



Enhancing Undergraduate Students' Business English Vocabulary Knowledge through Digital Game-Based Learning

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Abstract: This research aims to explore the effects of Digital Game-Based Learning (DGBL) on the development of undergraduate students' vocabulary knowledge in a Business English Course and to examine students' opinions of this teaching approach. The participants are 60 first-year Thai students majoring in Modern Trade Business Management in the Faculty of Business Administration at a private university in Thailand. The researcher divided the participants into two groups: an experimental group and a control group. This study employed a mixed-methods approach by collecting quantitative data from a pretest, a posttest and a questionnaire. Qualitative data were collected by a semi-structured interview, a questionnaire, and student journals. The results showed vocabulary knowledge of the experimental group with a pretest mean score of 11.03 and a posttest mean score of 14.12, which reflected a statistically significant difference of this study ($t = 5.361$, $p = 0.000$). However, the control group's scores showed no significant difference in this study. The qualitative findings also revealed that the experimental group had positive opinions of digital game-based learning because it increased engagement, and entertainment. This study highlights the benefits of DGBL in developing students' business English vocabulary knowledge by reviewing their vocabulary as a self-study tool outside of the classroom. It is useful for English teachers to employ this approach in English classes for teaching in higher education.

Keywords: vocabulary knowledge, digital game-based learning, motivation, business English

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Introduction

English is currently the first language of 373 million people. In contrast, approximately 1.08 billion people speak English as a second language (de Girolamo et al., 2024). In Thailand, the educational system specifies that English is a compulsory subject from primary to higher education levels. This reflects the importance of English in the Thai education system. However, many people still face problems to successfully communicate in English, though it has been a compulsory subject for many years. In the educational field, many students struggle in English learning courses, especially with vocabulary acquisition, leading to them to be less successful in communication and self-expression. The famous idea from Schmitt (2000) can support this situation; he

mentioned that students will find it difficult to study if they do not gain sufficient vocabulary knowledge.

English vocabulary knowledge is necessary for the four skills; reading, writing, speaking, and listening, including its breadth (number of words one knows) and depth (understanding of form, meaning, and use) since people employ this knowledge for communication (Nation, 2001; Wilkins, 1972). Regarding vocabulary knowledge, many Thai students have difficulty in this area, especially in English for Specific Purposes (ESP) such as Business English (Changpueng & Pattanapichet, 2023; Low, 2018). This problem affects students' communication in learning and careers (Schmitt, 2000).

Teaching style is one factor that influences students' vocabulary knowledge. Teachers can choose their teaching methods to enhance vocabulary knowledge. In Thailand, teachers employ many approaches in the classroom including Communicative Language Teaching (CLT) and Student-Centered Learning. However, in some places where there are many students in one class or a limitation of teaching materials, the Grammar Translation Method (GTM) is still used. In this approach, students need to memorize contents, often leading to them feeling bored and resulting in poor vocabulary knowledge. (Attachoo & Chaturongakul, 2015; Singsatit, 2020). Other factors include the difficulties of learning in large class sizes and limited English exposure, which affect students' vocabulary knowledge. (Blatchford et al., 2011).

These are the difficulties Thai students face in learning vocabulary, especially in ESP for career opportunity after graduation. They have low motivation and limited English exposure. One way to improve their vocabulary knowledge is integrating Digital Game-Based Learning (DGBL) in English courses. It can increase engagement and vocabulary retention (Kapp, 2012; Prensky, 2001). Moreover, they can enjoy encountering vocabulary in English contexts while playing games.

Employing DGBL in English classes can be effective not only as a vocabulary-learning tool but also as a source of stimulating activities and materials that create a dynamic learning environment. Nation (2008) suggests that the planning stage should focus on four strands: meaning-focused input, meaning-focused output, language-focused learning, and fluency development. Integrating DGBL with these strands can improve students' vocabulary knowledge, motivation, and confidence in using English.

Recent studies in Thailand have explored the use of digital games and the motivation for teaching and learning in the Thai contexts showing both positive and negative results. Some researchers investigated how games improve vocabulary and motivate students to learn English. They focused on public school or undergraduate levels in different fields, for example, nursing, engineering, or general English. (Kongprab, 2019; Rachayon & Soontornwipast, 2019; Rakangthong & Yimwilai, 2020; Supakaew, 2007; Vate-U-Lan, 2015). To fill this gap, the researcher created DGBL named "Challenge Me" in a Business English course for undergraduate students majoring in Modern Trade Business Management to enhance their business English vocabulary knowledge to improve their education and future careers.

