Vocabulary-Enhanced ESP for Physical Therapy

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Abstract
A large population uses English for Specific Purpose (ESP) instructions with a content-based approach in Japanese universities. Given this trend, various studies have been conducted that focus on ESP's theory, status, effects, and issues. Many have suggested further effective implementation of the ESP program, thus emphasizing the importance of acquiring vocabularies. Believing in the requirement of learning vocabulary to implement effective ESP instructions, the current study focuses on students' vocabulary learning, their vocabulary size and ESP corpus development in an English as a Second Language context. Participants are 98 university students majoring in physical therapy (PT). The study first performs a needs analysis for designing the vocabulary-emphasized instruction. The instruction involves various types of vocabulary-enhanced activities, including word list construction (index), translation and definition exercises, fill in exercises, and round up tests. The instruction's effectiveness is measured by students' pre- and post-test vocabulary scores. The numerical and correlational analysis is performed using the IBM SPSS Statistics software. The results of the vocabulary size test and PT corpus vocabulary tests are also included in the analysis. Although significant improvements in students' vocabulary acquisition were not observed, examining each vocabulary item helps understand students' learning tendencies and difficulties. Further studies are needed to delve into various factors such as students' autonomy and vocabulary learning strategies in vocabulary acquisition. It is believed such examination will help to design successful ESP instructions.

Keywords: English for Specific Purpose, Physical Therapy, Vocabulary-Emphasized Instruction

Introduction

Following the transfer of university curriculum control from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in 1994, each university shifted its English curriculum to adapt to internationalized or globalized societies. As a result, ESP (English for Specific Purposes), EMI (English as a Medium of Instruction), CLIL (Content and Language Integrated Learning), and CBI (Content-Based Instruction) succeeded the more traditional general English courses. In such instructions, students are expected to expertly utilize their practical English skills and knowledge to function in this global society. Taking into consideration students' English proficiency and motivation levels, vocabulary-enhanced instruction is considered as suitable and effective. Although such instruction has been practiced, the effectiveness has not been evaluated. Therefore, this study aims to measure the effectiveness of vocabulary-enhanced instructions using various vocabulary measurements. It is believed such information will help review and modify this particular approach.

Literature review

The literature review covers the following topics:

1. Tertial English education in Japan
   - EMI (English as a Medium of Instruction)
   - CLIL (Content and Language Integrated Learning)
   - CBI (Content-Based Instruction)
2. ESP (English for Specific Purposes)
   - Overview of ESP
   - Difficulties in constructing the ESP instructions
3. Vocabulary
   - Importance of vocabulary learning
   - ESP vocabularies
   - Vocabulary size of Japanese students

1. Tertiary English education in Japan

In 1994, the MEXT decided to largely hand over its control of university curriculum to the individual universities. Subsequently, this has led to rapid growth or changes in English courses. Each university shifted its English curriculum, promoting students' practical skills so they could function well in our globalized society. Notably, the growth of ESP, EMI, CLIL, and CBI instructions has been observed at a tertiary level. As such, this section summarizes EMI, CLIL, and CBI in relation to tertiary levels of education in Japan.

EMI (English as a Medium of Instruction)

Dearden (2015) explains the rapidly growing global phenomenon of EMI. In her report, she defined EMI as "the use of the English language to teach academic subjects in countries or jurisdictions where the first language (L1) of the majority of the population is not English (p. 2)." In Japan, the MEXT introduced the Top Global University Project (TGUP) in 2014 and heavily invested in the internationalization of higher education, thereby aiming to increase the number of its EMI courses in Japanese universities.

According to a MEXT survey (2019), 309 out of 774 universities (about 40%) in Japan offered certain types of EMI programs; however, some have criticized this particular

government policy. Phan (2012) argues MEXT English language policy over-promotes English and undermines local languages for the sake of internationalization. Kuwamura (2019) examined the situation of EMI using a questionnaire targeting 260 colleges and universities in Japan offering EMI courses. The study found a shortage of qualified faculty who could effectively deliver academic content in English. Leong (2016) explored constraints in implementing EMI programs at Japanese universities. He argued several major factors hindered the implementation which included a lack of trained teachers, students' English proficiency and motivation in learning English, institutional culture, an English-speaking environment, and finally, a lack of understanding of EMI by top-level management. Aizawa and McKinley (2020) presented the inconsistencies in university policies and reported practice as students with low proficiency levels need language support. The study called for an investigation regarding the English language level required for EMI teaching and learning, the effectiveness of EMI for improving students' language knowledge, the aims of EMI, the role of L1 in EMI, challenges placed on students and teachers, and support and training consideration for students and teachers.

