

English vocabulary knowledge of EFL engineering students

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ABSTRACT: Reported in this article is research conducted in an Indonesian university to estimate the English vocabulary knowledge of a sample of engineering students. This is a significant topic, because the EFL (English as a foreign language) engineering students are expected to be able to read English language texts in their engineering course, and also create simple oral or written text in English. This is difficult for them to manage without an adequate knowledge of vocabulary. Through two of the instruments, the subjects were tested on their understanding of words that occur frequently in academic writing: the receptive vocabulary level test (RVLT), and the productive vocabulary level test (PVLT). The tests were used to measure not only whether the students knew the words, but also how well they knew them. The results showed that on average the EFL engineering students have sufficient receptive vocabulary sizes, but they struggled to cope with the productive vocabulary test. The implications of the results and suggestions of ways in which the engineering students' vocabulary knowledge could be improved are discussed.

INTRODUCTION

Foreign language acquisition is an active process in which students need to continually increase their vocabulary size in the target language. In English as a foreign language (EFL), students need to acquire appropriate and sufficient knowledge of vocabulary, because successful vocabulary acquisition has been associated with being a successful reader [1], and with becoming a more skilful communicator [2]. Vocabulary knowledge is pivotal for successful English language use since it helps EFL students understand texts and produce texts in both oral and written modes.

Vocabulary knowledge is a critical prerequisite for EFL university students to be efficient readers. Learners of English as a foreign language need a vocabulary size of at least 3,500 high-frequency used English words to be able to cope with university reading tasks [3]. It is estimated that a vocabulary size of 5,000 words means that a student knows a high enough proportion (about 95 percent) of the running words in a text to be able to read it relatively independently [3].

Receptive vs. Productive Vocabulary Knowledge

Vocabulary knowledge can be categorised as receptive or productive vocabulary knowledge [4]. Receptive vocabulary knowledge refers to students' ability to understand a word when they listen or read English texts, while productive knowledge is the knowledge to produce a word when the students write or speak. It is widely believed that words are known receptively first, and only after intentional or incidental learning do they become available for productive use.

Therefore, vocabulary knowledge should be regarded as a continuum on which words develop from receptive to productive status. Learners' receptive vocabulary size is much larger than their productive vocabulary size [5].

To understand university students' vocabulary knowledge, a test of vocabulary size is used to measure how many words a learner knows. It typically measures a learner's knowledge of the form of the word and the ability to link that form to a meaning. A receptive vocabulary size measure looks at the knowledge needed for listening and reading. A receptive test measures whether learners can provide or choose a meaning when they see the form of the word. A productive measure looks at the knowledge needed for speaking and writing, so it measures whether learners can provide a word form to express a meaning [4].

Internationally, there have been many studies to measure the English vocabulary knowledge of university students. The receptive vocabulary knowledge of Turkish university students majoring in English language teaching (ELT) showed that the majority of them had a receptive vocabulary of between 3,000 and 5,000 words [6]; in Spain, ELT students' receptive vocabulary was found to have a mean of approximately 5,100 words [7]. In China according to

Liu, their university students did not do very well on receptive vocabulary knowledge [8]. Only the mean score for the 2,000 word level has reached the level of mastery. The mean scores for the 3,000; 5,000 and academic words levels are much lower than it is for the 2,000-word level.

Other researchers focus on investigating the factors, which affect vocabulary knowledge. For example, vocabulary knowledge of students was found to increase as they get older [9]. In New Zealand, the age of the students was found to be a significant factor affecting the vocabulary size of the students [4]. But in Hong Kong, Tang found that students with a higher level of schooling, i.e. with longer English learning experience, do not necessarily possess a larger vocabulary than those at junior levels [10].

In spite of the importance of this vocabulary mastery for their university success, there has been apparently little research on how many words Indonesian university students know and factors which may affect it. The one study that is widely cited was carried out by Nurweni and Read at a university-level institution in a Province in Sumatera [11]. They investigated the vocabulary size (and depth) of first-year Indonesian university students to find out whether they have enough English words for their academic reading [11]. They found a mean vocabulary size of 1,226 words and concluded that the students' total vocabulary size was very small, although they had spent six years studying English in junior and senior high school.

