vocabulary learning.

Moreover, the materials and textbooks should be adjusted in accordance with the needs of the students and teachers. Activities that enhance vocabulary learning should be provided to create good motivation and good attitude toward English.

A better attitude among Science students towards English should be promoted. This is to help them realize the equal importance of English and science subjects.

A Natural Science context, especially in environmental topics, should be introduced and integrated into the English lessons and reading texts for the students from all fields of study, not only for the Science students.

CHAPTER VI

CONCLUSION

This chapter presents a summary of the study and recommendations for further studies.

Summary of the Study

This study has been conducted on the consideration that vocabulary is an important element of background knowledge for language learning, apart from reading, writing, listening and speaking skills. However, vocabulary is one of the most important problems that hinders the ESL/EFL students' language learning throughout the world, no less in Thailand.

This study was conducted to investigate the vocabulary proficiency in a natural science context of first year university students from an arts or science background.

The subjects of this study were 615 first year university students from selected government universities. The subjects included 154 first year Arts students from Chulalongkorn University and Silpakorn University, 238 first year Science students from Mahidol University and Kasetsart University and 223 first year Medical Science students from Chulalongkorn University and Mahidol University.

The instruments used in this study were a multiple–choice English Vocabulary in a Natural Science Context Test, a short background questionnaire and a set of interview questions. The test consisted of 60 items and took 60 minutes to complete, the questionnaire explored the students' background information and the interview was conducted to gain more information about the students' strategies in developing vocabulary proficiency and problems mostly found in their vocabulary learning.

The findings of this research were obtained from the results of test administration. The raw data were calculated and analyzed by employing One–Way ANOVA, t-test and the Student–Newman Keuls procedure.

The findings of the study can be summarized as follows:

1. The test mean score of the Medical Science group (38.5202) was the highest test mean score among these three groups of the students. The mean score of the Arts group (31.4675) was second and that of the Science group (23.6765) was the lowest.

2. There was a significant difference in vocabulary proficiency among these three groups of students (from the Faculty of Medical Science, the Faculty of Science and the Faculty of Arts) at P–value<0.01.

3. There were no significant differences in vocabulary proficiency between male and female students within each faculty.

4. There was a significant difference in vocabulary proficiency between male and female students among these three groups taken as a whole at P–value<0.01. The test mean score of male students (32.6308) was higher than that of female students (30.1446).

Recommendations for Further Studies

1. Further studies should be done to compare the students' vocabulary proficiency in the natural science context to that in the arts context in order to to find out whether the results from the new test will be different from the results obtained from this test by using the students from the same fields.

2. Replication of this study should be conducted to see whether there will be any developments or differences in vocabulary proficiency of students from the same fields when they are at the third or fourth year of their university education. The Science students should be especially followed up on.

3. Students from other fields of study such as Social Science, Political Science, Engineering, etc. should be tested in a similar manner to compare and examine whether there would be any significant differences from the students of this research.

BIBLIOGRAPHY

Adams, S.J. (1982). Scripts and the recognition of unfamiliar vocabulary: Enhancing second language reading skills. Modern Language Journal, 66, 155-159.

A Handbook of English language Teaching Terms and Practice. (1982) . London: Macmillan.

Angsirikulthumrong, T. (1994). Learner training in vocabulary memory strategies. M.A. Thesis in Applied Linguistics, Faculty of Graduate Studies, King Mongkut Institute of Technology.

Bailey, C.J. & Shuy, R. (Eds.). (1973). New ways of analyzing variation in English. Washington D.C.: Georgetown University Press.

Bernard, H.W. (1965). Psychology of language teaching. New York: McGraw-Hill Book Company.

Bransford, J.D. (1979). Human cognition: Learning, understanding and remembering. California: Wadsworth.

Bromberg, M. & Gale, C. (1979). Building an effective vocabulary . New York: Barron's Educational Series Inc.

Carell, P.L. (1983). Three components of background knowledge in reading comprehension. Language Learning, 33, 183-207.

Carell, P.L., Devine, J. & Eskey, D.E. (Eds.). (1988). Interactive approach to second language reading. Cambridge: Cambridge University Press.

Carell, P.L. & Eisterhold, J. (1983). Schema theory and E.S.L. reading pedagogy. TESOL Quarterly, 17, (4), 553-573.

Carter, R.A. & Redman, S. (1986). Working with words. Cambridge: Cambridge University Press.

Cheng, L. (1996). What do foreign language learners do in their academic reading? IAL: Issues in Applied Linguistics, 7, (2), 279-296.