CLIL (Content and Language Integrated Learning)

CLIL approaches can be traced back to the mid-1990s, originating in European secondary schools. Mehisto and Marsh (2008) defined CLIL as an approach used to lead dual-focused education where attention is given to both topic and language. Furthermore, an additional language is used as a medium in the teaching and learning of non-language content. The 4 C's framework from Coyle et al. (2010) suggests the 4 C's framework of CLIL. In this regard, the CLIL consists of four crucial elements—content, communication, cognition, and culture, key to deeper learning and understanding intercultural awareness.

Advocates argue CLIL has great potential in the area of facilitating English as a second language. Ikeda (2011) contends CLIL is designed for students not only to acquire new knowledge, but also to be able to apply their knowledge to solve problems and develop interactive skills to collaborate with others to solve larger problems. Tanaka (2019) examined the compatibility of CLIL to Japanese higher education. Through examining the concepts of CLIL and an implemented CLIL course, she concluded CLIL serves as an excellent approach to teaching both content and English as a part of a larger goal, which matches goals of the 21st Century Skills and Global Competencies. Thus, CLIL is believed to help students prepare to meet the challenges they might encounter in their future endeavors.

CBI (Content-Based Instruction)

There has been a dramatic increase in the number of degree programs taught through English; specifically, through Content Based Instruction (CBI) in Japan. Many definitions refer to CBI as an umbrella term covering all approaches that teach subject matter in a second language. Brown and Bradford (2016) argue the use of CBI as an umbrella term is too broad. Thus, they defined it as an approach to language teaching in which content, texts, activities, and tasks drawn from subject matter topics are used to provide learners with authentic language input and engage them in authentic language use (p.332). Hirai (2015) suggests using CBI to foster higher order thinking skills in Japanese settings after observing CBI classes in the United States. She believes in the importance of setting goals for language development and content understanding; notably, this includes the four language skills and providing rubrics, which promoted the cohesive integration of all learning. Kobayashi (2015) examined the students' reaction to CBI in college reading classes. The results showed CBI promotes students'

language learning and motivates them to learn by analyzing their responses. Shibata (2019) studied the effectiveness of CBI on beginners' writing skills. In fact, his nine months of study at a private senior high school in Japan showed the participants improved their writing abilities regarding the number of tokens used and the increase of supporting sentences.

2. ESP (English for Specific Purposes)

Since the current study focuses on ESP, this section of literature review places emphasis on ESP.

Overview of ESP

ESP is defined as a subset of English as a foreign language (EFL). It refers to the teaching of English that focuses on developing communicative skills in a particular field or occupation and is designed to help learners master relevant vocabulary, expressions, and other elements of English needed to function well in a specific field. Dudley-Evans (1997) contended the definition of ESP has absolute and variable characters. The absolute features of ESP are: 1) ESP is defined to meet specific needs of the learners; 2) ESP makes use of underlying methodology and activities of the discipline it serves; and 3) ESP is centered on the language appropriate to these activities in terms of grammar, lexis, register, study skills, discourse, and genre.

Although ESP has a long history—which began in the early 60—the ESP movement in Japan started developing in the 1990s and eventually showed rapid growth, thereby becoming one of the most prominent areas of EFL teaching today. The reasons behind this rapid growth are closely related to MEXT's emphasis on practical skills to function well in our global society. Sugiyama (2021) argues the necessity of ESL is recognized when the Central Education Council of MEXT suggests English education should be designed in accordance with students' specialized fields. Meanwhile, Amano (2014) points out an information-oriented society—which includes the Internet and mobile phones as well as rapid globalization—is responsible for ESP approaches in tertiary levels of education.

Many universities reported how their ESP approaches work (Yokoyama, 2005; Hirouchi, 2012; Mullaer, 2015; Ishikawa & Ito, 2017; Davis et.al, 2020).

Difficulties in constructing the ESP instructions

Dudley Evans and St. John (1998) presented five different roles that should be accomplished by an ESP practitioner: teacher, collaborator, course designer and materials provider, researcher, and evaluator. Specifically, a course designer develops or selects materials and textbooks while being concerned about the authenticity and level appropriateness of the content. A collaborator works directly with content teaching instructors in material development; moreover, they also evaluate learning outcomes, which include students' knowledge and skills, assessing the outcomes, and the effectiveness of instructions. Since ESP teachers have such various roles to play, they tend to face many difficulties in teaching.

As such, there are specific difficulties that are associated with this situation. First, in ESP instruction, emphasis is placed on both learners' English skills and their knowledge in the content area. Yamada (201?) suggests ESP materials should be authentic, organized, and rationalized. She argues such content quality has great influence on students' learning and

their motivation. Meanwhile, it is assumed that students have well-founded basic knowledge needed for understanding ESP materials. However, if too much emphasis is placed on the context, students do not develop language skills. Therefore, beside the authenticity and level appropriateness, well-balanced materials should be necessary.