Kweldju has conducted several nation-wide vocabulary studies in Indonesia. She investigated the vocabulary size of pre-service teachers from 15 teachers' colleges in Sumatera, Java, Kalimantan, Sulawesi, Bali and Nusa Tenggara [12]. She discovered that English department students or pre-service English teachers only had 4,664 base words or 2,800 family words, a size right at the threshold level for reading shorter academic texts.

Suteja conducted a vocabulary-size (and depth) study with Indonesian nationals including high school (year 10) students [13]. She found that the subjects had an average vocabulary of 5,000 words, which was enough to read texts required for their study. It should be noted that the result is an exception rather than the norm, because the subjects in this study did not represent typical Indonesian students, as they were students from an international institution, where English is used as a medium of instruction. Furthermore, Putra also investigated English-language teacher students and found that their receptive and productive vocabulary knowledge reached the 5,000 and 3,500 levels, respectively [14].

A recent vocabulary study was conducted by Novianti [15]. She examined the receptive vocabulary knowledge of second-year undergraduate students in an English education programme in an Indonesian college. This study used the 2,000-word frequency-band from the receptive version of the VLT (vocabulary level test) and a questionnaire for data collection. She compared the receptive vocabulary size of students who obtained extra hours of English instruction with those who did not. The results show that their receptive vocabulary scores are lower than 2,000 words, and no significant difference was found between the students who had extra hours of English instruction and those who did not. Then, it can be stated that even after they had gained extra hours of English instruction, their average vocabulary knowledge was still lower than the estimated 1,000-word level in the RVLT.

Previous studies on Indonesian vocabulary knowledge have mainly focused on university students majoring in English language teaching as their subjects. Little is known about the vocabulary knowledge of engineering students. The aim of this study was to examine the receptive and productive vocabulary knowledge of engineering students in a state university in Indonesia. In addition, investigated in this study were the factors affecting the vocabulary size of these students. Factors considered included school year, gender, taking extra English and English learning autonomy. These questions guided the study:

1. What is the receptive vocabulary knowledge size of the engineering students, as measured by the RVLT test?
2. What is the productive vocabulary knowledge size of the engineering students, as measured by the PVLT test?
3. What factors affect the vocabulary size of these students?

METHOD

Participants

The site of the study was a state university located in East Java, Indonesia. As the researcher was one of the teaching staff in the university, there was access to the Engineering Faculty and participants. A lecturer, the researcher's colleague, helped conduct this study by administering and distributing tests and the questionnaire to the participants. A total of 89 undergraduate students majoring in the Electronics Department participated in this study. They ranged from first- to fourth-year students. The students were between 17 and 23 years old.

In relation to the length of formal English instruction at school, they started English lessons in primary school at different grades, because English was not compulsory. Primary schools have the flexibility to provide English lessons depending on the resources they have. At secondary level, English is a compulsory subject. Therefore, students had six years of English instruction at secondary level and one year of English at university. Some students who could afford the tuition took extra English courses outside of the schools.

Instruments

Three instruments were used in this study. The first was a student questionnaire, which asked for background information about the participant. viz. year that they were admitted to the university, gender, age, length of studying English at school, whether they had extra English courses.

The second instrument was the receptive vocabulary level test (RVLT) [16]. This test was used to measure the participants' receptive vocabulary knowledge at five different levels, including 2,000; 3,000; 5,000 and AWL (academic word list). The test had 30 items in 10 clusters. The participants were asked to match three of the six words with definitions. A score on each level of RVLT indicates the number of words known at that particular level. For example, if a student gets 15 words correct, they know 50 percent words at that level. Getting 30 words correct at a level of RVLT indicates mastery at that particular level [17].

The third instrument was the productive vocabulary level test (PVLТ) [17]. This test was used to measure the participants' productive vocabulary knowledge. For each item in the test, a meaningful sentence context was presented and the first few letters of the target words were given to the learners. The purpose of providing the first few letters was to prevent the participants from filling in the sentence with another word, which would be both grammatically and semantically correct, but which comes from a different frequency level. The grading of the receptive test and productive test was to mark each item as correct/incorrect.