Chongsatityoo, C. (1970). A program for teaching reading in Thai lower secondary school students. M.A. Thesis, Department of Secondary Education, Faculty of Graduate Studies, Chulalongkorn University.

Cinko, M. & Elisabeth, L. (1993). Gender differences in cooperative computer-based foreign language tasks (CAI). Library Management [Online]. Abstract from: ERIC Item 9410653 [1994, May].

Clapham, C. (1996). Studies in language testing: A study of the effect of background knowledge on reading comprehension. Great Britain: Cambridge University Press.

Clarke, D.F. & Nation, I.S.P. (1980). Guessing the meanings of words from context: Strategies and techniques. System, 8 , 211-220.

Cook, V. (1991). Second language learning and language teaching. Great Britain: Routledge.

Dali, A. and Sami, A.M. (1996). The age variable: An investigation of English acquisition among Arabic-speaking intermediate-level students in the state of Kuwait. Library Management [Online]. Abstract from : ERIC Item 9718701 [1997, July].

Dictionary of Linguistics. (1969). New Jersey: Adams & Co.

Ellis, R. (1994). The study of second language acquisition. Oxford: Oxford University Press.

Eskey, D.E. (1988). Holding in the bottom: An interactive approach to the language problems of second language readers. In P.L.Carell, J. Devine & D.E. Eskey (Eds.).

Farhady, H. (1982). Measure of language proficiency from the learner's perspective. TESOL Quarterly, 16, 43-59.

Fox, L. (1987). On acquiring an adequate second language vocabulary. In M.H. Long & J.C. Richard (Eds.).

Freeman, D.L. & Long, M.H. (1991). An introduction to second language acquisition research. Hongkong: Longman.

Funk, W. & Lewis, N. (1942). Thirty days to a more powerful vocabulary. New York: Macmillan.

Gronlund, N.E. (1977). Constructing achievement tests. London: Prentice-Hall Inc.

Harris, D.P. (1977). Testing English as a second language. New York: McGraw-Hill Inc.

Hudson, T. (1982). The effects of induced schemata on the 'short circuit' in L2 reading: Non-decoding factors in L2 reading performance. Language Learning, 32 , 3-31.

Hughes, A. (1989). Testing for language teachers. Great Britain: Cambridge University Press.

Jordan, R.R. (1981). English for academic purposes. Cambridge: Cambridge University Press.

Kajornsilp, B. (1996). Educational research methodology. Bangkok: P.N. Printing.

Krashen, S.D. (1982). Principle and practice in second language acquisition. Oxford: Pergamon.

Kruse, A.F. (1987). Vocabulary in Context. In M.H. Long & J.C.Richard (Eds.).

Kulsiriswad, S. (1985). Teaching vocabulary with special reference to EAP reading for commerce and accountancy. PASSA . XVV (1): 44-48.

Labov, W. (1973). The Boundaries of words and their meanings. In Bailey, C.J. and Shuy, R. (Eds.).

Lado, R. (1961). Language testing: The construction and use of foreign language tests. London: Longman.

Long, M.H. & Richard, J.C.(Eds.). (1987). Methodology in TESOL: A book of reading. New York : Newbury House.

Maccoby, E.E.& Jacklin, C.N. (1974). The psychology of sex differences. California: Stanford University Press.

Ministry of Education. (1991). Secondary school curriculum,Thailand.

Narue-Domkul, D. (1984). The validation of a new instrument to assess the English oral proficiency of the first year medical students at Mahidol University. M.A. Thesis in Applied Linguistics, Faculty of graduate Studies, Mahidol University.

Nation, I.S.P. & Coady, J. (1988). Vocabulary and reading. In R. Carter & M. McCarthy(Eds.). Vocabulary and language teaching. New york : Longman.

Nattinger, J. (1988). Some current trends in vocabulary teaching . In R. Carter & M. McCarthy (Eds.) Vocabulary and Language Teaching London: Longman.

Nuttal, C. (1982). Teaching reading skills in a foreign language. London: Heinemann Educatinal Books.

Office of the National Education Commission Office of the Prime Minister Kingdom of Thailand. (1997). Education in Thailand. Bangkok: Seven Printing Group.

Oxford Advanced Learner's Dictionary.(1995). Oxford: Oxford University Press.

Panprem, H. (1995). Individualizing vocabulary learning by using double language texts activity. M.A. Thesis in Applied Linguistics, Faculty of Graduate Studies, King Mongkut Institute of Technology.

Potaski, J.E. (1996). Prediction of student performance on a statewide early warning assessment test. Library Management[Online].Abstract from : DAI-A File: ERIC Item: 9717001[1997,June].