The second concern is students' English proficiency level. Currently, many universities in Japan face the issue of low academic achievement among students. Many students are admitted by a recommendation-base and so their academic proficiencies are not measured or evaluated through the entrance examination. As a result, underprepared students have been increasing. Okamo (2012) argues that students should have enough English proficiency before learning ESP materials. He argues that if students with low English proficiency levels have little knowledge in the content area, they suffer from difficulties not only in language but also in understanding content. So, and increase in students with low English proficiency create a situation in which the gaps with students who entered the university through general entrance examination become wider.

Besides such specific concerns, Orr (1998) points out while many studies deal with specific applications of ESP, it is still important to address the broader issues. These issues include establishing clear learning goals, examining the needs and levels of students, selecting or developing content that matches with learning goals and students, and considering ways to deliver instructions.

Considering such matters, it is not easy to create a syllabus regarding the aims of the instruction as well as the determination on focusing on certain levels while helping individual students build their foundation of language skills. Instructional goals and learning objectives that match the educational goals and school philosophy should be clarified while guaranteeing the quality of education so that students can promote their practical English skills and knowledge, and functions well in the global society.

3. Vocabulary

Importance of vocabulary learning

As Meara (1980) argues, vocabulary was once a neglected aspect of language teaching and learning; additionally, it has been acknowledged as L2 learners' greatest source of difficulty. Previous research indicates vocabulary teaching may be problematic because many teachers are not confident about best practices in vocabulary teaching and at times do not know where to begin to form an instructional emphasis on word learning. (Berne & Blachowics, 2008). At the same time, other research reveals vocabulary is the source of many learners' difficulties as learners have inadequate receptive as well as productive vocabulary knowledge. Even learners with higher levels of language proficiency still feel they need to learn vocabulary (Laufer, 1986; Nation, 1990).

Accordingly, some studies suggest the need for a systematic and principled approach to vocabulary teaching and learning. Creating and implementing such an approach is urgent to improve students' ultimate language development. Nation (1982) contended deliberately teaching vocabulary is one of the least efficient ways of developing learners' vocabulary knowledge, but nonetheless it was an important part of a well-balanced vocabulary program. He also indicated a good vocabulary component of a course ensures balanced learning through listening and reading on the one hand, and production through speaking and writing

on the other. Direct formal study of vocabulary and activities helps learners to develop necessary language skills.

Laufer (2000) argues good instruction will promote both intentional and incidental vocabulary learning. The keys for retention depend on the quality of information processes, degree of elaboration, quality of attention, and richness of encoding. Facilitating the intentional learning of vocabulary seems to be critical for English learning. Schmitt (2018) suggests, "A more proactive, principled approach needs to be taken in promoting vocabulary learning."

The following theories and practices may remain controversial but are well- recognized in the vocabulary learning research field.

1. Level of processing, by Craik and Lockhart (1972), concerns the level of processing effects. According to their theory, the depth of mental processing affects memory function. As such, memories that are deeply processed lead to longer-lasting memories; the memories remain with elaborate rehearsal in which the information is analyzed in a deeper way.
2. Involvement of Load Hypothesis (ILH), by Hulstijn and Laufer (2001), concerns the ILH, which is a motivational–cognitive construct of involvement comprising three basic components: need, search, and evaluation. Hulstijn and Laufer claimed the retention of unfamiliar words is contingent upon the involvement load of a task, which can be perceived in terms of the degrees of need, search, and evaluation. The combination of the degrees of these three factors determines its effectiveness in promoting word learning. They argue the greater the involvement load, the more effective the task is.
3. Use of L1 for L2 vocabulary learning. Notably, some research has shown the effectiveness of using L1 for L2 vocabulary learning, like Liu (2008).
4. Teaching etymology (affix, suffix, and root). It is quite common for over 10% of the words in a text to contain a prefix or a suffix (Vocabulary in ESP, p. 6). Therefore, teaching knowledge of prefixes and suffixes is a useful strategy to improve students' vocabulary knowledge, which also enhances their awareness of such prefixes and suffixes.
5. Other deliberate teaching practices—such as making word lists, word association practices, and repetition through a variety of activities—enhance retention and are effective ways to facilitate vocabulary learning.

ESP vocabularies

Although vocabulary acquisition is an essential part in any type of English learning environment, the mastering of vocabulary becomes vital for ESP. Nababan (1993) mentions the vocabulary component is a core part of ESP programs and that vocabulary is the most prominent feature of a register. Therefore, he argues vocabulary learning and acquisition are essential in ESL course design.

