Digital Game-Based Learning as a Strategy to Expand Vocational Students' Vocabulary: A Mixed Methods Approach

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A B S T R A K

Strategi Digital Game-Based Learning (DGBL) direkomendasikan secara luas bagi pembelajar asli digital untuk memperkaya kosa kata. Penelitian ini bertujuan untuk mengevaluasi efekyivitas DGBL dalam meningkatkan pengetahuan kosa kata siswa. Pendekatan campuran diterapkan. Rancangan quasi-experimental melibatkan kelompok eksperimen (diajar dengan DGBL, N = 29) dan kelompok kontrol (dilatih dengan pembelajaran kosa kata konvensional, N = 28). Setiap kelompok diberi tes sebelum intervensi dan setelah intervensi, yang terdiri dari 30 pertanyaan serupa. IBM SPSS Statistics 26.0 digunakan untuk mengukur data yang dikumpulkan, menggunakan uji-t sampel berpasangan dan uji-t sampel independen. Inspeksi mengungkapkan bahwa penggunaan DGBL mempengaruhi perkembangan pembelajaran kosa kata siswa. Skor rata-rata kelompok eksperimen meningkat dari 44,83 menjadi 63,45. Namun, tidak terlihat adanya perbedaan yang signifikan antara rata-rata hasil post-test kedua kelompok. Peneliti menganalisis tiga faktor penyebab tidak signifikannya hasil uji-t sampel independen, yakni keterbatasan waktu, koneksi internet yang buruk, dan kedua kelompok sama-sama mendapatkan pembelajaran kosakata yang disengaja. Selain itu, delapan pertanyaan dalam sesi wawancara diajukan kepada kelompok eksperimen untuk mengeksplorasi pandangan mereka tentang DGBL dan mengkonfirmasi informasi yang kurang jelas dari hasil data kuantitatif. Narasumber setuju bahwa DGBL dapat memperkaya kosa kata, meningkatkan motivasi belajar, dan mengurangi kebosanan.

A B S T R A C T

The Digital Game-Based Learning (DGBL) strategy is widely recommended for digital-native learners to enrich their vocabulary. The purposes of this study was to evaluate the effectiveness of DGBL in expanding students' vocabulary knowledge. A mixed methods approach was implemented. The quasi-experimental design involved an experimental group (taught with DGBL, $N = 29$) and a control group (trained with conventional vocabulary learning, $N = 28$). Each group was assigned a test before and following the intervention, consisting of 30 similar questions. IBM SPSS Statistics 26.0 has been employed to gauge the data collected, and utilized a paired sample t-test in conjunction with an independent sample t-test. The inspection exposed that, using DGBL affects students' vocabulary learning development. The experimental group's average score rose from 44.83 to 63.45. However, there was no discernible distinction between the two groups' mean post-test results. The researchers analyzed three factors causing the insignificant results of the independent sample t-test: time constraints, poor internet connection, and both groups obtaining intentional vocabulary learning. Eight questions in the interview session were asked to the experimental group to explore their views about the DGBL and confirmed the unclear information that resulted in quantitative data. Interviewees agreed that DGBL can enrich vocabulary, increase learning motivation, and reduce boredom.

1. INTRODUCTION

Vocabulary is among the English abilities, play a critical role in both language learning and production. It is even likened to the soul and the heart of the language, and becomes the first step in learning a language (Bhatti & Mukhtar, 2020; Qomariyah & Nafisah, 2020). Individuals who have mastery of vocabulary in foreign languages would find it easier to learn languages because language is all about words. It means that having good vocabulary mastery will help the students to learn languages well. Concurrently, language production and understanding will only be possible with vocabulary mastery (Bahri, 2018; Hazar, 2020). Thus, individuals will find it difficult to express their ideas and fail to interpret the meaning of a speech or writing without mastering vocabulary (Angraeni et al., 2019; Montag, 2019). Therefore, learning vocabulary is one of the prerequisites for learners to acquire a new language. It becomes one of the determining factors in the failure or success of language learners. Previous study found that many language learners learn new words through reading from word lists, teachers' explicit instructions, and rote memorization (Alizadeh, 2016). Traditional strategies like