Prawanpath, J. (1984). A study of general vocabulary knowledge of the pre- medical science students at Mahidol University. M.A. Thesis in Applied Linguistics, Faculty of Graduate Studies, Mahidol University.

Raven, P.H., Berg, L.R. & Johnson, G.B. (1995). Environment. Florida: Saunders College Publishings.

Read, J. (1997). Vocabulary and testing. in N. Schmitt & M. McCarthy, Vocabulary : Description, acquisition and pedagogy. Cambridge: Cambridge University Press.

Rivers, W.M. (1983). Apples of gold in pictures of silver: Where have all the words gone? In W.M. Rivers, Communicating naturally in a second language. New York : Cambridge University Press.

Roloff, J.G.,Brosseit,V. & Carrick, W.E. (1981). Vocabulary. NewYork: Macmillan.

Rumelhart, D.E. (1980). Schemata: The building blocks of cognition. In R.J. Spiro & B.C. Bruce & W.F.Brewer (Eds).

Schmitt, N. & McCarthy, M. (1997). Vocabulary : Description, acquisition and pedagogy. Cambridge: Cambridge University Press.

Silva, J.P. (1993). Untutored vocabulary acquisition and L2 reading ability.Reading in a Foreign Language, 9 , 845-854.

Spiro, R.J., Bruce, B.C. & Brewer, W.F.(Eds.). (1980). Theoretical issues in reading comprehension. NewJersey: Erlbaum.

Tassana-ngam, I. (1994). Using vocabulary -card -box technique to help less-able learners retain the vocabulary taught in class. M.A. Thesis in Applied Linguistics, Faculty of Graduate Studies, King Mongkut Institute of Technology.

Thammonkol, K. (1977). Techniques of testing reading skill. PASAA. VII: 196-200.

Thorndyke, P.W. (1977). Cognitive structures in comprehension and memory of narrative discourse. Cognitive Psychology, 9 , 77-110.

Tuaycharoen, P. (1972). A study of errors in reading textbooks in English of the second year students in the college of education Prasanmitr and Pratumwan. M.A. Thesis, Department of English, Graduate School, Srinaklarinwirot University Prasanmitr.

Vinotai, A. (1992). Using a step by step puzzle to help students with vocabulary and reading comprehension. M.A. Thesis in Applied Linguistics, Faculty of Graduate Studies, King Mongkut Institute of Technology.

Wallace, M.J. (1982). Teaching vocabulary. London: Heinemann Educational Books.

Weir, C.J. (1990). Communicative language testing. Hamel Hemstead: Prentice- Hall International.

Wen, G. & Johnson, R.K. (1997). L2 learner variables and English achievement: A study of tertiary- level English majors in China. Applied linguistics, 18, (1) 27-45.

Wiener, H.S. & Bazerman, C. (1978). Reading skills handbook. Boston: Houghton Miffin.

Wilkins, D. A. (1972). Linguistics in language teaching. London: Arnold.

Wongsothorn, A. (1996). Testing and assessment in English language learning and teaching. Bangkok: Chulalongkorn University Press.

Zimmerman, C.B. (1997). Do reading and interactive vocabulary instruction make a difference?: An empirical study. TESOL Quarterly, 31, 121-139.

APPENDIX A

VOCABULARY TEST

Vocabulary in a Natural Science Context

Instruction : Read the following sentences carefully and select a , b , c or d that is closest in meaning to the underlined word(s).

1. **The world' s population is expected to surpass 6 billion by 1998.**
   a) become b) reach c) exceed d) overcome

2. **Agricultural land was contaminated by radioactive isotopes, particularly downwind from the reactor.**
   a) harmed b) polluted c) contracted d) prevented

3. **In 1990, the minimum concentration of ozone in the troposphere was 50 percent lower than the minimum ten years earlier.**
   a) reaction b) attention c) complexity d) intensity

4. **By 1992, there was clear evidence that the ozone was also being depleted over the arctic.**
   a) reduced b) increased c) irritated d) distributed

5. **As CO_2 accumulates in the earth' s atmosphere, enough heat may be trapped to gradually warm the earth.**
   a) gathers b) reduces c) releases d) circulates

6. **If prevailing winds blow onto a mountain range, precipitation occurs primarily on the windward slopes of the mountains.**
   a) storm b) flood c) rainfall d) humidity

7. **When animals consume plant tissues, they also assimilate nitrogen by taking in plant nitrogen compounds and converting them to animal compounds.**
   a) absorb b) exchange c) reproduce d) eliminate