This digital game, Challenge Me, is a web-based digital game designed for students to review vocabulary as a self-study outside of the classroom. This study employed Nation's four-strand framework to help teachers manage their lesson plans, emphasizing form, meaning, and use. Additionally, this study focuses on business English vocabulary to enhance English learning and motivation, address teaching challenges, and build students' confidence for their careers. Hence, this study may provide useful information for Thai educators to foster classroom innovation through DGBL to support students' English vocabulary, creating a good atmosphere in English classes.

In this study, there are two research questions as follows:

1. What is the effect of using digital game-based learning on Thai undergraduate students' business English vocabulary knowledge?
2. What are the students' opinions of using digital game-based learning to enhance their business English vocabulary knowledge?

Literature Review

Vocabulary Knowledge

Vocabulary is necessary for L2 learners to explore language learning since it supports communication across listening, speaking, reading, and writing (Nation, 2001). Moreover, Wilkins (1972) emphasized vocabulary's importance by mentioning that without grammar, people can communicate some messages, but without vocabulary, people cannot communicate at all. Vocabulary knowledge consists of breadth, which is knowledge of the number of words, and depth, the knowledge of the meaning, form, and use of words. Both breadth and depth are essential for language learning (Nation, 2001; Schmitt, 2000).

Referring to Nation (2007), to know a word, learners should focus on the three aspects: form, meaning, and use of vocabulary. "Form" refers to spelling and pronouncing those words correctly. "Meaning" refers to identifying form-meaning relationships by matching words to definitions correctly. Finally, "Use" refers to writing target words in sentences with grammatical functions and meaningful vocabulary in context. However, in Thai contexts, many students face difficulties in learning vocabulary through memorization and limitation of English contexts. Although, in Thailand, teachers employ CLT in the classrooms, traditional teaching methods like GTM are still used (Attachoo & Chaturongakul, 2015). This affects students' vocabulary learning and the development of their vocabulary knowledge.

Digital Game-Based Learning (DGBL) and Vocabulary Acquisition

Digital Game-Based Learning (DGBL) is an approach employing digital games as a medium to connect to the educational contents with activities, helping learners gain knowledge and skills. This approach keeps students participating in learning vocabulary which improves their motivation and retention (Prensky, 2001). By creating an enjoyable learning environment, students can play and learn at the same time. This can motivate them to develop their vocabulary knowledge. There are some studies showing the benefits of DGBL in terms of vocabulary memory, word use, and motivation in learning (Dehghanzadeh et al., 2021; Hwang et al., 2017). However, designing effective DGBL at the university level is a challenge for teachers who may lack the skills in game design as well as having to consider its appeal to a diverse range of students and the technology constraints of the classroom and teaching institution (Brown et al., 2018; Yaman, 2024).

In addition, Nation (2007) suggests teachers to design well-balanced vocabulary programs focusing on the vocabulary level to suit the learners. He mentioned the four strands: meaning-focused input, meaning-focused output, language-focused learning, and fluency development. In order to balance language learning for the learners, DGBL integrates meaning-focused input and output with repeated, interesting fluency and language-focused exercises. In the Thai higher education, there are studies on business English vocabulary, but not in the field of Modern Trade Business Management. This group of students has to use ESP vocabulary in a real situation, both in English classrooms and during internship. However, they face difficulties in using the vocabulary. (Low, 2018). By investigating the effects of DGBL on Thai undergraduate students'

vocabulary knowledge in Business English classes and designing activities that focus on form, meaning, and use deploying Nation's framework, this study intends to fill the gap.

Research Methodology

This study was a mixed-methods approach to explore undergraduate students' business vocabulary knowledge by using digital game-based learning and to explore their opinions of it.

Participants

The study consisted of 60 first-year Thai undergraduate students, aged 19 to 21 years old, majoring in Modern Trade Business Management at a private university. They were enrolled in two English courses with English proficiency of A1 to A2. Many of them were always playing online games for their pleasure. The researcher divided the participants into two groups: the experimental and the control group. There were thirty students in each group. These participants enrolled in the English for Business and Work course in the first semester of academic year 2023.