memorizing several vocabularies by rote can cause students to feel bored and unmotivated to learn. Consequently, the lesson given by the teacher cannot be absorbed properly. Hence, teachers must create effective vocabulary teaching so that the students can excel in their academic life and overall competencies in English (Babaei & Ahour, 2016; Ngaiza & Sivashanmugam, 2020). Following the trend of modern educational technology, many scholars advise adopting digital games to aid students in expanding their vocabulary knowledge (Arsini et al., 2022; Ibrahim et al., 2022). Implementing digital games in educational contexts and aims for learning is not a new phenomenon; this teaching strategy is more commonly known as Digital Game-Based Learning (DGBL). The learning design process of DGBL is a balance between the needs of the subject matter with the desire to prioritize the game. This strategy offers solutions for learning English to eliminate boredom, reduce tension and pressure, as well as increase students' creativity, attention, and motivation since they can play and learn simultaneously (Plass et al., 2015; Wu & Huang, 2017). Currently, DGBL has become a popular approach and trend in education.

Several researchers have reported positive responses to the use of DGBL in vocabulary teaching and learning. Extant literature has studied the effectiveness of DGBL in enhancing students' vocabulary mastery (Huei et al., 2021; Komalasari & Zuhriyah, 2021; Ling & Abdul Aziz, 2022);. For instance, previous study investigated the efficacy of *Quizizz* with twenty eighth-grade students through classroom action research. The finding showed an improvement in students' vocabulary performance from cycle one to cycle two (Komalasari & Zuhriyah, 2021). Besides, *Quizizz* can improve students' attention and motivation regarding observation and field notes. Nevertheless, a small number of studies have shown different results. They claim that DGBL does not significantly affect students' vocabulary mastery (Bal, 2018; Çil, 2021). Other study developed a quasi-experimental using a pre-and post-tests control group design to explore the impact of computer educational games on students' vocabulary and grammar (Jalali & Dousti, 2012). Although the experimental group appeared more active and motivated, according to the data analysis, no statistically significant difference existed between the experimental and control groups. There is also experienced similar results that used *Quizizz* to build pre-intermediate students' vocabulary knowledge (Bal, 2018). Even though the experimental group did slightly exceed the control group, the findings found no statistically significant difference.

Following the difference results of the studies mentioned earlier, the researchers were interested in conducting research to see how well DGBL works in improving students' vocabulary proficiency at vocational school. Since student feedback on the effectiveness of DGBL in vocabulary learning has received less consideration, this study will apply a mixed methods approach. In the qualitative part, the researchers explore students' views and experiences about using DGBL in vocabulary learning (Huei et al., 2021; Jannah & Syafryadin, 2022; Masita & Fitri, 2020). The point that differs this present study from the previous studies is in terms of research design and data collection methods. The present study implemented a quasi-experimental research design by using the *Wordwall.net* platform, which applied various types of tests, such as multiple-choice, matching words, and missing words. This strategy builds upon the study by previous study where they employed *Quizizz* with a classroom action research design (Huei et al., 2021). However, they only used multiple-choice tests with three treatments to enhance students' vocabulary. The study demonstrates that Quizizz, an application with a leaderboard feature, is suitable for students' learning styles. Accordingly, the learning environment becomes more enthusiastic and enjoyable. Also, the test results proved that Quizizz helps enrich students' vocabularies. This present study also expands on what has been done by other study through the application of *Plicker* for formative assessment by using exploratory sequential design (Masita & Fitri, 2020). This research was started by conducting a qualitative study using observation and interviews on the responses of teachers and students regarding the use of Plicker. Then, the research was continued by conducting quantitative research on student test results. With similar favorable outcomes, using *Plicker* to teach vocabulary increases students' interest, involvement, and motivation (Masita & Fitri, 2020; Quiroz et al., 2021).