8. **Seawater and saline groundwater can be made fit to drink through the removal of salt.**
   a) silty b) salty c) mineral d) slimy

9. **At present, desalinization is not a <u>viable</u> solution for the water supply problems of many developing countries because it is too expensive.**
a) notable b) visible c) legible d) practical

10. **The rhinoceros is <u>an endangered</u> species with only a few hundred left in Central Africa.**
a) a dangerous b) a harmful c) a threatened d) an uncontrolled

11. **When a forest is <u>intact</u>, surface water cannot drain away easily.**
a) controlled b) untouched c) destroyed d) attracted

12. **The plant is protected from natural <u>competition</u> with other plants and from plant eating animals.**
a) strong reaction c) rapid absorption
c) positive action d) struggle interaction

13. **The simplest way to deal with these <u>annuals</u> is to sow them where they flower.**
a) daily fruits c) yearly plants
b) wild plants d) young branches

14. **Wheat, maize and rice are all <u>propagated</u> by seeds and required relatively complicated agricultural knowledge.**
a) prepared b) classified c) developed d) reproduced

15. **In combustion, organic molecules are rapidly oxidized and thus <u>converted</u> into carbon dioxide and water.**
a) transferred b) transformed c) transmitted d) transported

16. **Traditional <u>irrigation</u> methods involve flooding the land or diverting water to fields through open channels.**
a) water power c) water treatment
b) water supply d) water removal

17. **Sugar and salt are two common food additives added to food to <u>retard</u> the growth of bacteria and fungi that cause food spoilage.**
a) stop b) remove c) delay d) irritate

18. **Molecular nitrogen is so <u>stable</u> that it does not readily combine with other elements.**
a) strong b) isolated c) durable d) steady

19. **Because little light <u>penetrates</u> through the top of the trees, many of the plants living underneath have adapted to climb trees.**
a) passes b) absorbs c) generates d) inserts

20. **The C - horizon of the soil is below the extent of most roots and is often saturated with groundwater.**
a) sealed b) filled c) combined d) separated

21. **When tropical rain forests are destroyed, the minerals in the soil are quickly leached out.**
a) removed b) divided c) absorbed d) rejected

22. **Water management should have the long-term goal of developing a sustainable resource rather than the short -term goal of providing water in limited supply.**
a) lasting b) generating c) replacing d) remaining

23. **The recognized need for a long -term solution has led to worldwide interest in renewable energy sources.**
a) resistible b) regradable c) replaceable d) recognizable

24. **As organic material is decomposed, essential minerals are released into the soil.**
a) eroded b) reformed c) dehydrated d) disintegrated

25. **The prolonged drought caused crop failures leaving fields barren.**
a) humid b) abandoned c) nourished d) infertile

26. **Biological diversity encompasses genetic diversity, species diversity and ecosystem diversity.**
a) includes b) supports c) indicates d) concludes

27. **The body digests animal and plant proteins, which are then reassembled in different orders to form human proteins.**
a) reacted b) reunited c) rearranged d) reinforced

28. **Plants have evolved natural chemical defenses to discourage insects from consuming them.**
a) protected b) involved c) developed d) destroyed

29. **It sometimes takes thousands of years for rock to disintegrate into finer and finer mineral particles.**
a) evolve b) digest c) separate d) dissolve

30. **The Carolina parakeet, a beautiful bird, was exterminated by farmers because it ate fruits.**
a) trapped b) chased c) prevented d) eliminated

31. Water greatly <u>interferes</u> with the penetration of light so floating aquatic organisms that photosynthesize must remain near the water' s surface.
a) injects b) intrigues c) interacts d) interrupts

32. Many deep ocean animals have <u>illuminated</u> organs, enabling them to see one another for mating or food capture.
a) pale b) bright c) hidden d) beautiful

33. The auto industry has been searching for a suitable liquid fuel that can be <u>substituted</u> for gasoline.
a) replaced b) supplied c) utilized d) withstood

34. Although alcohol fuels produce CO_2 and therefore <u>contribute to</u> global warming, they produce substantially fewer nitrogen oxides than gasoline does.
a) divert b) curtail c) support d)modify

35. As a radioactive element <u>emits</u> radiation, its nucleus changes into the nucleus of a different element.
a) reflects b) transforms c) sends out d) carries off

36. The greenhouse effect occurs partly because the material that <u>envelops</u> the air inside the enclosure is transparent to visible light but impenetrable to heat.
a) blows b) covers c) exposes d) decreases

