

# Utilization of LUNA to Enhance TOEIC Vocabulary

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## Abstract

Considering the prevalence of the use of TOEIC<sup>®</sup> Listening and Reading Tests (hereafter the TOEIC) scores in the work world, university English programs need to assist students in achieving the TOEIC scores they will need in the future. The English Program in the School of Science and Technology has been implementing TOEIC-related vocabulary tests in an attempt to meet the demands of the TOEIC. However, there are some concerns about the current testing method. The authors have tried an alternative approach as a pilot study to explore 1) whether it ameliorates the issues with the present testing method and 2) whether it helps students increase their knowledge of TOEIC-related vocabulary. This paper describes the current test format and concerns about it. The vocabulary tests in the current program are analyzed qualitatively, and the results of the students' scores on pre- and post-tests are compared quantitatively. The results show the alternative approach effectively helps students practice vocabulary and perform better on more appropriate tests.

## 1. Introduction

In Japan, the use of the TOEIC is becoming more and more prevalent for various purposes. In the business world, companies have increasingly begun to utilize the TOEIC to measure their employees' English proficiency, for example when considering promotions or transfers to overseas branches. Some companies also require a specific TOEIC score when selecting potential recruits. Reflecting this trend, universities are also relying more on TOEIC scores to assess students' English ability. Some universities in Japan exempt English exams in cases where entrance applicants have earned a specified TOEIC score at the time of their application. In many universities, the granting of credits based on scores achieved on the TOEIC and other certified examinations has become a common practice.

In the School of Science and Technology, if a student achieves a score of 750 or more on the

TOEIC, they do not have to take required English classes. All of the students in the School of Science and Technology have been obliged to take the TOEIC® IP Test twice; once in the spring semester when they are in their first year and again in the spring semester in their third year, to determine whether they have made any improvement and to what degree.

The English program in the School of Science and Technology is unique in that all of the classes are science-content based. What the students learn through the program is so called “English specifically practiced in the science field;” therefore, the vocabulary they learn in the program differs significantly from what the students need to know in order to get a high score on the TOEIC. Considering the demands for English in working society now and the reliance on TOEIC scores, our students also need to increase their knowledge of general TOEIC vocabulary in addition to learning the science-based vocabulary.

To meet society’s demands, in the Reading courses, in addition to the science-content reading text, the students use the TOEIC vocabulary textbook, “TOEIC test *ni derujun eitango*.” Currently, in the Reading courses, to encourage the students to study the TOEIC-related vocabulary, each semester, they take three vocabulary tests based on the TOEIC vocabulary textbook. The aim of administering the vocabulary tests is ultimately to help students study the vocabulary periodically and have better retention of the vocabulary they have acquired. However, there are some issues with the current testing method. The students are assigned the vocabulary textbook, but there is a lack of supplementary study materials and in-class activities. Also, it is difficult for teachers to assess students’ learning progress on an ongoing basis between tests. Furthermore, the testing procedure, in which a teacher reads a word aloud and students write the spelling and translation of the word, does not reflect testing procedures they will actually meet when they take the TOEIC.

Thus, the authors have proposed an alternative pilot approach to address the issues with the current testing method. This pilot approach enables the students to engage with TOEIC vocabulary learning not just inside but also outside of class through the use of LUNA, which is our LMS (Learning Management System). The research questions of this study can be described as follows:

1. Does the alternative pilot approach ameliorate the issues with the present testing method?
2. Does the alternative pilot approach help increase the students’ vocabulary?

## 2. Background and Concerns

### 2.1 Overview of the English Program

During their first two years, the students in the School of Science and Technology are required to take three courses: Reading, Writing, and Communication. Reading I for the first year students is taught by a Japanese teacher, while Reading II for the second year students is taught by either a Japanese or a native speaker of English depending on the class arrangements. All of the Writing I and II and Communication I and II courses are taught by native speakers of English.

Each course is science-content based, which provides opportunities for the students to explore basic science information in English and acquire vocabulary and expressions specifically used in the field of science. As globalization is increasing rapidly, in the laboratories students will be assigned to in their fourth year, they will have more interaction with their foreign counterparts. The English program is designed to prepare individuals to work with foreign researchers and for a career in science in their future.