This study was conducted in SMKN 1 Bunga Raya, a public vocational school in a rural area at Siak, the province of Riau. The school was chosen because based on the preliminary research, the researchers discovered some issues with students having trouble learning vocabulary. The students think learning English is not fun; eventually, most of them lack vocabulary mastery. Moreover, the students have never had the experience of learning vocabulary using DGBL. Therefore, this study analyze sought to determine how well DGBL increased the students' vocabulary at SMKN 1 Bunga Raya and provided a relatively new vocabulary learning experience for the students. The study's findings are anticipated to shed light on whether the use of DGBL can improve vocational students' vocabulary mastery, compare whether a substantial difference in vocabulary learning outcomes between the experimental and control groups, and examine students' views toward using DGBL for vocabulary learning in a vocational school. The researchers expected DGBL to be considered as one of the alternative strategies in teaching English vocabulary. As a limitation, this study applied a type of DGBL named *Wordwall.net*. Besides, it was only conducted for the eleventh-grade students in two classes at a rural vocational school.

2. METHOD

The present study employed a mixed-method approach. The quantitative research developed a quasi-experimental research design, which used a nonrandomized control group with a pre-and post-test design. In this inquiry, two groups took part: the experimental and control groups. The experimental group received treatments via DGBL *(Wordwall.net),* while the control group applied a conventional vocabulary learning strategy. Members of both groups were assessed before and after the therapy using the pre-and post-tests. Then, those scores were computed and compared to assess the impact of DGBL on enhancing vocational students' vocabulary. Meanwhile, the researchers used a descriptive research design for the qualitative part. Hence, the researchers explored students' experiences and opinions toward using DGBL.

The study population comprised all eleventh-grade students at SMKN 1 Bunga Raya, which consisted of five classes with a total of 108 students. Samples of this study were taken from 29 students from XI TKJ (Teknik Komputer dan Jaringan), and 28 students from XI TBSM (Teknik dan Bisnis Sepeda Motor) class. There are 57 students as the research sample. In this investigation, the researchers used purposive and convenience sampling to select a sampling unit based on certain considerations with the desired characteristics or criteria (Husna & Suryana, 2017). Class XI TKJ and XI TBSM were chosen because, generally, both of them have a similar level of English proficiency. Further, class XI TKJ was the experimental group, while class XI TBSM was the control group.

Two kinds of instruments were employed to gather the data. For the quantitative research approach, the researchers utilized some quizzes to test students' vocabulary mastery. The test was about 30 questions comprising multiple-choice, gap-fill, and matching, which were tailored to the learning topics in the syllabus. The researchers conducted a vocabulary test to measure student achievement in vocabulary mastery before and after receiving the treatments. Before assigning the tests to both experimental and control groups, the researchers examined the instruments' validity and reliability to ensure the test items could be used properly (Bolarinwa, 2015; Gani et al., 2020). There were two stages in analyzing the data: quantitative and qualitative. Through quantitative data analysis, the researchers would investigate whether there would be an enhancement in students' vocabulary mastery through the DGBL strategy using *Wordwall.net*. The researchers employed two paired sample t-tests to calculate the data and compare the experimental and control groups' pre-and post-test scores. The statistical hypotheses of paired sample t-test is show in Table 1.

Table 1. Hypothesis Testing of Paired Sample T-test (RQ1)

Comparison	Hypotheses		Findings
	(H₀)	**(Hₐ)**	
Sig. (2-tailed) < 0.05	Rejected	Accepted	The application of DGBL can expand vocational students' vocabulary.
Sig. (2-tailed) > 0.05	Accepted	Rejected	The application of DGBL cannot expand vocational students' vocabulary.

Additionally, an independent sample t-test was utilized to evaluate whether there was a statistically significant difference in the post-test mean scores of the experimental and control groups. This test is recognized as the unpaired t-test, a statistical inference test that assesses if there is a statistically significant difference in the means of two independent or unrelated groups (Mishra et al., 2019). Herein, IBM SPSS Statistics 26.0 for the Windows computer program was employed. The statistical hypotheses of the independent samples t-test is show in Table 2.