37. As the tides <u>recedes</u>, the gates are opened again and water move to turn the turbines and produce electricity.
a) advances b) proceeds c) removes d) decreases

38. Many forms of renewable energy are <u>dispersed</u> and therefore tend to be inefficiently utilized.
a) scattered b) reduced c) transported d) exploited

39. The damage from the flood was <u>exacerbated</u> by draining wetlands, building on flood plains and constructing banks to hold back flood water.
a) reduced b) reversed c) worsened d) overestimated

40. Dams <u>confine</u> water in natural or artificial lakes from which the flow is regulated.
a) keep b) move c) refine d) circulate

41. There is <u>enormous</u> variation in the half - lives of different radioactive isotopes.
a) strong b) great c) strange d) deviant

42. During the dry season ,tropical trees <u>shed</u> their leaves and remain dormant much as temperate trees do during the winter.
a) keep d) show c) convert d) release

43. All microorganisms in various stages of decomposition <u>constitute</u> the organic portion of soil.
a) give off b) make up c) provide d) maintain

44. Benthos are bottom dwelling creatures that fix themselves to one spot and <u>burrow</u> into the sand.
a) dig b) throw c) stick d) travel

45. Rhinoceroses are <u>slaughtered</u> for their horns which are used for dagger handles in the Middle East.
a) bought b) chased c) killed d) reserved

46. The bacteria also <u>secrete</u> long molecule chains that bind soil particles together.
a) split b) form c) preserve d) release

47. The stored heat can be <u>transmitted</u> throughout the building naturally by convection.
a) sent b) leaked c) located d) removed

48. The ammonia can be cooled and <u>condensed</u> back to liquid form by colder water drawn up from a depth of 1000 meters.
a) melted b) drawn c) bought d) changed

49. Although harnessing wave power is technologically <u>feasible</u>, more research will have to be done to make generation of electricity.
a) flexible b) reliable c) possible d) available

50. Geothermal energy from hot springs has been <u>exploited</u> for thousands of years for bathing, cooking and heating buildings.
a) used b) searched c) distributed d) developed

51. Nutrients and soil are <u>retained</u> on the horizontal platforms instead of being washed away.
a) kept b) trapped c) refilled d) organized

52. Soil <u>reclamation</u> involves stabilizing the land to prevent further erosion and resting the soil to its former fertility.
a) revolution b) restoration c) retardation d) reproduction

53. **After the plants have been established to <u>stabilize</u> the land, they start to improve the quality of the soil.**
a) starve b) modify c) maintain d) fertilize

54. **Some solid waste is removed and sent to a local utility where it is <u>incinerated</u> to produce energy.**
a) melted b) burned c) combined d) transformed

55. **Lead and cadmium are some of the toxic pollutants that may be <u>discharged</u> into the atmosphere during mineral process.**
a) blocked b) changed c) pushed d) released

56. **In the Antarctic , the shifting ice formed during the <u>harsh</u> winter would tear the rigs apart.**
a) rare b) long c) severe d) strange

57. **By liquefying carbon dioxide and then pumping it deep into the ocean, oceanic pressure might <u>solidify</u> it.**
a) melt b) harden c) damage d) modify

58. **Timber <u>harvested</u> from forests is used for fuel, construction materials and paper products.**
a) smuggled b) discharged c) collected d) transformed

59. **Prevention is the <u>ultimate</u> solution to global warming because it is permanent.**
a) final b) extra c) practical d) supplemental

60. **As with all technologies , wind power has some <u>lamentable</u> consequences, namely bird fatalities.**
a) visible b) countable c) remarkable d) regrettable

****

APPENDIX A

QUESTIONNAIRE (ENGLISH)

Instruction **Please answer the following questions truthfully.**

1. Sex ( ) Male ( ) Female

2. Age ..... years

3. You are a first year students at ..... university, the Faculty of.....
( ) Medical Science ( ) Science ( ) Arts

4. Which program that you studied at the upper secondary school level?
( ) A Science Program ( ) A Maths–Arts Program
( ) A Language–Arts Program ( ) Others.....

5. Did you graduate your upper secondary school level by taking the government equivalency examination?
( ) Yes ( ) No

6. You graduated your upper secondary school level from (give your school name).....school, which is.....
( ) a public school ( ) a private school

7. How long have you studied English?
( ) 1-7 years ( ) 8-14 years ( ) Others.....

8. Had you taken any extra English courses before you took the entrance examination?
( ) Yes ( ) No

9. Please choose 3 subjects from which you obtained good grades at the upper secondary school level.
( ) Mathematics ( ) Biology ( ) Physics
( ) Chemistry ( ) Social Studies ( ) Thai
( ) English ( ) French ( ) German
( ) Others .....