## 2.2 Reading Courses

The Reading I course aims to improve students' reading ability through both intensive and extensive reading. Students are expected to read science-based articles without depending on Japanese translations. The main objective of the Reading II course is to acquire critical thinking skills by reading about science-based topics. Students are expected to read in English without the aid of dictionaries, with the aim being the development of reading fluency.

As Table 1 shows in the example of the Reading I course schedule, in addition to completing reading assignments and other activities, each semester, students must take three TOEIC vocabulary tests based on vocabulary presented in the TOEIC vocabulary textbook, "TOEIC test *ni derujun eitango*," indicated in the column of tests. They must obtain an average of 60% or more on the three tests; otherwise, they will fail the course even if they have obtained a final grade above 60% based on all of their assignments.

Table 1 *Reading I Class Schedule Example*

Week	In-class activities	Tests
1	Orientation	
2	Pre-test	
3	Reading 1: Three Biologists	
4	Reading 2: How Science Figures out the Age of the Earth	
5	Reading 4: Matatoshi Koshiba	TOEIC vocabulary test 1 #501~670
6	Reading 5: Marie Curie	
7	TOEIC Practice (1): Listening	
8	TOEIC Practice (2): Reading	TOEIC vocabulary test 2 #671~840
9	Reading 6: To Be or Not to BE on Facebook	
10	Reading 7: DNA	
11	Reading 9: What to Do about CO <sub>2</sub>	TOEIC vocabulary test 3 #841~1000
12	Reading 11: Bio-inspired Robotics	
13	Review	
14	Post-test	

*Note.* # indicates the tested section of words in the TOEIC vocabulary textbook.

### 2.3 Current TOEIC Vocabulary Testing Procedure

“TOEIC test *ni derujun eitango*” contains approximately 3,500 high-frequency words, divided into seven sections, with approximately 500 words in each section. The vocabulary is listed according to the order of frequency on the TOEIC. In Reading I, the first year students are assigned 500 words from Part 2 in the textbook to study in the spring and the next 500 words in Part 3 to study in the fall. In Reading II, the second year students are expected to learn 500 words in Part 4 in the spring and an additional 500 words in Part 5 in the following semester. Part 1 is omitted because the vocabulary is so simple, and it is expected that most of the students learned it before they entered the university. The total of 500 words is divided into three, which makes approximately 170 words assigned for each vocabulary test.

Vocabulary tests are administered using the following process each time (see Table 2, which displays a section of the exam):

- 1) Students independently study the 170 words presented in the vocabulary textbook.
- 2) From the 170 words, the teacher chooses 20 words to be tested.
- 3) The teacher distributes a test sheet (40 blank boxes) and reads each test word aloud in English.
- 4) Students listen to the teacher, and using the blank boxes, they write the words with the correct spelling and also translate them into Japanese.
- 5) The teacher continues the same process for all 20 test words.
- 6) The test is marked and returned to students later. Spelling and translations have equal value, which add up to a total score of 40.

### 2.4 Concerns about the Current TOEIC Vocabulary Testing Procedure

Conducting the vocabulary tests in this way has some advantages. Since most of the English teachers are teaching more than two Reading classes, this method we have been following has been effective in preventing students from sharing test items across classes because a teacher can easily design completely different tests for each class. As for the students, the test procedure is quite simple, so there is no confusion or misunderstanding. In addition, this method encourages students to study the pronunciation as well as spelling and they make the effort to memorize the words.

