Ability of EFL Health Science Graduate Students in Identifying the Core Parts of Long, Complex Sentences

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Abstract

Professional academic articles often contain long, complex sentences, which can hinder comprehension. This study investigated the ability of 151 EFL health science graduate students taking an EFL course entitled *Technical English for Medical Science Graduates* in 2006 and 2007 in identifying the core parts of 15 long, complex sentences with an average length of 27.47 words (S.D. = 6.17), a minimum of 17 words and a maximum of 40 words. The readability index of these test sentences was 13.85 and the Flesch Index 44.18, indicating that students may find them difficult to read. Each sentence included one dependent clause – a noun, adjective or adverb clause. This study found that the graduate students' ability to identify the sentence core was moderate (64.6%). Sentence length did not always affect identification of the sentence core, but other factors, such as position of the subject and distance between the subject and its verb, modifier, conjunction, punctuation and adverbial, distracted students. Identification of the sentence core becomes more difficult when there is a long dependent clause or additional information between the subject and the main verb.

Introduction

The difficulty of academic texts is affected by a number of factors, including sentence structure and sentence length (Ryder and Graves, 1998: 350). As regards sentence length, it is usually suggested that to be comprehensible sentences should contain about 15 to 20 words (Askoxford, 2007; Write, 2007), 17 to 20 words (van Emden, 2001), an average of 18 words (Anderson, 1998), or 20 words (Peters, 2004).

However, long sentences are often difficult to read, and sometimes are incomprehensible (APA, 1994). In addition, complex sentences are often more difficult to read than simple or compound sentences. Irwin (1980) carried out a study on the effects of explicitness and clause order on the comprehension of reversible causal relationships and found that both explicitness and clause order were significant factors in the college level study. Also, regarding complex sentences, Davis and Ball (1989) studied the effects of age on comprehension of complex sentences in adulthood and found that comprehension accuracy declines after age 60, and aging affected the syntactic component. Ryder and Graves (1998) have empirically confirmed that very long and complex or convoluted sentences usually make a text more difficult to read. Unfortunately, sentences in academic writing can vary in length from 28 to 47 words (English, 2007). Barber (1985) has found that even his own writing has the average sentence-length of 27.6 words. A reason why long, complex sentences are used may be attributable to the fact that too many short sentences in quick succession create an awkward, repetitive rhythm that distracts the reader from what is being said (Peters, 2004:492).

Reading sentences in a foreign language is usually more difficult than reading sentences in a native language, especially when the target language is very different from the native language. This fact is supported by Yorio (1989:109) in that the main sources of reading problems of EFL students are vocabulary, syntax and interference of their native language. Therefore, EFL students will inevitably encounter grave reading problems. Tzung (1993) studied the syntactical problems that Chinese college students met in reading technical textbooks and reported that Taiwanese college students had significant difficulty in reading technical texts in

English in three areas: frequent use of prepositions, use of a relative clause that interrupts the subject-verb-object sequence of an independent clause, and failure to look at the English phrase. Several other studies have also investigated sentence comprehension. Abrahamsen and Rigrodsky (1984), for example, investigated comprehension of complex sentences in children at three levels of cognitive development. Townsend and Bever (2001) examined sentence comprehension focusing on the integration of habits and rules.

In the Thai context, Nilagupta (1997) conducted a study on the relationship between syntax and readability in EFL students in Thailand and found several syntactic factors that affected readability difficulty, including embedding or the inserting of one kernel into another. Prappal (2003) investigated English proficiency of Thai graduate students who took the Chulalongkorn University Test of English Proficiency (CU-TEP) in 2001 and found that the majority of the students could not meet the standard required to study at the graduate level at Chulalongkorn University.

All these aforementioned studies have indicated that comprehension depends largely on syntactical structures and that long and complex sentences may be difficult to read. A strategy that can facilitate the reading of long, complex sentences is to identify the sentence core, or the main skeletons of the sentences. With respect to sentence core, Devine (2002) has ascertained that the readers must be able to manipulate the structural aspects of a second language in order to understand the propositional content of a second language text. In addition, successful readers should be able to get the "kernel" or core of sentences by unraveling the syntax.

Despite a number of previous studies on sentences, there is no study that addresses Thai EFL graduate students' ability to read long, complex sentences. Therefore, the purpose of this study was to examine the ability of EFL graduate students in identifying the core parts of long, complex sentences.

Objectives

1. To examine the ability of EFL health science graduate students in reading long, complex sentences.

2. To specify the students' major difficulties in reading long, complex sentences.

3. To investigate the impact of an interruption of a dependent clause between the main subject and its finite verb on identification of the sentence core.