10. Your English subject grade of the last semester from the upper secondary school level is.....

QUESTIONNAIRE (THAI)

<u>คำชี้แจง</u> **โปรดกรอกข้อมูลให้ครบถ้วนตามความเป็นจริง**

๑. ( ) เพศชาย ( ) เพศหญิง

๒. อายุ.....ปี

๓. ขณะนี้คุณเป็นนักศึกษาชั้นปีที่ ๑ มหาวิทยาลัย.....

คณะ ( ) แพทยศาสตร์ ( ) วิทยาศาสตร์ ( ) อักษรศาสตร์

๔. ขณะที่คุณเรียนในระดับมัธยมปลายคุณเป็นนักเรียนสายใด

( ) สายวิทย์ ( ) สายศิลป์คำนวณ

( ) สายศิลป์ภาษา ( ) อื่นๆ (โปรดระบุ).....

๕. คุณได้รับวุฒิการศึกษามัธยมปลายจากการสอบเทียบใช่หรือไม่.....

๖. คุณได้รับการศึกษาชั้นมัธยมปลายจากโรงเรียน.....

ซึ่งเป็นโรงเรียน..... ( ) เอกชน ( ) รัฐบาล

๗. คุณเรียนภาษาอังกฤษมาเป็นระยะเวลาทั้งหมดประมาณกี่ปี

( ) ๑-๗ ปี ( ) ๘-๑๔ ปี ( ) อื่นๆ (โปรดระบุ).....

๘. ก่อนการสอบเอนทรานซ์คุณได้เรียนพิเศษวิชาภาษาอังกฤษหรือไม่.....

๙. กรุณาเลือก ๓ วิชาที่คุณทำคะแนนได้ดีที่สุดตอนที่คุณเรียนอยู่ในระดับมัธยมปลาย

( ) คณิตศาสตร์ ( ) ชีววิทยา ( ) ฟิสิกส์

( ) เคมี ( ) สังคม ( ) ไทย

( ) อังกฤษ ( ) ฝรั่งเศส ( ) เยอรมัน

( ) อื่นๆ (โปรดระบุ).....

๑๐. ผลการเรียนวิชาภาษาอังกฤษในชั้นมัธยมปลายเทอมสุดท้ายของคุณคือเกรด.....

APPENDIX C

ANSWER KEY

1. c (exceed)
2. b (polluted)
3. d (intensity)
4. a (reduced)
5. a (gathers)
6. c (rainfall)
7. a (absorb)
8. b (salty)
9. d (practical)
10. c (a threatened)
11. b (untouched)
12. d (struggle interaction)
13. c (yearly plants)
14. d (reproduced)
15. b (transformed)
16. b (water supply)
17. c (delay)
18. d (steady)
19. a (passes)
20. b (filled)
21. a (removed)
22. a (lasting)
23. c (replaceable)
24. d (disintegrated)
25. d (infertile)
26. a (includes)
27. b (reunited)
28. c (developed)
29. c (separate)
30. d (eliminated)
31. d (interrupts)
32. b (bright)
33. a (replaced)
34. c (support)
35. c (sends out)
36. b (covers)
37. d (decreases)

38.a (scattered)
39.c (worsened)
40.a (keep)
41.b (great)
42.d (release)
43.b (make up)
44.a (dig)
45.c (killed)
46.d (release)
47.a (sent)
48.d (changed)
49.c (possible)
50.a (used)
51.a (kept)
52.b (restoration)
53.c (maintain)
54.b (burned)
55.d (released)
56.c (severe)
57.b (harden)
58.c (collected)
59.a (final)
60.d (regrettable)

APPENDIX D

INTERVIEW

A: Top Students (from the Three Groups)

Name	:	Mr. Sumeth Suratthakarndavadee
Faculty of Medical Science	:	Chulalongkorn University
Test Score	:	Top 55/60 = 91.66%
Favorite Subjects	:	Biology and chemistry
Interest Areas	:	Technology
Favorite Journal	:	Reader's Digest
Hobbies	:	Playing computer games
English Problem Skill	:	Writing English complex sentences
Techniques in completing the test	:	Eliminating impossible choices, guessing from word roots,prefixes, suffixes and using contextual clues
How to improve vocabulary	:	Practicing guessing techniques, using contextual clues and memorizing synonyms, antonyms
Importance of English vs. science knowledge in completing the test	:	English proficiency is more important than science knowledge, once we understand English then we can gain science knowledge later.