Sampling Methods

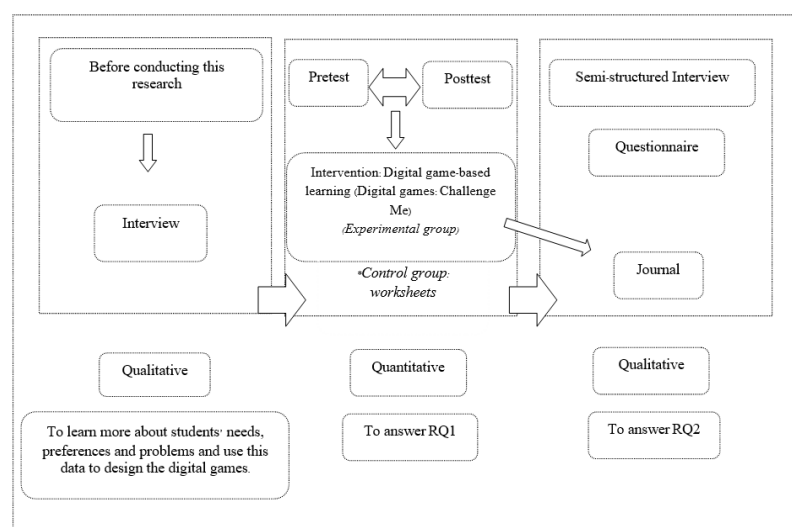
The researcher used a convenience sampling method to choose the participants for this study since they were assigned in the researcher's section of this course.

Data Analysis

This study used a mixed-methods approach, combining quantitative and qualitative data collection and analysis. To answer Research Question 1, quantitative data were gathered from a pretest, posttest and a questionnaire about opinions on playing DGBL. These data were analyzed by using paired-samples t-tests and descriptive statistics (mean and standard deviation). Addressing Research Question 2, qualitative data were collected from open-ended questions in a questionnaire, a semi-structured interview, and students' journals. These data were analyzed by using thematic content analysis. The coding reflected the opinions and students' experiences in playing DGBL to develop their business English vocabulary knowledge. The research design is shown in Figure 1 below:

Figure 1

The Research Design of This Study



The research instruments for this study included (1) interview questions before creating digital games, (2) a business vocabulary knowledge pretest and posttest, (3) a questionnaire on the opinion of the students toward learning business English vocabulary through digital games, using a five-point Likert scale and open-ended questions, and (4) semi-structured interview questions. The instructional materials included (1) digital games, (2) worksheets for the control group, (3) student journals, and (4) lesson plans.

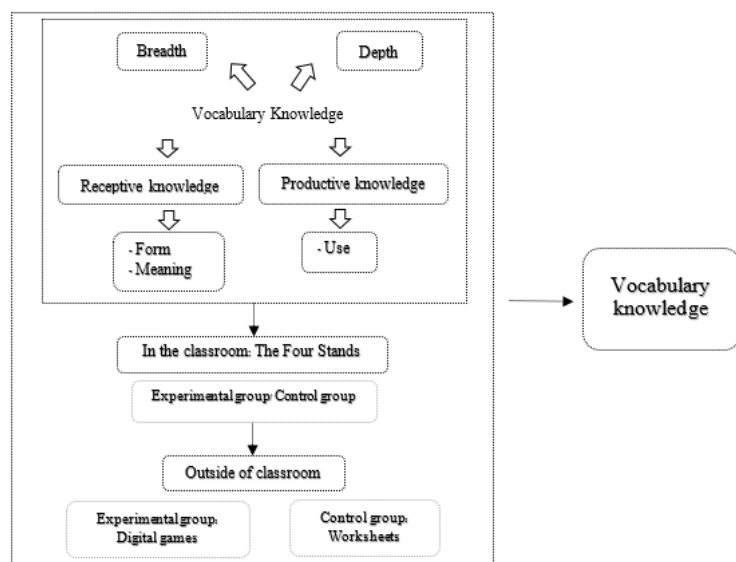
Since this study aimed to examine the effect of using DGBL on Business English vocabulary knowledge focusing on form, meaning, and use, these research instruments and instructional materials were created to reflect these aspects. To validate and ensure appropriate quality before implementation, these materials were reviewed for language accuracy by a native English teacher. Next, they were sent to three experts to assess content and validation. The experts were requested to rate each item on an Index of Item Objective Congruence form (IOC). Next, the researcher revised the test according to the experts' comments. Finally, the test was piloted with one group of thirty students. This group was a different group of participants with similar backgrounds. The pilot test was conducted during the semester prior to the study.

The content and vocabulary of this study were from the English for Business and Work course based on the textbook *Business English (Book 2)* which was the commercial textbook. In the classroom, both the experimental and control groups learned the same business vocabulary and content through the four-strand method focusing on vocabulary from five units: product details, telephoning, types of meetings and meeting etiquette, customer service, travel arrangements and travel necessities. Then, the experimental group needed to review their vocabulary knowledge through DGBL outside of the classroom as their self-study. On the other hand, the control group reviewed through self-study worksheets.

The lesson plans for this study were developed through the theoretical framework presented in Figure 2 below.