In fact, there are some distinctive features of vocabularies in ESP. According to Zaharan (2017), ESP vocabularies have the following characteristics: They are used less frequently in everyday situations; they are learned for specific uses related to a particular field; they include many abstract terms; and they are designed around the needs of the students in their fields. In light of these features, learning vocabulary plays a crucial role in successful learning in ESP programs. Sinadinovi (2013) points out the difficulty of the vocabulary in medical English. He argues it is highly technical, having restricted, specific meanings within

the field. Moreover, there are numerous collocations, an abundant use of synonyms, abbreviations, and eponyms, and much of the vocabulary has Greek and Latin origins. Sinadinovi argues such characteristics of the vocabulary make it a very demanding subsystem of ESP. However, Nation (2001) argues vocabulary learning should be directed to more specialized areas when learners have mastered the 2,000 to 3,000 words of general usefulness in English (p.187).

Therefore, it is critical for teachers to make a careful selection of vocabularies that range from general use vocabulary, academic use vocabulary, and specialized vocabularies specific to a particular field.

Vocabulary size of Japanese students

There have been numerous studies of Japanese learners' vocabulary sizes. Shillaw (1995) and Barrow, Nakanishi, and Iishino (1999) suggest the vocabulary size of non-English major Japanese university students is between 2,000 (by Shillaw) and 2,300 (by Barrow et al.) word families. In these studies, vocabulary knowledge was assessed using over 3,000 word families for which students are required to complete self-checking familiarity surveys. Such a self-checking approach depends heavily on students' recall rather than measuring receptive reading vocabulary knowledge.

Several studies widely applied and used vocabulary tests based on studies by Nation or Schmitt. McLean, Hogg, and Kramer (2014) studied the vocabulary size of Japanese students and its relation to university department standardized rank scores using Nation's Vocabulary Size Test (VST). The results estimated an average score of 3,715.20 word families; specifically, the VST scores were significantly higher for students in departments that were ranked more highly on standardized tests. Furusho (2005) studied the relationship between university students' vocabulary knowledge and English standardized tests using the Vocabulary Level Test (VLT) version 1 by Schmitt (2000); the VLT version 2 by Schmitt, Schmitt, and Clapham (2001); and the Vocabulary Levels Dictation Test (VLDT) by Fountain and Nation (2000). The study found a significant correlation between the VLDT and VLT, with the highest correlation at the 3,000-word level.

Several studies claim Nation's vocabulary test is not suitable for the Japanese population. Three studies used Mochizuki's Vocabulary Size Test.

First, Nonaka (2004) used Mochizuki's Vocabulary Size Test in a study of 172 university students at the lower intermediate level, and estimated the students' vocabulary size as 3,772.9 words. In another study (2009), he examined the vocabulary size of junior college students whose level was similar to that in the previous study. In this study, he looked at the changes of subjects' vocabulary size over nine months. His pretest and posttest estimated a vocabulary size of 3679.7 and 4130.1, respectively. Nonaka states the test in 2004 was conducted in September while the second tests were performed in April and the next January. Therefore, he suggests an estimate of Japanese university students' vocabulary size as 3,600 to 3,800.

Chino and Ominato (2007) studied the development of the vocabulary size of students at a college of technology using Mochizuki's Vocabulary Size Test. The study found the average vocabulary size of first-year students is 2,370, that of second-year students is 2,612, and that of third-year students is 3,417.

Katagiri (2007) investigated the vocabulary size of Japanese high school students, having tested them four times over three years. The average vocabulary sizes (two tests) of the first-year students were 2,423 and 3,111, while the averages for the second-year and third-year students were 3176 and 3525, respectively. The study further revealed that 63.9% of the students made little or negative progress in their second year and 42.2% of them made little or negative progress in their third year.

Although Mochizuki's test is widely used with Japanese subjects, some research points out it yields higher estimated scores than other tests. Mochizuki's test includes vocabulary items for which the examinees could guess the correct answers.

Two studies developed original tests to measure students' vocabulary size. One of these studies, Ishihara, Okada, and Matsui (1999), developed a vocabulary recognition and production test based on Yoshida's List, comprising two sub-lists of 1,200 words of "Vocabulary for College Study." They provide a tentative estimate of participants' recognition vocabulary ranging from 2,000 to 2,500 word families.

The other one, Igarashi (2003), was a study involving anxiety and its relationship with vocabulary size among 477 college students in five different majors. In order to measure students' vocabulary size, she used the JACET 8,000 words, randomly choosing 10 words from each of eight levels. While Japanese college students' average vocabulary size is 1,800, her subjects' vocabulary size was about 1,797. Physical therapy (PT) majors had the highest mean of 2,140.66, while social welfare majors had the lowest mean, 1,541.71.

In short, the vocabulary sizes of Japanese university students have been tested using various measures as described above; also, the reliability and validity of most of these tests have been tested. The sizes estimated by the Nation's test are about 2,000 to 2,500 words, while other measures indicate a range from 1,541 to 4,130, with the averages ranging between 2,370 to 3,800 words.