Name	:	Mr. Sirichai Chaisuthamporn
Faculty of Medical Science	:	Chulalongkorn University
Test Score	:	Top 55/60 = 91.66%
Favorite Subjects	:	Mathemetics and English
Interest Areas	:	The supernatural and paranormal
Favorite Journal	:	Update
Hobbies	:	Playing football and computer games
English Problem Skill	:	Listening and writing
Techniques in completing the test	:	Guessing meaning by using contextual clues
How to improve vocabulary	:	Developing vocabulary knowledge by grouping words in sets of synonyms, antonyms and meanings
Importance of English vs. science knowledge in completing the test	:	English proficiency plays a more important role in completing this vocabulary test than science knowledge.

Name	:	Miss Nipaporn Jaidee
Faculty of Arts	:	Chulalongkorn University
Test Score	:	Top 52/60 = 86.66%
Favorite Subjects	:	English
Interest Areas	:	Languages and novels
Favorite Journal	:	Seventeen
Hobbies	:	Reading novels
English Problem Skill	:	Vocabulary
Techniques in completing the test	:	Using prefixes, suffixes and roots
How to improve vocabulary	:	Reading a lot in various topics and trying to guess the meaning of the unknown words then checking meanings from a dictionary
Importance of English vs. science knowledge in completing the test	:	English proficiency is more important than science knowledge because science knowledge always comes after understanding English.

Name	:	Miss Chonthicha Wattanasub
Faculty of Arts	:	Silpakorn University
Test Score	:	Top 44/60 = 73.33%
Favorite Subjects	:	English
Interest Areas	:	Poems and novels
Favorite Journal	:	Elle
Hobbies	:	Collecting impressive poems and novels
English Problem Skill	:	Writing
Techniques in completing the test	:	Guessing word meaning from context
How to improve vocabulary	:	Memorizing various fields of vocabulary by composing it into poems or songs and testing vocabulary everyday
Importance of English vs. Science knowledge in completing the test	:	English proficiency is more important than science knowledge.

Name	:	Mr. Sirichai Lawanwisut
Faculty of Science	:	Kasetsart University
Test Score	:	Top 48/60 = 80.00%
Favorite Subjects	:	Mathemetics
Interest Areas	:	Pharmacy and chemistry
Favorite Journal	:	Science journals
Hobbies	:	Playing Table-tennis and harmonica
English Problem Skill	:	Listening and speaking
Techniques in completing the test	:	Using Science knowledge with vocabulary knowledge, using guessing techniques

How to improve vocabulary	:	Using prefixes, suffixes, roots and memorizing vocabulary in set (synonym, antonym, word origin)compose stories, songs and poems by using vocabulary with meanings
Importance of English vs. Science knowledge in completing the test	:	English vocabulary proficiency is as important in completing the test as science knowledge.

Name	:	Miss Sadudee Boonmee
Faculty of Science	:	Mahidol University
Test Score	:	Top 42/60 = 70.00%
Favorite Subjects	:	Biology
Interest Areas	:	Research and Technology
Favorite Journal	:	Update
Hobbies	:	Collecting stamps and phone cards
English Problem Skill	:	Writing
Techniques in completing the test	:	Guessing word meaning from context
How to improve vocabulary	:	Reading a lot and trying to expose myself to a wide range of vocabulary
Importance of English vs. Science knowledge in completing the test	:	In completing this test, science knowledge is more important than English proficiency.

Name	:	Mr.Nisit Thongkhamtrakul
Faculty of Medical Science	:	Mahidol University
Test Score	:	Top 54/60 = 90.00%
Favorite Subjects	:	Mathematics and biology
Interest Areas	:	Mystery, Pyramids
Favorite Journal	:	Reader's Digest, Nation Junior
Hobbies	:	Watching TV, playing computer games
English Problem Skill	:	Vocabulary and Terminology
Techniques in completing the test	:	Guessing by using contextual clues and grammatical knowledge
How to improve vocabulary	:	Developing lexis, trying to expose to a lot of reading texts
Importance of English vs. science knowledge in completing the test	:	Science knowledge helped me a lot in completing this vocabulary test because this test required a lot of science knowledge.

B: Other Science Students

A female student from the Faculty of Science, Kasetsart University

Major	:	Mathemetics
Opinion of the test	:	The test is difficult. Some vocabulary are the unseen word. The text is various in scientific field. The distracters are effective.
Your most important English skill	:	Reading is necessary for my studying.
Your vocabulary problem	:	I always misused the confused words.
Opinion of your English courses	:	I think grammar teaching is enough and I wish to develop the other skills. I want to practice some strategies in guessing word meanings and I want my teacher to use some movies and songs in English teaching.