Methods

Subjects

The subjects of this study were 151 EFL graduate students taking an EFL course entitled *Technical English for Medical science Graduates* (5500530) offered by Chulalongkorn University Language Institute during three consecutive semesters of the academic years 2006 and 2007. Of these 151 students, 65 and 26 took the course in the first and second semesters of 2006, and 60 in the first semester of 2007. These students were from the Faculty of Medicine, Dentistry, Pharmaceutical Sciences, Nursing, and the Faculty of Science, being the Ph.D. candidates, while most of them were working on their master's degree.

Instruments

The research instrument was 15 long, complex sentences from academic journals, books and encyclopedias. Each sentence contains one of the three types of dependent clauses -- noun, adjective or adverb clause. In addition, half of these sentences begin with adverbials, not the subjects. The test was tried out with 15 target students during the first semester of 2006. As shown in Table 1, the test sentences ranged from 17 to 40 words, with an average of 27.47 words (S.D. = 6. 17).

Table 1:   Sentence length

Sentence No.	Number of words	Sentence No.	Number of words
1.	17	9.	30
2.	20	10.	30
3.	21	11.	31
4.	22	12.	32
5.	24	13.	33
6.	25	14.	34
7.	26	15.	40
8.	27	N = 15 $\overline{x}$ = 27.47 SD = 6.17	

The total readability index of these sentences, computed by the Right Writer 3.0 (Right Soft, 1988), was 13.85 and the Flesch Index was 44.18, both indicating that these test sentences may be difficult to read.

As regards position of the sentence subject, "Beginning" refers to Word 1 to Word (sentence length / 3), "Middle" refers to Word (last word of beginning + 1) to Word 2(sentence length/3), and "End" refers to Word (last word of middle + 1) to Word n. However, this formula was used leniently.

Example: A sentence with 18 words:

- Beginning = Word 1 to (18/3) → Word 1 to Word 6

- Middle = (6+1) to Word 2(18/3) → Word 7 to 12

- End = (12 + 1) to Word n → Word 13 to Word 18

Table 2:   Positions of subjects

Positions of subjects (N = 15)			Total
Beginning	Middle	End	
10 (66.67%)	3 (20%)	2 (13.33%)	15 (100%)

According to Table 2, ten sentence subjects (66.67%) are at the beginning of the sentences, ranging from the first to seventh word. Three sentence subjects (20%) are in the middle, and two (13.33%) are at the end.

Table 3:   Sentence subjects and their modifiers

Sentence subjects and their modifiers (N = 15)			
Subjects with no modifier	Subjects with pre-modifier only	Subjects with post-modifier only	Subjects with both pre- and post-modifiers
3 (20%)	3 (20%)	3 (20%)	6 (40%)

Table 3 gives more details about the subjects and their modifiers. Of 15 sentence subjects of the test sentences, three (20%) did not have any modifiers, three (20%) had pre-modifiers only, another three (20%) had post-modifiers only, and six (40%) had both pre- and post-modifiers. These nine post- modifiers included six adjective clauses, two prepositional phrases, and one past participle.

Procedures

The test sentences were tried out with 20 target students. The tryout results in a revision of test instructions, especially inclusion of two examples of sentence cores at the beginning of the test. The revised test was administered to 65 graduate students in the first semester and 26 students in the second semester of 2006, and 60 students in the first semester of 2007.

Students' answers were marked manually. The correct answer for each sentence was given 1 point, and 0 for incorrect answer. Incorrect answers were further examined to identify students' weaknesses. They were also analyzed on account of sentence length, positions of the main subjects, interruption of the post-modifier or adverbial clause between the subject and its verb, and pre- and post-modifiers.

Statistical analysis

The data obtained were processed to determine the percentage, the mean and standard deviation using the SPSS Version 15.

Results

One hundred and fifty-one EFL graduate students in medical science and related fields were recruited for this study. The variable investigated was the ability of the graduate students taking *Technical English for Medical Science Graduates* in identifying the core parts of 15 long, complex sentences, with an average of 27.47 words. The scores and percentages obtained are presented in Table 4.