Figure 2

Theoretical Framework of This Study



This study investigated business vocabulary in three aspects: form, meaning, and use. "Form" involves pronouncing and spelling those words correctly. "Meaning" refers to identifying form-meaning relationships. Finally, "Use" relates to grammatical functions and meaningful vocabulary in context. (Nation, 2007) Therefore, the pretest and posttest were designed reflecting these

aspects. The test contains three parts. The first part focused on form and it evaluated students' ability to spell and pronounce words through dictation and pronunciation (10 items 10 points). The second part focused on meaning so students had to match words with their definitions (10 items 10 points). The third part focused on use consisting of two sessions: short sentence writing (10 items 20 points) and multiple-choice questions (5 items 5 points).

The focus of vocabulary selection focused on business words and parts of speech including nouns, verbs, adjectives, and adverbs in balanced proportion. These words were chosen based on the parts of speech (mostly nouns) and the CEFR level (from A2 to B1) relating to students' level since the participants were first-year students whose English proficiency was at the A1 and A2 levels. Finally, a total of 90 target vocabulary items were selected from five units in the textbook, 18 words from each unit. The participants were exposed to these vocabulary words in the classroom together with other words from the textbook. Thirty-five words were randomly selected to create the pretest and posttest with some words selected to create digital games. Students in the experimental group practiced these words using digital games, while the control group used worksheets. All selected vocabulary items were reviewed by three experts to ensure content validity and suitability for the level of the participants.

The vocabulary for pretest and posttest is listed in Table 1.

Table 1

The Business Vocabulary Used for This Study

Units/weeks	Topic	Type of vocab	Pretest/ Posttest	Part of speech	Words randomly selected to be used in the pretest/posttest	CEFR level
Unit 1/Week 2	Product details	Business vocab	Part I	n.	benefit	B1
		Business vocab	Part 2	n.	price	A2
		Business vocab	Part 3	n.	receipt	A2
		Business vocab	Part 3	v.	develop	B1
		Business vocab	Part 2	adj.	available	A2
		General Vocab	Part I	adv.	quickly	A2
		Business vocab	Part 3	v.	announce	B1
Unit 2/Week 3	Telephoning	Business vocab	Part I	n.	company	A2
		Business vocab	Part 2	n.	information	A2
		General Vocab	Part 3	n.	relationship	B1
		Business vocab	Part 2	v.	connect	B1
		Business vocab	Part I	adj.	polite	A2
		General Vocab	Part 3	adv.	unfortunately	A2
		Business vocab	Part 3	v	discuss	A2
Unit 3/Week 4	Type of Meeting and Meeting Etiquette	Business vocab	Part I	n.	meeting	A2
		Business vocab	Part 2	n.	opinion	B1
		Business vocab	Part 3	n.	reason	A2
		Business vocab	Part 2	v	repeat	A2
		Business vocab	Part 3	adj.	annual	B1
		General Vocab	Part I	adv.	recently	B1
		Business vocab	Part 3	v.	postpone	B1
Unit 4/Week 5	Customer service	Business vocab	Part I	n.	duty	B1
		Business vocab	Part 2	n.	effort	B1
		Business vocab	Part 3	n.	guest	A2
		Business vocab	Part 2	v.	improve	A2
		General Vocab	Part 3	adj.	helpful	B1
		General Vocab	Part I	adv.	frequently	B1
		Business vocab	Part 3	v.	complain	B1
Unit 5/Week 6	Making travel arrangements and travel necessities	Business vocab	Part I	n.	accommodation	B1
		Business vocab	Part 2	n.	baggage	B1
		Business vocab	Part I	n.	passenger	A2
		Business vocab	Part 3	v.	departure	B1
		Business vocab	Part 2	adj.	essential	B1
		Business vocab	Part 3	adv.	once	A2
		Business vocab	Part 3	v.	confirm	B1

The experimental period was 7 weeks which was divided into the following phases. The first phase: the Pretest Phase (Week 1) during which the control and experimental groups completed a

pretest. The second phase, the Treatment Phase (Weeks 2–6): after presentation of the contents in the classroom, the experimental group reviewed the vocabulary through “Challenge Me” as their self-study outside of the classroom. To provide an equal chance of learning vocabulary, the control group completed vocabulary worksheets outside of the classroom and submitted them through an e-learning platform. The experimental group reviewed the vocabulary and played games with rewards to finish the task. They were instructed how to write a journal and were asked to write journal entries, reflecting on their experience with the digital games. The final phase, the Posttest Phase (Week 7): in which the experimental and control groups completed the same posttest, while the experimental group also completed an opinion questionnaire about playing the games. The researcher selected ten students for interviews about their experience in playing the digital games. They were selected based on their posttest scores and divided into 3 groups: high score group (4 students), medium score group (3 students), and low score group (3 students).