Discussion of the significance of the results of the work

Literature review reveals the ESP approach has been gaining momentum at the tertial level in Japan. Although certain research reported various ESP approaches, difficulties in constructing materials, and the importance of the acquisition of ESP vocabularies, few studies provide specific vocabulary learning approaches. At the same time, cases of evaluating such activities are not observed. Therefore, the current study presents a concrete example of vocabulary learning instructions and its examination of the effectiveness through student outcomes. Ultimately, it is hoped the current study would help designing effective ESP instructions with an emphasis placed on vocabulary learning.

Methodology and Methods

Purpose of the study

The current study aims to first present an example of vocabulary-enhanced instruction, and then move to evaluate the effectiveness of the instruction. The effectiveness is measured by students' outcomes with regard to their vocabulary learning.

To achieve the latter, three types of vocabulary tests were prepared as follows:

1. VST: Hamad et al. (2021) developed a VST for Japanese EFL learners, using the New JACET List of 8,000 Basic Words (VST-NJ8). It consisted of the current study level 1 to level 5, concluding 100 words. It was administrated at the beginning of the school year.
2. Vocabulary test for the semester (pre- and post-): In total, 100 key terms were selected through the textbook. This test was performed twice, at the beginning and the end of the semester.
3. PT corpus (pre- and post-): From Miyamoto et al., Miyamoto developed a list of ESP vocabulary for PT. The current study involves 50 words, including 25 frequently used terms from the RA (research article) corpus and 25 frequently used PT terms. This was also administrated at the beginning and the end of the semester.

In all the above measurements, there were questions requiring students to match English and Japanese via a multiple choice approach.

Participants

The classes involved were two PT major classes, each consisting of 33 students. A total of 66 second-year students majoring in PT, received required English instruction. This session was held once a week for 90 minutes; specifically, there were 15 sessions in a semester. For their referencing, they used an originally developed textbook, ESP for Physical Therapy.

The participants were notified their scores would be used for the study while protecting their confidentiality; in addition, the data would be anonymous and would not influence their grades. The data were entered in SPSS for descriptive approaches, including rank/order, numerical interpretation, distribution, and frequency; correlational analysis was employed to assess the relationships among variables.

Vocabulary-enhanced instruction

Principles used for the introduced vocabulary emphasis instruction.

Although the research findings described in the literature review are still controversial, the presented vocabulary activities adhere to the principles listed below.

1. Deliberate (Explicit) vocabulary teaching: A large amount of research supports the idea that explicit instruction is effective for vocabulary learning (Rinaldi, Sells, & McLaughlin, 1997).
2. Repetition/recycling: According to empirical studies (Gu, 2003; Schmitt, 1997), repetition strategies are crucial, especially when starting to learn vocabulary.
3. Key words first (Making word lists first): The research suggests when students are taught key words before reading the text, they have a greater comprehension than students who do not receive this instruction (NRP, 2000).
4. Prefix/suffix teaching: Some studies suggest teaching the knowledge of prefixes and suffixes is a useful strategy to improve students' vocabulary knowledge (Nakayama, 2008; Wu, 2014).
5. Variety of activities: Better learning outcomes can be expected when students are exposed to a variety of activities. (Nation, 1990; Stahl, 2005).

Using a vocabulary-enhanced instruction in this study

Instead of EMI or CLIL, the presented instruction uses ESP instruction, combined with CBI. Here are the reasons: First, our English curriculum aims to have students promoting their necessary and practical PT skills. Second, our students are not motivated to study English since they believe they do not need English skills in their career; subsequently, many are taking English just because it is a required course. Therefore, if the instruction is related to their future field, it is hoped their motivation would be promoted while using their content knowledge. Moreover, the English proficiency levels of our students are low. In particular, they have a weakness of vocabulary and grammar due to their previous education. Classes are also mixed-level classes and have a variety of students. Therefore, it is determined that using EMI or CLIL—which require certain student proficiency levels—is not level appropriate.

Moreover, it seems necessary to implement instruction in which students develop their vocabularies first so they would have a better understanding of the content.

English textbook used in the class

English II-1 and II-2, which are required courses for second-year students in the Health Science Department, use original university English textbooks created by instructors. English II classes use major-specific English for Rehabilitation Purpose (ERP) textbooks for Physical Therapy (PT), Occupational Therapy (OT), and Welfare and Psychology (WP). The classes involved in the study used the PT textbook.

These are the units common for all majors:
Unit 1: Regenerative Medicine & Rehabilitation
Unit 2: Brain & Its Function
Unit 3: International Classification of Functioning (ICF), Disability & Health

The units for major-specific topics (for PT) are as follows:
Unit 1: Stroke
Unit 2: Osteoarthritis
Unit 3: Parkinson's Disease
Unit 4: Spinal Cord Injury
Unit 5: Diabetes
Unit 6: Lower Back Pain

Appendix
1. Medical Terminology (Muscles)
2. Glossary
3. Physical Therapy

Summary of the vocabulary enhancement instruction

For this study, Spinal Cord Injury (Unit 4), from the textbook was used as an example.