RESULTS AND DISCUSSION

There were 89 EFL undergraduate students who were majoring in electronics who took the RVLT and PVLТ tests. The RVLT and PVLТ descriptive statistics are displayed in Table 1. As Table 1 shows, it seems that the students could do the receptive vocabulary test, since they could answer more than half of the questions correctly (56% to 75%). But, the percentage of students mastering the receptive vocabulary differs by level.

When comparing mean scores, it is immediately noticeable that there is a continuous decrease in the results from level to level. For example, at the 2,000 level, the mean score was 22.57, while for AWL, the mean was only 17.06. It means that the students' mastery at the 2,000 level was higher than their mastery of AWL.

Table 1: The RVLT and PVLТ descriptive statistics.

| RVLT Level | Mean and percentage | Score minimum | Score maximum | Mean | % | SD |
|------------|---------------------|---------------|---------------|-------|-------|------|
| 2,000 | 30 | 4 | 30 | 22.57 | 75.23 | 6.22 |
| 3,000 | 30 | 7 | 28 | 22.01 | 73.36 | 4.97 |
| 5,000 | 30 | 7 | 30 | 21.57 | 71.09 | 5.62 |
| AWL | 30 | 1 | 29 | 17.06 | 56.86 | 9.13 |
| PVLТ Level | | | | | | |
| 2,000 | 18 | 0 | 20 | 6.31 | 35.05 | 4.09 |
| 3,000 | 18 | 0 | 12 | 5.03 | 27.94 | 3.30 |
| 5,000 | 18 | 0 | 12 | 4.40 | 24.44 | 2.29 |
| AWL | 18 | 0 | 12 | 3.54 | 19.66 | 2.93 |

Also shown in Table 1 are the descriptive statistics (minimum and maximum scores, means and standard deviations) for the PVLТ for all levels. In the productive vocabulary test, they only managed to cover 35% at the 2,000 word level, while they struggled at the 3,000; 5,000 and AWL levels (28% to 20% mastery, rounded). The mastery level did not even reach 50%. The highest mean score indicated on the 2,000 level was 6.31 and the lowest mean score indicated in AWL was 3.54. It means that the highest mastery of the productive vocabulary of the 2,000 level reached only 35.05% and the lowest mastery on AWL was 19.66%. In conclusion, the students' mastery of the productive vocabulary was low and the scores were smaller than for the receptive vocabulary test.

Based on the students' vocabulary level mastery, their receptive and productive vocabulary size can be estimated. Displayed in Table 2 are the receptive vocabulary size and the productive vocabulary size of the participants, which are 4,134 and 1,541, respectively. As predicted, the results reveal that the receptive vocabulary size is higher than the productive vocabulary size.

The third research question focused on the factors of age, gender, length of study of English and extra English courses taken outside the classroom that might affect the vocabulary knowledge. A one-way analysis of variance was used to test whether the mean results were different for different groups.

Shown in Table 3 is a significant difference in the mean test scores by age. The results indicate $F(5.098) = 0.000$ ($p < 0.05$) for the receptive vocabulary and $F(2.096) = 0.039$ ($p > 0.05$) for productive vocabulary. There were no

significant differences by gender, the length of study of English, and extra English courses outside the class for both the receptive and productive vocabulary.

Table 2: Receptive and productive vocabulary size for participants.

| Receptive | % Mastery | Receptive vocabulary size per level | Total receptive vocabulary size |
|-----------------|-----------|-------------------------------------|----------------------------------|
| 2,000 | 75.23 | 1,504 | |
| 3,000 | 73.36 | 733.6 | |
| 5,000 | 71.09 | 1,421.18 | |
| AWL (836 words) | 56.86 | 475.34 | |
| | | | 4,134 |
| Productive | % Mastery | Receptive vocabulary size per level | Total productive vocabulary size |
| 2,000 | 35.05 | 701 | |
| 3,000 | 27.94 | 279 | |
| 5,000 | 24.44 | 448 | |
| AWL (570 words) | 19.66 | 112 | |
| | | | 1,541 |

Table 3: Factors that may affect the vocabulary knowledge.