Table 2 Vocabulary Test Example

English	Japanese	English	Japanese
1. <i>instruction</i>	指示	11. <i>selected</i>	選ばれた
2. <i>supply</i>		12. <i>client</i>	顧客
~~~~~			
10. <i>operation</i>	操作	20. <i>occur</i>	起こる

However, there are some drawbacks associated with the current testing procedure. First, this method does not test how each word is used in context. Furthermore, the majority of the students seem to simply memorize the words and the Japanese translations that are in the vocabulary textbook just a few days prior to the test in order to earn the minimum grade required to pass the course. If the goal of English courses is to provide students with opportunities to learn or acquire the vocabulary and actually retain it long-term to use in practical applications in the future, simple memorization for tests may not be in their best interests. As Nation (2001) states in his second language acquisition research, “most vocabulary learning requires repeated attention to the item.” It is crucial to practice the vocabulary repeatedly and regularly for long-term retention.

In addition, the pronunciation of words can create problems. One such problem is related to the inevitable existence of homonyms such as “principle” and “principal” or “suite” and “sweet,” which would technically both be correct using the current test method. An additional problem is that sometimes it is difficult for the Reading I Japanese teachers to pronounce each word as correctly as native speakers of English would. For that matter, because of national or regional differences in dialect, even amongst native speakers, pronunciation of some of the words will vary. Therefore, presenting words out of context can be problematic and confusing for students. A further issue is that for the native speakers of English, though giving the test is relatively easy, some of them have difficulty when marking the Japanese translations. Currently, the English Department hires Teaching Assistants to mark the tests, but, due to words with multiple meanings, such as “screen,” which could be a noun or a verb, or “volume,” which could mean the loudness of sound or a book, is difficult for these assistants to determine whether a given answer is correct or not. Though these latter personnel issues are perhaps more administrative than educational, it is still critical to address them in order to ensure the quality and consistency of the Reading classes and the testing procedures.

### 3. Development of an Item Bank

To ameliorate these concerns regarding the present testing system, the authors have proposed an alternative TOEIC vocabulary pilot teaching and testing method. First, the authors considered the actual test format. Because the students are ultimately studying TOEIC vocabulary to obtain a higher score on the TOEIC, and considering Part 5 on the TOEIC, which tests knowledge of vocabulary and grammar, the authors have decided to employ the same format as Part 5, which consists of fill-in-the-blank style multiple-choice questions as shown as in the example below.

115. The restaurant critic for the *Montreal Times* \_\_\_\_\_ the food at Corban’s Kitchen as affordable and authentic.
- (A) ordered
  - (B) admitted

- (C) described
- (D) purchased

(TOEIC® Test *koshiki mondaishu shinkeishiki mondai taiouhen*, 2016, p. 49)

It is expected that in addition to the students becoming more accustomed to the test format, they also can learn expressions in context. According to Read (2000), “In normal language use, words do not occur by themselves or in isolated sentences” (p. 4); Read goes on to say “the way that we interpret a word is significantly influenced by the context in which it occurs” (p. 4).