The activities are implemented through the following steps.

1. Preparation
As vocabulary is a fundamental component of ESP courses, carefully choosing target words is necessary. With this consideration in mind, 20 target terms were chosen (e.g., central nervous system, cervical, dysfunction, spine, paraplegia, and lumbar). Based on these 20 terms, homework is then developed.

2. Homework
Before starting a new unit, students are required to complete their homework. For the homework, the students have to match each target term with a Japanese translation.

3. Creating a glossary sheet
A vocabulary list including the key terms necessary for understanding all of the materials in the unit is developed. In the left column, the English terms are listed, while the Japanese terms are listed in the right column. The key terms mentioned above are written in red and their Japanese translations are left blank. The students have to complete these Japanese translations. (See Appendix A)

4. Explanations using the glossary sheet
The instructor goes through all of the key terms, checking the answers (meanings and usage).
Have students pronounce all of the key terms as well as other important terms.
Add some explanations if necessary.

5. Etymological analysis (prefix, suffix, and root) for medical terms
The instructor explains the prefix, suffix, and/or root of each word where possible.
e.g., quadr(i)-/tetra means 4 (also in Japanese)
plegia means paralysis

6. Vocabulary exercise
For the Vocabulary exercise, two types of the activity sheet are given. One matches the term with the appropriate explanation and the other involves filling the blanks for the given term.

7. Other activities
The textbook includes the following materials and students use their glossary sheets as necessary. All activities use the key terms:

1. Reading materials
2. Grammar
3. Listening
4. Speaking activities (e.g., giving advice)
5. Other activities

8. Quiz for each unit
At the end of each unit, a vocabulary quiz for the key terms is given (Matching English and Japanese).

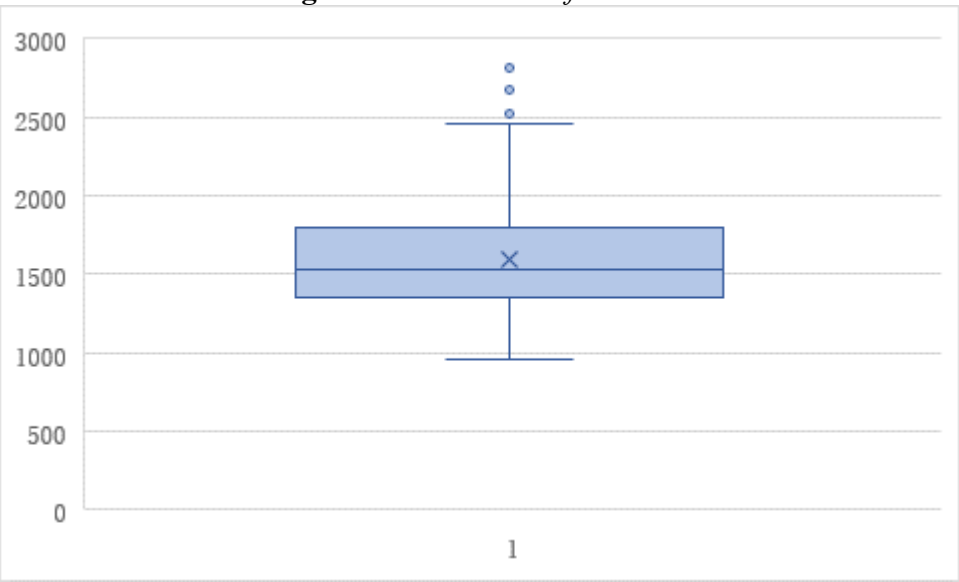
9. Quiz for a semester
Moreover, at the end of semester, the quiz for all terms learned throughout the semester is given (Matching English and Japanese).

Findings (Evaluation of the instructions)