“Challenge Me”, a web-based digital game, was designed by the researcher and development team. To motivate the students and create engagement in learning vocabulary, the researcher designed different games matching the research framework: form, meaning, and use. The digital games consisted of five units, each unit containing three stages designed according to the game elements. After studying each unit in the classroom, the students were assigned to review their vocabulary through this game. They were able to repeat the game anywhere and anytime.

The integration of different game types can support vocabulary acquisition and provide a richer learning experience. Therefore, in this study, the researcher employed a variety of game types and key game elements like rules, goals, feedback, rewards, competition, and creativity in creating this digital game to motivate students’ learning. To emphasize, the digital games focused on the three aspects: form, meaning, and use, so each stage in the game reflected the learning objective. In the first stage, focusing on form, students needed to complete tasks related to spelling and pronunciation of the vocabulary. In the second stage, focusing on meaning, students had to match words with definitions. In the last stage, focusing on use, students created sentences from the word provided to assess students’ competency in using the vocabulary word. To further motivate players, participants in the experimental group received in-game rewards upon successfully completing tasks, with the ultimate objective of collecting all available rewards.

Results

This section reveals the results of employing DGBL to improve undergraduate students’ business English vocabulary knowledge, specifically from the pretest and posttest, the questionnaire on students’ opinions on learning business English, interview and students’ journal. The researcher analyzed the data both quantitatively and qualitatively. The results are as follows:

The Findings from the Pretest and Posttest

To answer Research Question 1, “What is the effect of using digital game-based learning on Thai undergraduate students’ business English vocabulary knowledge?” and to test the hypothesis of this study, “Digital game-based learning can enhance Thai undergraduate students’ business English vocabulary knowledge,” a pretest and posttest were conducted to assess student’s business vocabulary knowledge before and after learning through digital games. Table 2 displays the statistical analysis of pretest and posttest of the experimental group and the control group.

Table 2*The Pretest and Posttest Scores from the Experimental Group and Control Group*

		N	Mean	SD	Mean Difference	Standard Deviation	t	df	p
Experimental group	Pretest	30	11.03	7.95	3.09	3.16	5.36	29	.000
	Posttest	30	14.12	7.59					
Control group	Pretest	30	12.62	8.24	-0.36	1.25	-1.56	29	.129
	Posttest	30	12.27	8.69					

The statistical analysis in Table 2 shows pretest and posttest scores of the experimental group and the control group. The test consisted of a maximum 45 points to assess form (10 points), meaning (10 points), and use (25 points). The pretest mean score of the experimental group was only 11.03 but the posttest mean score increased to 14.12 with a mean difference of 3.09. The standard deviation (SD) for the pretest was 7.95, while the posttest was 7.59. The t-test result ($t = 5.361$, $p = 0.000$) also confirmed the statistical significance of the experimental group. In contrast, the pretest mean score of control group was 12.62 and the posttest mean score was 12.27, with a mean difference of -0.36. The standard deviation (SD) for the pretest was 8.24 and the posttest was 8.69. The t-test result ($t = -1.564$, $p = 0.129$) evidenced that the difference was not statistically significant. The results reveal that the DGBL created for this study was effective in improving students' business English vocabulary knowledge.

Table 3 presents the statistical analysis of the pretest and the posttest of the experimental group in the following categories: dictation (5 items, 5 points), pronunciation (5 items 5 points), writing (10 items, 20 points), definition (10 items, 10 points), word selection (5 items, 5 points), and overall test. The researcher used a scoring rubric for this test. For example, in the dictation part, students heard the word "passenger" and were expected to write the word on their papers. In the writing part, the students were assigned to write a sentence by using the word "receipt". This test can be seen in the Appendix.

Table 3*Paired Samples Test of Vocabulary Knowledge from the Experimental Group*

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Dictation: Pretest/Posttest	0.667	0.994	0.182	0.295	1.038	3.673	29	.001
Pronunciation: Pretest/Posttest	0.100	0.995	0.182	-0.271	0.471	0.551	29	.586
Writing: Pretest/Posttest	0.792	0.689	0.126	0.534	1.049	6.295	29	.000
Definition: Pretest/Posttest	0.567	1.547	0.282	-0.011	1.144	2.007	29	.054
Word selection: Pretest/Posttest	0.967	1.474	0.269	0.416	1.517	3.593	29	.001
Pretest vs Posttest	3.208	3.240	0.592	1.999	4.418	5.424	29	.000

Table 3 shows significant difference at the 0.05 significance level of pretest and posttest mean scores for dictation, writing, and word selection. However, the other two tests, pronunciation and definition, do not show significant difference at the 0.05 significance level of the experimental group. For the scores of the pretest and posttest, the paired samples test showed a mean difference of 3.208, with a standard deviation of 3.240. The t-value was 5.424 with a p-value of 0.000. This confirms the significant difference at the 0.05 significance level between the pretest and posttest.