Table 2. Hypothesis Testing of Independent Samples T-test (RQ2)

Comparison	Hypotheses		Findings
	(H₀)	**(Hₐ)**	
Sig. (2-tailed) < 0.05	Rejected	Accepted	Students' vocabulary learning outcomes in the experimental and control groups varied significantly.
Sig. (2-tailed) > 0.05	Accepted	Rejected	Students' vocabulary learning outcomes in the experimental and control groups are not significantly different.

For qualitative data analysis, the researchers employed a descriptive analysis technique to explore the students' viewpoints about their experiences using the DGBL strategy to enhance their vocabulary mastery. The researchers conducted face-to-face interviews with ten students after getting the results of the post-test scores. More precisely, one week after the post-test results were obtained. In this case, the respondents were selected

based on the five best scores, and the five lowest scores obtained by the students on the post-test results. All interviewees received the same eight questions regarding their points of view on DGBL. The researchers transcribed recorded interview data to get the appropriate analysis results. It was read and reread to capture the crucial insights to be noticed. Some excerpts were taken from the interview transcripts to illustrate the results. In addition, some data from respondents have been compared to avoid bias and made a triangulation method.

3. RESULT AND DISCUSSION

Result
The Effectiveness of DGBL to Expand Vocational Students' Vocabulary Mastery
This section will address the study's first research question. Herein, the researchers wanted to analyze whether using DGBL could expand vocational students' vocabulary. Table 3 illustrates the descriptive data of the pre-and post-tests delivered to the experimental and control groups.

Table 3. Descriptive Statistics of Pre- and Post-Tests Results

	Groups	Mean	Range	Max	Min	SD
Pre-test	Experiment	44.83	26.67	56.67	30.00	7.30
	Control	46.55	46.7	76.67	30.00	11.63
Post-test	Experiment	63.45	40.00	83.33	43.33	11.50
	Control	59.29	43.33	83.33	40.00	11.03

Table 3 presents that before the vocabulary learning treatment with DGBL, the students in the control group got an average score of 44.40, with a low score of 30 and a high score of 56.67. Meanwhile, the results of calculations based on the research data indicate that the control group's pre-test scores before the implementation of conventional vocabulary learning obtained an average score of 46.55, ranging from 30 to 76.67. Based on how the two groups did on the pre-test, the average pre-test score in the control group was 1.72 points better than the average pre-test score in the experimental group. After implementing DGBL, the experimental group's post-test scores averaged 63.45, with scores ranging between 43.33 and 83.33. After the conventional vocabulary learning strategy, the control group's average post-test score was 59.29, with a minimum score of 40 and a maximum score of 83.33. The analysis revealed that the average post-test scores of the two classes were higher than their average pre-test scores. The experimental group's average score increased from 44.83 to 63.45. Simultaneously, the mean scores of the control group rose from 46.55 to 59.29. Nonetheless, the experimental group saw a marginally greater increase in student learning outcomes than the control group, with a difference of 4.16 points in the average post-test score. Before testing the hypothesis to investigate whether DGBL and conventional vocabulary learning strategies affected students' vocabulary mastery, the researchers first examined the normality of the pre-and post-test for the two groups to check if the data were normally distributed. The normality test is necessary because the parametric statistic t-test is only applicable when the data have a normal distribution. (Demir, 2022; Orcan, 2020). The SPSS outputs for variable normality tests using the Kolmogorov-Smirnov technique are presented in Table 4.