The results of the VST

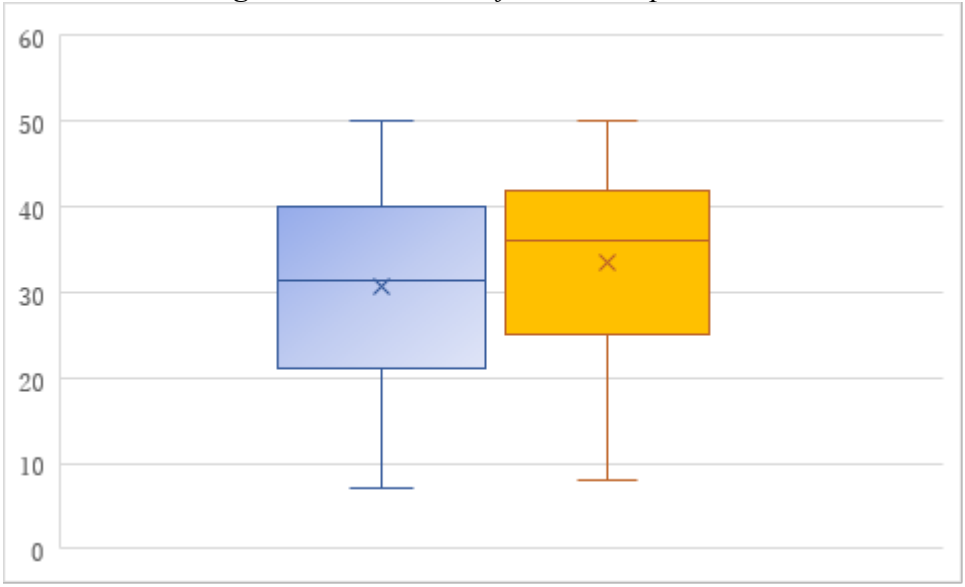
The following graph (Figure 1) shows the results of the VST. The average score is 1,578.71, the medium is 1,530, ranging from 960 to 2,820. The box plot shows the scores are clustered in the middle. The interquartile range was 1,350 to 1,800 and the outliers are only three, which is 2820, 2670, 2520. The available research found the average of VST scores for Japanese university students are between 2,370, which is the lowest among various studies to 4,130, the highest among studies. Compared to such an average score, this result shows the students' VST is much lower.

Figure 1. *The results of the VST*



The results of the PT corpus test

Figure 2. *The results of the PT corpus tests*



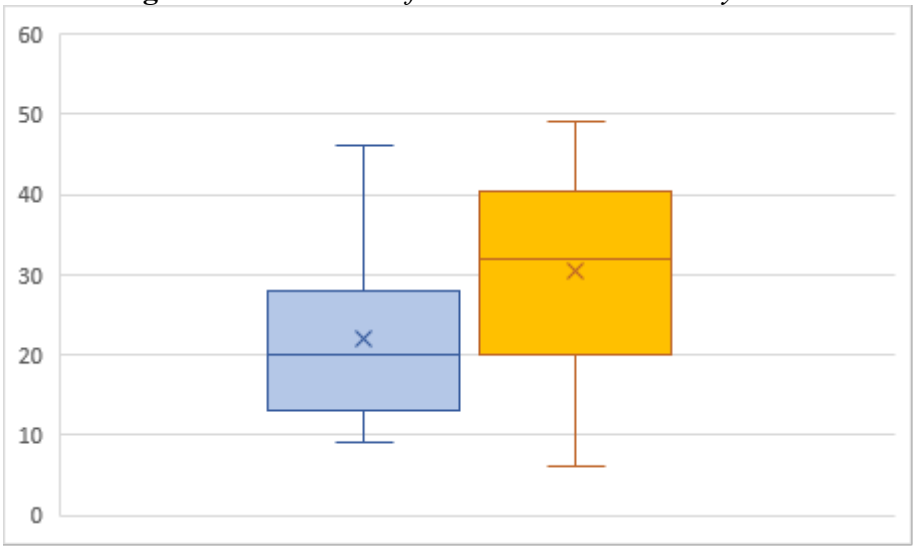
Left: The results of the first test. Right: The results of the second test

The above graph (Figure 2) shows the results of the PT corpus test. The left graph describes the first test whereas the right shows the second test. The average score on the left is 30.74; the medium is 33, ranged from 7 to 50. The average score on the right is 33.63; the medium is 36, ranged from 8 to 50. Although the score of the end of the second test as well as average score are higher than the first test score, the statistical analysis (t-test) found there is no significant difference.

The results of the semester vocabulary tests

The next graph (Figure 3) shows the results of semester vocabulary tests. The left graph shows the pretest whereas the right shows the posttest. The average score on the left is 21.82, medium is 19, ranged from 9 to 46. The average score on the right is 30.50, medium is 32, ranged from 6 to 49. The score from the end of the semester as well as the average score are higher than the scores of the beginning and the t-test proved the difference is significant. When you look at the interquartile range, the left one has 13 to 28 while the interquartile of the right is 20 to 40.5. It is also clear that the right one has longer lower whisker.

Figure 3. *The results of the semester vocabulary tests*



Left: The results of the first test. Right: The results of the second test

Correlational Analysis

The next table shows the results of a correlational analysis of each test.