| Variable | Comparison | Mean receptive | SD | Sig. | Mean productive | SD | Sig. |
|-------------------------|-------------------|----------------|----------|-------------|-----------------|----------|-------------|
| Age | 17 - 20 | 112.5167 | 22.09033 | 5.098 | 25.2167 | 12.28764 | 2.096 |
| | 21 - 23 | 85.5862 | 25.82014 | $p = 0.000$ | 19.0345 | 14.50242 | $p = 0.039$ |
| Gender | M | 101.1731 | 22.41649 | 1.087 | 23.3269 | 12.31725 | 0.104 |
| | F | 107.3514 | 31.26252 | $p = 0.280$ | 23.0270 | 14.72429 | $p = 0.917$ |
| Length of study English | 7 years | 101.4630 | 26.57827 | 1.009 | 23.2407 | 12.72189 | 0.034 |
| | More than 7 years | 107.2571 | 26.28167 | $p = 0.316$ | 23.1429 | 14.31401 | $p = 0.973$ |
| Extra English course | Yes | 107.6341 | 24.93367 | 1.287 | 22.7805 | 12.66987 | 0.275 |
| | No | 100.4167 | 27.52858 | $p = 0.201$ | 23.5625 | 13.92213 | $p = 0.784$ |

The results, showing the means and ranges of receptive vocabulary level of the participants, reveal that the participants have reached a mastery of 56% to 75%. The estimated receptive vocabulary size was 4,134. It indicates that they can understand English textbooks consisting of the general vocabulary words within the 2,000- and 3,000-word levels, but will have difficulty understanding the texts, which consist of academic word list and words from higher levels.

The current study has yielded different results as compared to previous researchers' findings [11][15]. Novianti reveals that her participants' receptive vocabulary scores of second year undergraduate students were lower than 2,000 words [15]. Nurweni and Read also reveal their participants' average was 986 words [11]. In the current study, students' receptive vocabulary was 4,134.

The results of this study differ from three earlier studies which found receptive vocabulary scores of 4,664; 5,000 and 5,388, respectively [12-14]; these are higher than the scores found in this study. This is understandable, because in two of these earlier studies, participants were majoring in English language teaching, while in the third participants were the students of an international school where English is their medium of instruction.

The result for the productive knowledge of the participants was low and lower than the receptive knowledge. None of the participants reached the mastery of the 2,000-word level for productive knowledge. It indicates that students still have difficulty producing words to express themselves in oral and written form.

The next issue investigated in this study concerns the factors, which may affect the students' mastery of vocabulary. It was confirmed that statistically there was a significant difference in vocabulary knowledge between students whose ages were 17 to 20, with those whose ages were 21 to 23. Other aspects, such as gender, length of study of English in school and extra English courses outside the class were not statistically significant. Hence, the age of students was a significant factor, which may affect the students' vocabulary knowledge.

In this study, it was found that in vocabulary knowledge the students aged between 17 and 20 years outperformed those aged between 21 and 23. This finding contradicts other findings [4][9], where it was found the vocabulary knowledge increases as the students get older. There are many factors in this study, which may influence the performance of the participants aged 17 to 20, e.g. the quality of their English instruction and their exposure to the English language. This is an interesting result which needs further investigation.

Based on the results of this study, the receptive vocabulary mean scores were unsatisfactory on the 5,000 and AWL levels and all levels are unsatisfactory for productive vocabulary. Therefore, to improve students' academic English vocabulary knowledge in terms of both receptive and productive abilities, the Faculty of Engineering should deliberately implement explicit vocabulary learning into the English teaching syllabus. The vocabulary learning should cover the words from the 3,000- and 5,000-word levels and AWL.

Learning vocabulary can be combined with communicative activities. For example, the lecturer may take words from the AWL, and then ask students to learn different aspects of these words and ask them to apply these words in different contexts. This could be done by asking students to create oral texts, such as conversations, monologues and presentations, or creating written texts, such as reports, recounts and letters. By working consistently, students could become skilful in the use of the words receptively and productively.

CONCLUSIONS

In this research, the participants' vocabulary was measured by the RVLT and PVL. Based on the participants' performance on the RVLT, it was concluded that most of the participants achieved 56% to 75% mastery and the size of the vocabulary was 4,134. The performance on the productive vocabulary was unsatisfactory for no participants reached the mastery level. The results suggested that these participants needed more explicit instruction and practice on the frequently used 3,000- and 5,000-word levels and AWL. Vocabulary learning should be incorporated into the syllabus, and the lecturer should assist students with appropriate and effective strategies to learn and enlarge their vocabulary.

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