Next, the authors created an item bank of multiple-choice questions based on the list in the TOEIC vocabulary textbook, believing it would help students practice the vocabulary more regularly throughout the semester. As stated earlier, repetition is important in vocabulary acquisition. Hashemzadeh (2012) notes “one important means to focus on vocabulary is Exercises. Exercise has a beneficial effect on vocabulary learning.” The item bank can be utilized for tests as well as exercises to practice the vocabulary on a regular basis.

Since this is a trial project, a master list of the first 500 words that are assigned to the first year students in the spring semester has been created. An example of a typical item follows:

Do you know your \_\_\_\_\_ and departure time?

- a) arrived
- b) arriving
- c) arrive
- d) arrival

More details about the educational purposes of the item bank as well as a description of the process of the item bank development and advantages of having original items are described in “Development and Application of an Item Bank for TOEIC Vocabulary Learning” (Sumi, Kudo, & Yamada, 2016).

#### 4. Application of the Item Bank

To set up the developed items for student practice, first, six different 20-question vocabulary practice exercises consisting of vocabulary selected from the 500 master items were created. Then, as shown in Table 3, students practiced exercises in class six times, twice every three weeks over a period of nine weeks, in the period of time between the current program vocabulary tests, in the end providing a total of 120 practice questions. Students were given the 20-question paper-based vocabulary exercise at the beginning of the class, which was followed by immediate feedback from the teacher. This provided students opportunities to work on the TOEIC vocabulary on a regular basis and helped the teachers assess their learning progress. Vocabulary exercises on LUNA were available and optional for the experimental group only.

In order to measure the students' knowledge of the vocabulary before and after the course, the students took a 100-question test as the pre- and post-tests. Every fifth item was chosen from the item bank to make the 100-question test. The pre- and post-tests were identical, but the

Table 3 Reading I Class Schedule (Experimental Group)

Week	In-class activities	Tests / exercises
1	Orientation	
2	Pre-test	
3	Reading 1: Three Biologists	Vocabulary exercise 1
4	Reading 2: How Science Figures out the Age of the Earth	Vocabulary exercise 2
5	Reading 4: Matatoshi Koshiba	TOEIC vocabulary test 1 #501~670
6	Reading 5: Marie Curie	Vocabulary exercise 3
7	TOEIC Practice (1): Listening	Vocabulary exercise 4
8	TOEIC Practice (2): Reading	TOEIC vocabulary test 2 #671~840
9	Reading 6: To Be or Not to BE on Facebook	Vocabulary exercise 5
10	Reading 7: DNA	Vocabulary exercise 6
11	Reading 9: What to Do about CO <sub>2</sub>	TOEIC vocabulary test 3 #841~1000
12	Reading 11: Bio-inspired Robotics	
13	Review	
14	Post-test	

Note. # indicates the tested section of words in the TOEIC vocabulary textbook.

students were not informed of that. After the pre-test, the correct answers were not distributed to the students.

In addition, the authors have made all of the 500 items in the item bank available for students for self-study on LUNA (see Figures 1 and 2). Students can access it at home and school, and with their mobile devices. Practicing vocabulary exercises on LUNA was not mandatory for the students.

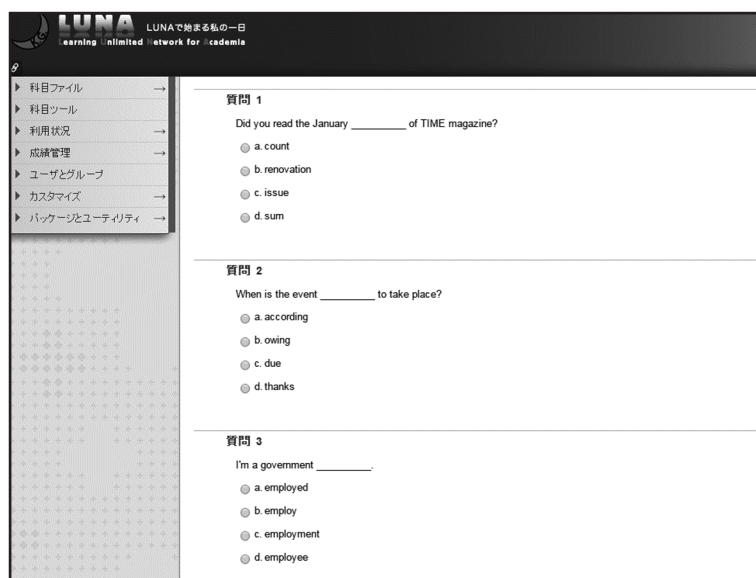


Figure 1 Exercises on LUNA before submitting answers.

<b>質問 1</b>	Did you read the January _____ of TIME magazine? 選択された解答 : a. count	0点 (1点満点)
<b>質問 2</b>	When is the event _____ to take place? 選択された解答 : a. according	0点 (1点満点)
<b>質問 3</b>	I'm a government _____ . 選択された解答 : a. employed	0点 (1点満点)