As it is observed, a very strong correlation (.091) was found between the first PT corpus measurement and the second PT corpus as well as between the first semester vocabulary test. At the same time, high correlations are also found in the same tests. The correlation between the first PT corpus measurement and the second corpus test was .743 whereas the correlation of the first semester vocabulary and the second semester vocabulary test was .689. On the other hand, although correlations between the VST and each measurement was found to be rather weak, ranging from .243 (with the first semester vocabulary test) to 366 (with the post-PT corpus test).

Table 1. *Correlational analysis of each measurement*

		Sem. 1	Sem. 2	Co.1	Co.2	VTS
Sem. 1	Pearson's correlation	1	.689**	.587**	.640**	.243
	Sig. (2-tailed)		.000	.000	.000	.053
	N	66	65	62	65	64
Sem, 2	Pearson's correlation	.689**	1	.672**	.901**	.342**
	Sig. (2-tailed)	.000		.000	.000	.006
	N	65	65	61	65	63
Co.1	Pearson's correlation	.587**	.672**	1	.743**	.365**
	Sig. (2-tailed)	.000	.000		.000	.004
	N	62	61	62	61	62
Co.2	Pearson's correlation	.640**	.901**	.743**	1	.366**
	Sig. (2-tailed)	.000	.000	.000		.003
	N	65	65	61	65	63
VTS	Pearson's correlation	.243	.342**	.365**	.366**	1
	Sig. (2-tailed)	.053	.006	.004	.003	
	N	64	63	62	63	64
**. Correlation is significant at the 0.01 level (2 tailed); p <.001						

Sem.: Semester vocabulary test
Co.: PT corpus test

Conclusions, Implications, and Limitations of the study

The results of the test suggest the possibility of the modification of the instructions as well as the measurement method.

First, the study found extremely low VST scores among the participants; so, these students need to build their foundation of vocabulary. Although the instruction is aimed to increase vocabulary, the basic competencies—including understanding functional words—are necessary before acquiring skills and knowledge needed in the ESP context. Therefore, utilizing opportunities for building such basic vocabulary knowledge is urgent. In the studied university, ESP material in PT is provided for the second-year students. Therefore, during their first year, students should be exploring in various activities for building their basic competency in which ESP in rehabilitation in general is implemented. Then, they should shift their efforts in the direction of more specialized ESP in PT.

Second, although vocabulary measurements show the improvement in both the semester vocabulary test and PT corpus, reviewing semester vocabularies are necessary. It is believed a close match between two tests is more practical and productive. At the same time, the number of items in tests is set at 50; yet, for further examination, the number should be increased to 100 so more accurate and precise data would be accessible. Hence, it would increase reliability.

The study also found a wide gap between the first and the second semester vocabulary tests. The interquartile range became wider with longer lower whisker in the second test. It is clear that the gap among students becomes wider in which some students with lower vocabulary scores become more evident. As such, it is necessary to consider these students with difficulty in acquiring new vocabularies. One possibility is vocabulary learning strategies can be suggested. In order to provide necessary support, an analysis on students' vocabulary learning strategies would be necessary. Based on such data, appropriate and effective strategies can be suggested. Meanwhile, it should be recognized that several students have high scores in vocabulary tests. Therefore, strategies for improving their potentials should be sought. Suggesting watching online English sites, using English learning applications, or challenging certified English proficiency tests are some examples.

Since the circumstances of tertiary education constantly change, a continuous need for analysis as well as evaluations are necessary to assure the quality of education.

In this regard, this study has some limitations. First the study involves a limited number of subjects (N = 66) who are focused on PT majors. Therefore, generalizability of the study may not be applicable. Another concern relates to the measurement. The validity or reliability of the semester vocabulary test has not been tested.

Although such limitations should be called into account, the study argues the students should have become familiar with the language used in the specific community through vocabulary-enhanced activities. Such activities are believed to increase their awareness of how language features are used in their subject areas.

Ultimately, it is hoped the current study may shed light on the design and implementation of effective vocabulary teaching in ESP. The results of the study would provide a reassuring guide for improving not only the designed vocabulary activities in the rehabilitation field but also other programs in similar fields. At the same time, it is also hoped that it will help raise awareness of the importance of ESP vocabularies and improve a student's ability to productively use such vocabularies.

Appendix A

A section of the glossary note (Unit for SCI) Only a part

accept	受け入れる	sensory paralysis	( )
acceptance of disability	( )	severe	重篤な
adequate	十分な、適切な	social resource	( )
appropriate	適切な	spine	( )
at present	現在のところ	strengthen	( )
autonomic	( )	suffer from	~に苦しむ、～を患う
autonomic dysfunction	自律神経機能障害		
autonomic nerves	自律神経	swelling	腫れ
available	利用できる	temporarily	一時的に
cause	原因、原因する	tetraplegia	( )
central nervous system	( )	thoracic	( )
certified	認定された、有資格の	trauma	( )
cervical	( )	trunk	体幹、胴体
		tumor	( )

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