A male student from the Faculty of Science, Kasetsart University

Major	:	Chemistry
Opinion of the test	:	The test is difficult. I don't understand the content. I am not familiar with those test vocabulary.
Your most important English skill	:	Reading is used a lot in my daily life.
Your vocabulary problem	:	My lexis is not enough, I can't remember the meaning.
Opinion of your English courses	:	I need some fun in my English classroom I need my English teacher to create some easy principles and rules to remember and use. I need to study English through songs and poems.

A female student from the Faculty of Science, Kasetsart University

Major	:	Chemistry
Opinion of the test	:	The test is difficult. I am familiar with the test words but I can't memorize the meaning. Test time is not enough.
Your most important English skill	:	Reading is important for studying science because I have to read a lot of textbook and the instrument manual.
Your vocabulary problem	:	I can't remember the meaning of some important vocabulary .
Opinion of your English courses	:	I want my English teacher to teach in English so that I can practice my listening skill. I want my teacher teach me some strategies in guessing and remembering word meanings.

A female student from the Faculty of Science, Kasetsart University

Major	:	Botany
Opinion of the test	:	The test is difficult. Some words are so familiar but I don't know their exact meaning.
Your most important English skill	:	Vocabulary is the most important skill. We will not be able to understand text if we do not know the meaning of vocabulary.
Your vocabulary problem	:	I always forget the meaning of important vocabulary.
Opinion of your English courses	:	I want my English teacher teach more idioms and techniques in extracting words meanings.

A female student from the Faculty of Science, Kasetsart University

Major	:	Mathemetics
Opinion of the test	:	This test is all about scientific matters.
Your most important English skill	:	Reading skill is the most important skill and we have to know a lot of vocabulary so that we can understand text.
Your vocabulary problem	:	I don't have enough vocabulary knowledge.
Opinion of your English courses	:	I want my English teacher to teach me some phonetics and pronunciation because I believe that if we can read and pronounce words correctly, we will automatically remember its meanings.

A female student from the Faculty of Science, Kasetsart University

Major	:	Mathemetics
Opinion of the test	:	The test is not difficult if I have a good preparation because all vocabulary were seen in my lesson.
Your most important English skill	:	Reading
Your vocabulary problem	:	I always forget word meaning.
Opinion of your English courses	:	I would like to study English with native English speaker teacher so that I can practice my listening and speaking skills.

A male student from the Faculty of Science, Kasetsart University

Major	:	Computer
Opinion of the test	:	The test is quite difficult but there are some words that are very familiar. I will do better than this if I read more scientific texts.
Your most important English skill	:	Reading

Your vocabulary problem	:	I am always confused with some words that are very similar in sounds and spellings.
Opinion of your English courses	:	I want my English teacher teach me more about roots, prefixes, suffixes so that I can use them in guessing word meaning.

A female student from the Faculty of Science, Kasetsart University

Major	:	Computer
Opinion of the test	:	The test contains a variety of vocabulary in scientific field.
Your most important English skill	:	Reading
Your vocabulary problem	:	Sometimes I know the meaning of the problem vocabulary but I cannot translate the whole context. I am too lazy to memorize word meaning.
Opinion of your English courses	:	I would like my English teacher to improve her teaching to be more understandable and not boring.

A female student from the Faculty of Science, Kasetsart University

Major	:	Biology
Opinion of the test	:	The test contains some unseen vocabulary.
Your most important English skill	:	Reading
Your vocabulary problem	:	I always forget the word meaning even if I used to see those words so many times and I have not enough time to memorize them.
Opiniof of your English courses	:	I would like my English teacher to teach some techniques in guessing word meanings.

A male student from the Faculty of Science, Kasetsart University

Major	:	Botany
Opinion of the test	:	The test is quite difficult because my vocabulary background is not so good.
Your most important English skill	:	Reading
Your vocabulary problem	:	I cannot remember the meaning of some words especially the unseen words.
Opinion of your English courses	:	I would like to practice some techniques in guessing word meanings.

BIOGRAPHY

NAME	Miss Panitda Reanjaroensuk
DATE OF BIRTH	24 May 1970
PLACE OF BIRTH	Bangkok, Thailand
INSTITUTIONS ATTENDED	Chulalongkorn University, 1988-1992: Bachelor of Arts (Education)
	Mahidol University, 1993-1999: Master of Arts (Applied Linguistics)