Figure 2 Exercises on LUNA after submitting answers.

After all of the answers have been submitted, LUNA shows the answers that students have selected and whether they are correct or not, but does not give students the correct answer (see Figure 2). Though the system could have indicated the correct answer at the same time, the authors believe it is more beneficial for the students to find the correct answer on their own.

## 5. Research Design

The two research questions referred to previously follow:

1. Does this alternative pilot approach ameliorate the issues with the present testing method?
2. Does this alternative pilot approach help students increase their knowledge of vocabulary?

### 5.1 Qualitative Research

To investigate how the process of the testing method in the current program might cause problems among students, we designed qualitative research. The authors analyzed the students' errors on the current program vocabulary tests qualitatively. Approximately 60 students' current program vocabulary tests that were administered three times during the semester were evaluated to identify what types of errors they made and what may have caused those errors. Half of the content in the three current program vocabulary tests was intentionally selected from the contents of the paper-based practice exercises for analysis.

### 5.2 Quantitative Research

In order to confirm whether the alternative pilot approach using the item bank has helped the students learn the TOEIC vocabulary, the students ( $N = 509$ ) were divided into two groups: the experimental group ( $n = 241$ ) which additionally completed two paper-based vocabulary exercises in class before each current program vocabulary test, over a total of nine weeks, and the control group ( $n = 268$ ) which only took the three current program vocabulary tests over the nine weeks. Both groups took the 100-question pre-test in April and the post-test in July. The results of the pre-tests and post-tests for both groups are examined.



Table 4 Common Errors on the Current Program Vocabulary Tests

Correct answers	Common errors
1. bargain	bargen, burgen
2. breathe	<i>bleed, brief, breeze</i>
3. occasion	occatation, ocatation, ocasion
4. actual	acture, actuar
5. raw	<i>law, low, row</i>
6. sore	<i>sour, soar, thor</i>
7. occur	ocur, occar
8. strength	stlength, strengus, strengs
9. downstairs	downsters, downstars, downsteer,
10. intelligence	interigence, inteligence, integijence

*Note.* Italics indicate a correctly spelled word, though it is not the correct test item.

## 6. Results

### 6.1 Qualitative Research

Table 4 shows common errors on the current program vocabulary tests. The first six words were only on the current program vocabulary tests, while the remaining four words were on the current program vocabulary tests, the pre- and post-tests, and also were included in the paper-based vocabulary exercises. Though there are spelling errors, their Japanese translations are, for the most part, correct for these 10 words. The common mistakes can be briefly categorized as follows:

- 1) misspelled, but phonetically correct, such as “-tion” and “-sion.”
- 2) incorrect, but a different word.
- 3) misspelled because of consonant problems, possibly caused by English learning issues unique to Japanese, such as “l” and “r” confusion as well as “s” and “th” confusion.
- 4) misspelled because of vowel problems, possibly caused by English learning issues unique to Japanese, such as “bar-” and “bur-” and “-ster” and “-star.”
- 5) blank, which means no attempt to spell it.