Table 4:   Performance of graduate students

Students' performance (N = 151)			
Sentence No.	Number of words	Correct answers (%)	Incorrect answers (%)
1	17	95 (62.91%)	56 (37.09%)
2	20	94 (62.25%)	57 (37.75%)
3	21	46 (30.46%)	105 (69.54%)
4	22	102 (67.55%)	49 (32.45%)
5	24	70 (46.36%)	81 (53.64%)
6	25	103 (68.21%)	48 (31.79%)
7	26	19 (12.58%)	132 (87.42%)
8	27	76 (50.33%)	48 (49.67%)
9	30	99 (65.56%)	52 (34.44%)
10	30	103 (68.21%)	38 (31.79%)
11	31	127 (84.11%)	24 (15.89%)
12	32	91 (60.26%)	60 (39.74%)
13	33	89 (58.94%)	62 (41.06%)
14	34	116 (76.82%)	35 (23.18%)
15	40	92 (60.93%)	59 (39.07%)

Table 4 shows the ability of 151 students in reading long, complex sentences. Out of 15 sentences, only two sentences (11 and 14) were correctly identified by 84.11% and 76.82% of students, respectively. Sixty to 70 percent of students could identify the cores of 8 sentences (sentences 1, 2, 4, 6, 9, 10, 12, and 15). Less than 50% of students were able to identify the cores of sentence 7, 5 and 3. These data revealed that students scored a mean of 8.69 (64.60%) out of 15 points, with an S.D. of 6.8.

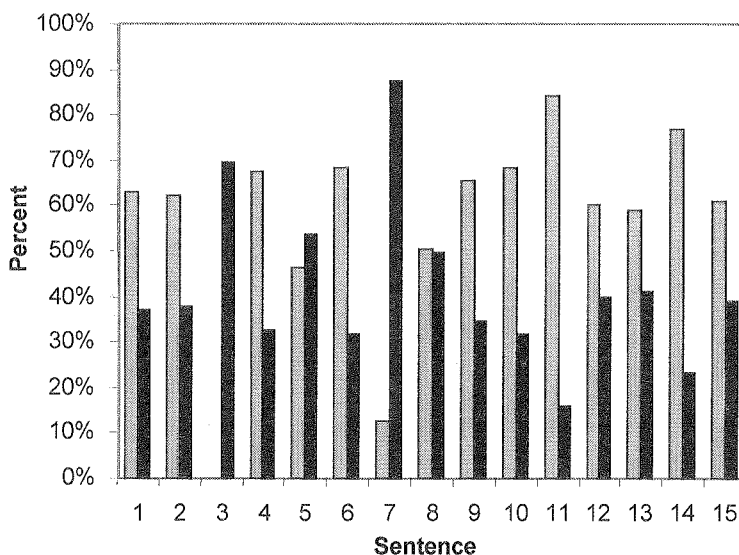Figure 1: Percentage of correct and incorrect answers

Figure 1 depicts the percentage of students' performance — "correct" and "incorrect". From the figure, the majority of students (70.20%) failed to identify the cores of sentences 3, 5 and 7. Sentence 7 was the most difficult because only 12.58% of students correctly identify its core. Sentence 3 comes second because only 30.46% found its core. Finally, only 46.35% of students could identify the core of sentence 5.

Further analyses of students' performance revealed interesting facts regarding students' major difficulties in reading long, complex sentences, and the impact of an interruption of a dependent clause between the main subject and its verb.

1. Sentence length does not always cause reading difficulty. For example, 60% to 80% of students could identify the cores of sentences 9 to 15 despite their length, 30 to 40 words. Meanwhile, they did not perform better when reading sentences 1 to 8, which are shorter, 17 to 27 words. Moreover, less than half of students (30.46%, 46.35%, and 12.58%) could identify the cores of sentences 3, 5 and 7, which are shorter (21, 24, and 26 words).

2. A close examination of sentences 3 and 9, which are composed of 21 and 30 words, indicates that the position of the subject and a list of words separated with commas preceding the subject obscure reading comprehension. For example, sentence 3 begins with an adverb clause and the verb of the clause (suffers) has a long list of objects. As a result, only 30.46% of the students could identify the core of this sentence. As in sentence 3, the sentence structure of sentence 9 also causes a similar problem.

3. Pre- and post-modifiers, especially those long ones or those which are clauses, distract students' identification of the main subject of the sentence. For example, 53.64% of students could not identify the subjects and the main verb of sentence 5.

Finally, the current study found that the distance between the main subject and the main verb affected readability of the sentence. In sentences 5 and 7, where the distances were 9, and 5 words, the majority of students could not identify the sentence cores, 69.54%, 53.64% and 84.42% respectively.

Discussion and Conclusion

The purpose of the present study was to examine the ability of 151 ELF graduate students who were enrolled in *Technical English for Medical Science Graduates* offered by Chulalongkorn University during the first and second semesters of 2006. This study found that out of 15 points the participants could score a mean of 9.69 (64.60%). The result suggested that the participants' ability to read long, complex sentences was at a moderate level. This result is consistent with that of Anderson (1998) in that long, complex sentences often cause problems to EFL and ESL students. A reason for this may be because complex sentences are often difficult for EFL students. Also, this problem can become worse when the subject or object of the sentence is modified by pre-modifiers or post-modifiers, or both.