In conclusion, the experimental group showed significant difference in the overall pretest and posttest including dictation, writing, and word selection. However, there is no significant difference in pronunciation and definition.

Findings from the Questionnaire on Students' Opinion about Learning Business English, Interview Questions, and the Journals

To answer Research Question 2, "What are the students' opinions of using digital game-based learning to enhance their business English vocabulary knowledge?" the opinions of the students from the questionnaire, the semi-structured interview questions, and the journals were analyzed. The results are as follows:

The first part of the questionnaire generated quantitative findings. They revealed the students' opinions on learning business English vocabulary through digital games. The participants were thirty (N=30). The questionnaire was divided into three areas: general satisfaction, content of the digital games, and motivation and outcomes. The assessment used a five-point Likert-type scale, structured as follows:

- 4.51 – 5.00 (Strongly Agree)
- 3.51 – 4.50 (Agree)
- 2.51 – 3.50 (Neutral)
- 1.51 – 2.50 (Disagree)
- 1.00 – 1.50 (Strongly Disagree)

The results are shown in Table 4.

Table 4

The Opinion of Students toward Learning Business English Vocabulary through Digital Games (N=30)

Aspect	Questions	Mean	Standard Deviation	Satisfaction
<i>General Satisfaction</i>				
1	User-friendliness of the digital games	4.17	0.99	Agree
2	Design interest of the digital games	4.33	0.84	Agree
3	Download speed	3.80	1.06	Agree
4	Systematic task organization	4.07	0.91	Agree
5	Appropriateness of task duration	4.23	0.97	Agree
6	Comprehensibility of digital game rules	4.33	0.80	Agree
7	Overall liking of the digital games	4.20	0.81	Agree
<i>Content of the Digital Games</i>				
8	Appropriateness of vocabulary for the subject	4.47	0.73	Agree
9	Relevance of vocabulary to the course area	4.50	0.63	Agree
10	Difficulty level of the review vocabulary	4.63	0.61	Strongly Agree
11	Enjoyment of the digital games' information	4.27	0.78	Agree
<i>Motivation and Outcomes</i>				
12	Benefit of using the digital games for vocabulary review	4.33	0.80	Agree
13	Enjoyment of vocabulary review through the digital games	4.50	0.63	Agree
14	Desire to complete the digital games	4.30	0.75	Agree
15	Motivation from the digital games to develop vocabulary	4.50	0.68	Agree
16	Increase in course interest due to the digital games	4.27	0.78	Agree

Aspect	Questions	Mean	Standard Deviation	Satisfaction
17	Improvement in vocabulary spelling	4.53	0.63	Strongly Agree
18	Improvement in vocabulary pronunciation	4.40	0.72	Agree
19	Improvement in vocabulary comprehension	4.33	0.71	Agree
20	Improvement in appropriate vocabulary usage	4.37	0.67	Agree

Regarding the first area of general satisfaction, the top three aspects with the highest scores are the design interest of the digital games (mean = 4.33, SD = 0.84), the comprehensibility of digital games rules (mean = 4.33, SD = 0.80), and the appropriateness of task duration (mean = 4.23, SD = 0.97). This highlights students' satisfaction with the game to a strong degree. The responses from the students' interviews confirm this finding. One student reflected on the design and interest of the digital games employed in this study by commenting, *"The content in the games is good for this subject because I can review the vocabulary teacher taught in the classroom. This is one way to review my vocabulary outside classroom by using the digital games."* Another student highlighted the comprehensibility of the digital games' rules in the journal: *"The games is fun and easy. The rules were clear and easy to understand."*

For the next area, content of the digital games, the top three aspects were the difficulty level of the review vocabulary (mean = 4.63, SD = 0.61), followed by the relevance of the vocabulary to the course area (mean = 4.50, SD = 0.63), and the appropriateness of the vocabulary for the subject (mean = 4.47, SD = 0.73). To support this in the interview, students mentioned that the game was fun and found that the difficulty level of the review vocabulary in the digital games was suitable with the tasks. One student mentioned that *"The vocabulary in the game was easy and fun, it makes me enjoy reviewing and learning."*

As for the last area, motivation and outcomes, the top three aspects with the highest scores were as follows: the highest rating was for improvements in vocabulary spelling (mean = 4.53, SD = 0.63), with second and third highest ratings for enjoyment of vocabulary review through the digital games (mean = 4.50, SD = 0.63) and motivation of the digital games to develop vocabulary (mean = 4.50, SD = 0.68). In support of these results, one student wrote that, *"The games improved my spelling because there were explanations of each word to play in the game. For example, I had to fill in the words in the game in Task 1, and there are definitions in that task, so it is easy for me to learn new vocabulary."*