### 6.2 Quantitative Research

Sumi, Kudo, and Yamada (2016) have analyzed the results of the pre- and post-tests using Bayesian statistics, and in this study, *t*-tests were employed to compare the results. All data were calculated by a web application named langtest.jp at <http://langtest.jp> (accessed September 1, 2016) (Mizumoto & Plonsky, 2015). The results of the pre-tests are in Table 5. It shows there were no significant differences between the control group and the experimental group using a non-paired *t*-test ( $p = 0.1298$ ,  $d$  [95% CI] = 0.13[-0.04, 0.31]). The results are also shown in Figure 3.

Comparisons of the pre-test and post-test scores of the experimental group were also analyzed by the paired *t*-test as shown in Table 7, Figures 5 and 6. As Figures 5 and 6 indicate,

Table 5 Results of the Pre-tests

	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>Min</i>	<i>Max</i>
Control	268	61.79	13.35	63	26	95
Experimental	241	60.03	12.77	61	29	86

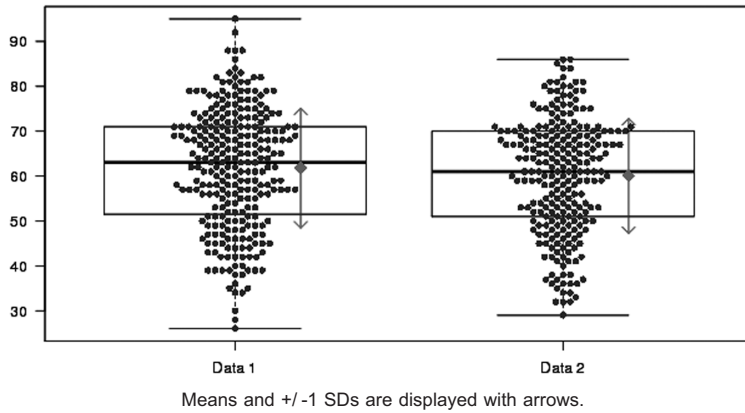


Figure 3 Results of the pre-tests. Data 1 displays the results of the control group and Data 2 displays those of the experimental group.

Table 6 Results of the Post-tests

	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>Min</i>	<i>Max</i>
Control	268	64.29	13.65	66	26	92
Experimental	241	73.65	13.42	75	18	99

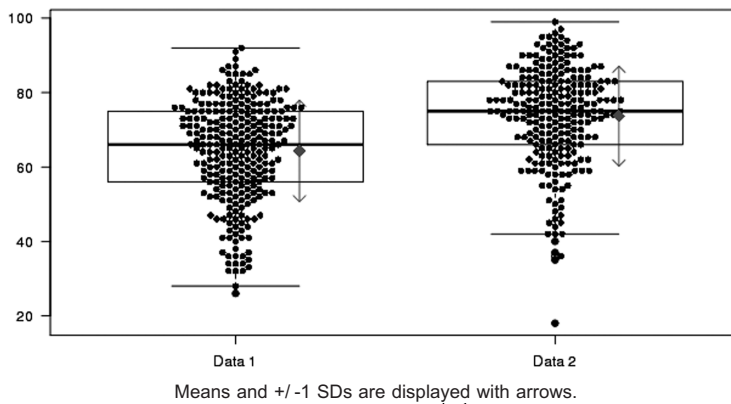


Figure 4 Results of the post-tests. Data 1 displays the results of the control group and Data 2 displays those of the experimental group.

most of the students increased their scores on the post-test. The average pre-test score was 60.03, while that of the post-test was 73.65, indicating an increase of approximately 13 points ( $p = 0.000$ ,  $d$  [95% CI] = 1.03[0.91, 1.15]).

Table 7 Results of the Pre-tests and Post-tests of the Experimental Group

	<i>Mean</i>	<i>SD</i>	<i>Median</i>	<i>Min</i>	<i>Max</i>
Pre-test	60.03	12.77	61	29	86
Post-test	73.65	13.42	75	18	99

Note.  $n = 241$

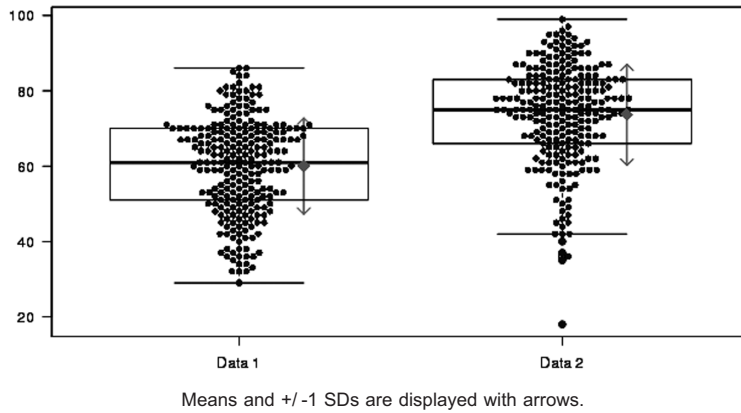


Figure 5 Results of the pre-tests and post-tests of the experimental group. Data 1 displays the results of the pre-tests and Data 2 displays the results of the post-tests.

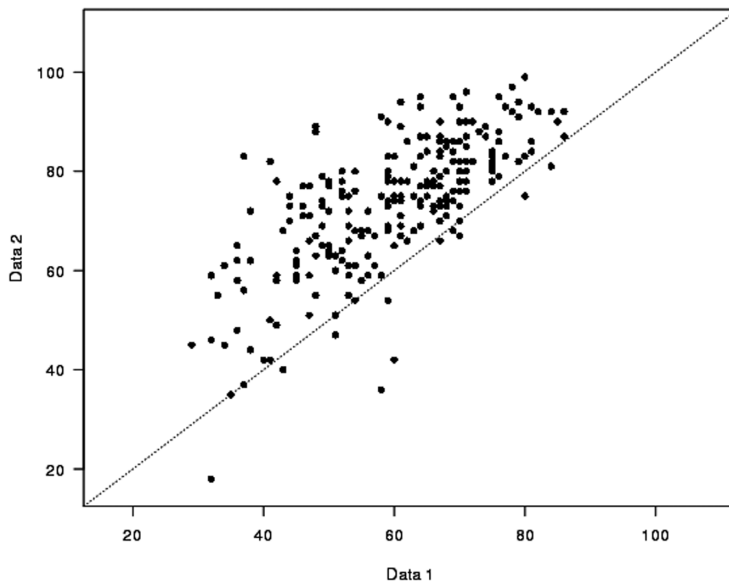


Figure 6 Results of the pre-tests and post-tests of the experimental group. Data 1 displays the results of the pre-tests and Data 2 displays the results of the post-tests.

## 7. Discussion

### 7.1 Qualitative Research

There are five main types of spelling errors. It became clear that not just homonyms, but also words that share some of the same pronunciation yet are spelled differently, can also be an obstacle with the current testing method. It should be noted that students' spelling might be incorrect; however, their Japanese equivalents were mostly correct. Furthermore, regarding the misspelling of words, teachers must ask themselves whether students are technically "wrong" when they understand a word's meaning or can identify its usage in a sentence, but simply do not know the correct spelling. The vocabulary test score in the current program, with its focus on correct spelling, may in some cases inaccurately underestimate a student's knowledge of certain vocabulary.

Common misspellings of "raw" indicate how the four words: "raw," "law," "low," and "row" are difficult to distinguish when presented only orally without any context. Students might have answered differently if it had been read in a meaning-based context. As for the words "occur," "strength," "downstairs," and "intelligence" that were also on the pre- and post-tests, it is interesting to learn that the accuracy rate of these four words on the pre- and post-tests was high. For example, 56 students out of 60 answered with "occur" correctly, and 55 students answered with "downstairs" correctly. This shows that depending on the format of the testing method, how well or poorly students do on the test may vary greatly despite their actual knowledge and understanding of the vocabulary.