Implications for ESL or EFL

The findings of this study suggest some implications for the teaching of English as a foreign language.

1. Students

Since almost half of the study subjects (43%) had difficulty in reading long, complex sentences, they should have more practice on the following:

1.1 identification of the word, phrase or clause that functions as the subject of the sentence,

1.2 identification of the noun head that functions as the subject, omitting both pre- and post-modifiers,

1.3 analysis of the sentence according to the relationships between its component phrases, or parts of sentence.

2. Teachers

The teacher should prepare various tests, especially diagnostic tests on sentence comprehension, and prepare learning materials that should help less able students to overcome their difficulties. This test should be administered to students at the beginning of the semester, preferably the first or second session of the class, so that the teacher can give appropriate practice required by individual students.

3. Syllabus

After a battery of tests to investigate students' ability to read long, complex sentences, the difficulties identified may be incorporated into the syllabus so that teaching materials (TM) as well as learning materials (LM) could be constructed appropriately. However, if the difficulties are not severe, supplementary materials may suffice for the purpose.

4. Instructional technology

To help students to develop adequate ability to read long, complex sentences, instructional technology should be employed. For example, computer-assisted language learning programs (CALL) may be constructed to give students practice on identifying the cores of long, complex sentences. This program should record and

display all the errors made by individual students. To make the program more useful, additional help functions, such as word meaning, sentence structure, adverbials, and correct answers may be included.

Recommendations for future research

Despite using empirical data, this study investigated only graduate students of medical science and related fields. As such, data were obtained from two groups of students, whose experience, background knowledge and reading ability may be different. Therefore, results may not apply to students of other disciplines and additional tests are required for more reliable results.

Since students' ability to identify the cores of sentences, especially long, complex sentences, is important and usually has an impact on text comprehension; future study should investigate the ability of a larger sample group of graduate students than the current study. In addition, test sentences of each dependent clause should be examined. Also, further study should investigate students' ability to identify sentence semantic functions as well as locutionary and illocutionary meaning of sentences.

The author

Phan Banpho is Associate Professor and former Head of Division of English for Science and Technology. He has been teaching at Chulalongkorn University Language Institute for more than two decades and has contributed many articles to PASAA and Pasaparitat, the two well-known journals of CULI. In his years of teaching English at Chulalongkorn University, he has accumulated substantial experience teaching graduate students to read and write research articles in medical sciences. Assoc. Prof. Phan Banpho is also a veteran computer programmer. He is currently writing a program entitled "Writing Cause-Effect Paragraphs" using Visual Basic.

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Appendix

Test Sentences

1. Most colors that we experience are produced by subtraction, that is, the selective absorption of white light.

2. It is difficult to make a decision whether we should approve what the director has proposed concerning the mobile library.

3. Whenever the human body suffers a serious injury, an infection or abnormality in its temperature-control system, an increase in temperature occurs.

4. Data that can be used to answer these questions of technology use are often collected by surveying technology directors, principals, or teachers.

5. Eucalyptus oil, which is extracted by a process of steam distillation, is used in the manufacture of medicine, throat lozenges, perfumes, disinfectants and detergents.

6. In most species, however, the female mosquitoes require a blood meal in order to nourish their eggs, which are laid on the surface of water.

7. The five ships, which carried 270 men of many nationalities, stopped in the Canary Islands and reached the Bay of Rio de Janeiro on December 13.

8. In addition, fresh water fisheries also play an important part in supplying the world's food needs, which are comprised of about 12 percent of the total catch.

9. During winter, particularly in regions where the ground is frozen and less water is available, leaves of many kinds of trees are shed to compensate for their loss of water.

10. Two studies financed by the National Cancer Institute, one of which tracked 88,757 women for 16 years, found no evidence that a high-fiber diet reduces the risk of colorectal cancer.

11. Born in Milan, Ohio, USA and famous for his invention of the phonograph, which was also known as gramophone, and the electric light bulb, Thomas Alva Edison had very little education.

12. As Robinson (2005) has pointed out about the impact of avian influenza, people may stay home to keep away from those who are sick or to take care of ill family members.

13. Since science was applied to the cosmetic industry, the cosmetics business has been a very important industry, particularly in Western society, where young girls start to take an interest in the make up.

14. One solution that could move more passengers through major air hubs is the plan of European aircraft manufacturer Airbus Industries to build the A380 jet, a two-level "superjumbo" jet that could carry 550 passengers.

15. Deciduous trees, the trees that shed their leaves and remain bare for a season, are fairly large tress, growing to perhaps 25 meters in height, with sturdy, straight trunks and numerous branches which form spreading crowns of broad, thin leaves.