In the second part of the questionnaire, it was divided into two sections which involved a qualitative analysis. The first section was an additional question about the students' level of satisfaction of the digital games to review business English vocabulary outside of the classroom as self-study. In this part, the findings showed that students were satisfied with the digital games. The results indicated that about 30% (9 students) of them were extremely satisfied with the games. The students also pointed out that the games were positive in learning. About 50% of the students (15 students) were very satisfied; they indicated that these digital games helped their learning effectively. About 16.67% (5 students) were moderately satisfied with the games. They explained the game's usefulness but they mentioned that it still needed some improvements. Finally, only 3.33% (1 student) were slightly satisfied with the games; this student showed some engagement to play the game. To strengthen the qualitative findings, the researcher analyzed the interview and student journals. One student mentioned, *"The digital games helped me to understand and remember vocabulary easily."* Another student commented, *"Activities make the class less stressful and more enjoyable."* From the student journals, students enjoyed playing "Challenge Me" in a fun environment. These findings confirmed the usefulness of digital games, and some students agreed that games helped them to learn new vocabulary.

The results of the second section of the questionnaire revealed some student feedback about the strengths, weaknesses of the games. Furthermore, some gave suggestions for the digital games. Students believed that the games were useful and entertaining for vocabulary review, and they felt engaged with the game. However, students also mentioned some technical problems, such as freezing, rapid gameplay, and bugs. However, they gave some suggestions to solve the problems, such as increasing order to make the games user-friendly and more effective.

These findings revealed that the students rated “Challenge Me” as a beneficial tool for learning and reviewing their vocabulary knowledge outside of the classroom as self-study. They explained that the digital games strengthened their vocabulary knowledge and were a suitable way for learning, but some students pointed out some technical problems in the digital games.

Discussion

This study aimed to investigate the effectiveness of DGBL to improve Thai undergraduates’ business English vocabulary knowledge. The findings demonstrated that the experimental group outperformed better than the control group, as shown by the improvement of the pretest and posttest scores of the two groups. Therefore, this finding confirms the effectiveness of DGBL in improving vocabulary knowledge and also supports Nation’s (2008) four stands concepts that promotes a balanced method for learning languages across the four areas.

The posttest consisted of five parts: dictation, pronunciation, writing, definition, and word selection. The score results reflected the improvement of business vocabulary knowledge of the experimental group. This can be noticed from the mean score of the posttest showing the significant difference of the control group ($p < 0.05$). The results highlight the benefits of DGBL in improving students’ business vocabulary knowledge. However, the posttest was conducted right after the intervention; this can be mentioned as short-term learning rather than long-term vocabulary retention (Ghosh, 2022). The evidence shows that DGBL can improve business vocabulary knowledge as shown in the scores of Form, Meaning, and Use. However, students showed no improvement in the posttest results for pronunciation and definition. This can result from test anxiety of the students or their limited English proficiency level.

The results of the questionnaire reveal that reviewing business English vocabulary through DGBL as self-study was useful. The students were satisfied with the improvement of their business vocabulary knowledge and enjoyed the digital games. They acknowledged the appropriate difficulty of reviewing words and their spelling improvement. This may also result from having learned business vocabulary in the classroom through Nation’s four strands. They also rated the enjoyment and comfort of reviewing the vocabulary knowledge through digital games as self-study.

To support the posttest and the questionnaire, the data from the interview and journals were analyzed qualitatively. The journal expressed students’ learning experiences with DGBL, revealing that it increased their attention, enjoyment, and vocabulary knowledge. For example, one student mentioned, “*I enjoy playing game and review vocabulary in a fun way*”. Another student wrote, “*I love to compete with my friends in the leaderboard of the game*”. It also revealed that students recognized the benefits of the digital game elements and its immediate feedback, supporting them to learn words (Rasti-Behbahani, 2021). Moreover, many students enjoyed playing the games in a less stressful activity. Some features in the digital game, like competition with leaderboard and rewards, increased their engagement and motivation (Prensky, 2001). To support these opinions, the Likert scale results showed the enjoyment of the digital game support of these students.

To confirm the benefits of the games, the findings from the interviews and journals were need to be clarified. They revealed that students noticed the usefulness of the elements of the digital games, such as the competition, scores, and the tasks. One student mentioned, *"I think I enjoy with the games and it was very educational."* This supports the study from Hwang et al. (2017) showing that digital games cause low-anxiety with greater motivation to increase engagement.