The test format in the pilot approach solves the issues clarified above because it tests the vocabulary in context. Additionally, it does not require perfect pronunciation of the test words on the teachers' and the students' parts, nor fluency in Japanese to mark the Japanese translations, which were drawbacks described earlier. It ensures that there is consistency in the testing procedures and evaluates students' knowledge of the vocabulary effectively.

### 7.2 Quantitative Research

Table 5 and Figure 3 show the results of the pre-tests. It is obvious that there were no significant differences between the control group and the experimental group, which indicates that there was not much difference in their English proficiency and knowledge of the vocabulary before the pilot teaching and testing. As seen in the results of the post-tests shown in Table 6 and Figure 4, it is clear that the control group improved: the average of the pre-test being 61.79 and that of the post-test being 64.29. Lastly, the experimental group, which had worked on additional vocabulary exercises regularly twice every three weeks over a period of nine weeks, has shown a greater improvement in scores in comparison with the control group, which had not had the same opportunities to study the vocabulary frequently. The results clearly reveal that regular studying of the vocabulary helps students retain vocabulary.

As previously stated, vocabulary exercises on LUNA were available and optional for the

experimental group only. The students who had more significant increases in scores tended to complete exercises on LUNA. For example, one student's score increased by 30 points, from 63 to 93. This student's pre-test score was higher than the average in the beginning, but still, there was an increase of another 30 points. This individual completed all of the exercises on LUNA. This student's improvement may be an indication that in addition to doing practice exercises in class, working on vocabulary exercises on LUNA may also contribute to improving student's scores.

## 8. Conclusion

The purpose of this study was twofold: to investigate whether utilizing the item bank might address issues with the current testing method and to examine if the use of an item bank might help students learn more vocabulary. First, the results show that modifying the current format of the vocabulary tests should be considered in order to better assist students in learning vocabulary and also to avoid the prevalence of spelling errors it induces and penalizes students for. The alternative pilot approach, using a multiple-choice context-based question format for practice and testing, solves a number of both educational and administrative issues described previously. Second, it has been confirmed that more opportunities to work on the vocabulary exercises inside and outside of class regularly enhances the students' retention of the vocabulary. Furthermore, the item bank that has been developed can be easily implemented.

In addition to learning the technical terms and English specific to their major fields of science, students in the School of Science and Technology need to also master TOEIC vocabulary. They need a two-pronged approach that will help them learn relevant science-based vocabulary as well as the vocabulary and test-taking techniques that will help them achieve the required scores they will need on the TOEIC. The pilot project described in this paper provides an effective way of utilizing an item bank to help students master TOEIC vocabulary through relevant practice exercises and appropriate, efficient testing that more closely reflects the TOEIC format.

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