Furthermore, the findings from this study promoted students' learning strategies to learn vocabulary. Vocabulary learning strategies (VLS) is divided into discovery strategies and consolidation strategies (Schmitt, 2000). The second one refers to social strategies, memory strategies, cognitive strategies, and metacognitive strategies. The digital games related with these strategies: discovery strategies through learning and reviewing vocabulary in each task, social strategies through playing with classmates to compete each task, and memory strategies through using the words from the previous tasks (repetition). These strategies promote the beneficial effect of DGBL.

However, some students pointed out some technical problems that interfere with their ability to review the vocabulary. These problems affected the learning process. They offered feedback and suggestions to improve the games' performance. This signals that students may be able to increase their vocabulary knowledge even further with improvements to the digital game.

In conclusion, planning classroom teaching by employing the four strands and applying DGBL to review the vocabulary for self-study may be a very effective method for teaching business English vocabulary to Thai undergraduate students. It enhances students' motivation, engagement, and vocabulary knowledge. These elements increase student engagement with their learning and enhance their ability to understand form, meaning, and use of words, as attested by the results from the qualitative and quantitative analyses. Furthermore, DGBL in this study aligned with Nation's four strands, showing a balanced learning experience of students. However, there are some limitations that must be identified for future implementation.

Conclusion and Recommendation

In conclusion, the findings of this study confirmed that DGBL enables students majoring in Modern Trade Business Management to improve their vocabulary knowledge and increases engagement in learning their Business English courses. The researcher combined the four strands method with DGBL, named "Challenge Me", which was created for this subject, for students to learn business vocabulary in the classroom and review them as self-study outside of the classroom. From the results, DGBL helps students enjoy learning and reviewing their vocabulary and offers them a new and motivating experience in learning English. However, there are some technical problems that should be improved. This integration, employing DGBL and the four strands to the curriculum, is one teaching approach to help students gain vocabulary knowledge. The four strands can help the teacher in classroom planning and allow the students to enjoy reviewing their vocabulary knowledge outside of the classroom.

To benefit future research, the limitations of this study are presented. First, the present researcher used convenience sampling to select the participants which limits the generalizability of the findings. Second, the period of the intervention was rather short. Research may be undertaken over longer periods to study students' long-term vocabulary retention. Also, technical issues, such as internet connection instability, should be resolved or mitigated as much as possible to ensure the integrity of the research.

For future research, larger or more diverse participants would make the research more generalizable. The research may also be conducted with participants from different educational

backgrounds. Longitudinal research can also be undertaken to investigate the long-term effects of DGBL on vocabulary retention. Additionally, researchers can add some interactive features to the digital games, such as employing the four-skill tasks, adding options for students to select their own difficulty level and giving detailed feedback for each student. This would enhance the learning outcomes and help to develop the English skills of the students.

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Appendix

1.2s Business vocabulary knowledge pre-test

Student

Name: _____	ID: _____	Section: _____
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Business vocabulary knowledge pre-test

The test is divided into 4 parts:

Dictation Part 1: Dictation and Pronunciation (10 items 10 points)

A. Directions: Listen carefully to the following words and write down those words you hear. (5 words 5 points)

1. (benefit)	2. (polite)
3. (recently)	4. (duty)
5. (passenger)	

Pronunciation

B. Directions: Pronounce these words out loud with your teacher.

1. quickly	2. company
3. meeting	4. helpful
5. accommodation	

Part 2: Matching word to definition (10 items 10 points)

Directions: Match the words on the left with the definitions on the right.

_____	1. Price	A. facts about a situation, person, event, etc.
_____	2. Available	B. a helpful or good effect, or something intended to help
_____	3. Information	C. to join or be joined with something else
_____	4. Connect	D. behaving in a way that is socially correct and shows respect for other people's feelings
_____	5. Opinion	E. to get better, or to make something better
_____	6. Repeat	F. a thought or belief about something or someone
_____	7. Effort	G. the amount of money for which something is sold
_____	8. Improve	H. necessary or needed
_____	9. Baggage	I. able to be bought or used
_____	10. Essential	J. to say or tell people something more than once
		K. bags, cases, etc. that you take with you when you travel
		L. physical or mental activity needed to achieve something

*1.2s Business vocabulary knowledge pre-test***Part 3: Short sentence writing test (10 items 20 points)**

Directions: Write a short sentence from the word given.

1. Receipt (n)

2. Develop (v)

3. Relationship (n)

4. Unfortunately (adv.)

5. Reason (adv.)

6. Annual (adj.)

7. Guess (v.)

8. Frequently (adv.)

9. Departure (n.)

10. Once (adj.)