Table 4. The Output of the Normality Test

	Classes	Kolmogorov-Smirnov		
		Statistic	df	Sig.
Vocabulary Learning Outcomes	Pre-test Experimental Group	0.132	29	0.200
	Post-test Experimental Group	0.125	29	0.200
	Pre-test Control Group	0.143	28	0.149
	Post-test Control Group	0.082	28	0.200

The data is determined to be normally distributed if the probability p-value is more than 0.05 (p>0.05). Based on Table 4, the p-value shows a higher significance level for the experimental group's pre-test (0.200>0.05), the experimental group's post-test (0.200>0.05), the control group's pre-test (0.149>0.05), and control group's post-test (0.200>0.05). Thus, it was possible to conclude that the experimental and control groups' pre-and post-test data had normal distributions. Therefore, the significant differences between pre-and post-test scores for each group could be compared using the mean comparisons testing with paired sample t-test. The description of how IBM SPSS Statistics 26.0 generates is show in Table 5.

Table 5. The Output of Paired Sample T-test

	Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pair 1: Pre- and Post-tests (EG)	-18.621	9.323	1.731	-22.167	-15.075	-10.756	28	0.000
Pair 2: Pre- and Post-tests (CG)	-12.738	8.319	1.572	-15.964	-9.513	-8.103	27	0.000

As shown in Table 5, the paired sample t-test indicates a significant difference if the significance score (2-tailed) is less than 0.05. Referring to the output of Pair 1 and 2 as depicted in Table 5, the sig. (2-tailed) with ninety-five percent interval of the difference shows a value of 0.000, which is less than 0.05. Thus, the analysis results indicate differences in the pre-and post-test average scores for both groups. We can see that students' post-test average scores were higher than the pre-test average scores. Between the pre-and post-tests, the experimental group's average score rose by 18.621 points; while the control group's average score rose by 12.748 points. The findings indicated that there were differences between the pre- and post-tests average scores in both groups. This study also proved that learning vocabulary, both with DGBL and conventionally had effects on vocational students' learning outcomes. However, the experimental group's average score was superior to the control group by 5.873 points, indicating the DGBL contributed to better learning performance compared to the conventional vocabulary learning strategy.

The Comparison of Experimental and Control Groups' Vocabulary Learning Outcomes

The second research query of this study was to investigate whether there was a significant difference between the average vocabulary learning outcomes (post-tests) of the experimental group (using DGBL) and the control group (using a conventional vocabulary learning strategy). The researchers tested the hypothesis by running an independent sample t-test. A homogeneity test was performed before testing the hypothesis as a requirement for inferential analysis testing. The experimental and control groups' pre-and post-test data were subjected to homogeneity testing, with a significance level of $\alpha = 0.05$. The results of the homogeneity of the variance test for the pre-and post-tests is show in **Table 6**.

Table 6. The Output of the Homogeneity of Variance Test (Pre-test)

		Pre-Test			
		Levene Statistic	df1	df2	Sig.
Vocabulary Learning Outcomes	Based on Mean	2.603	1	55	**0.112**
	Based on Median	2.738	1	55	0.104
	Based on the Median and with adjusted df	2.738	1	44.66	0.105
	Based on trimmed mean	2.717	1	55	0.105

Table 7. The Output of the Homogeneity of Variance Test (Post-test)

		Post-Test			
		Levene Statistic	df1	df2	Sig.
Vocabulary Learning Outcomes	Based on Mean	0.018	1	55	**0.893**
	Based on Median	0.021	1	55	0.884
	Based on the Median and with adjusted df	0.021	1	54.84	0.884
	Based on trimmed mean	0.016	1	55	0.899

Hence, if the significance value on 'Based on mean' is more than α (sig > α), then the two data variances tested are homogeneous. Conversely, if the significance value is lower than α, the data are not homogeneous (sig < α). According to Table 6, the significance value obtained in the pretest experimental and control groups was 2.603, meaning that the significance value was greater than $\alpha = 0.05$ (2.603 > 0.05). Whereas Table 7 shows the sig value in the posttest was obtained by 0.893, meaning that the sig. value was more than $\alpha = 0.05$ (0.893 > 0.05). Thus, the variance data of the experimental and control groups were found to be homogenous and the prerequisites for testing the hypothesis with parametric statistics using the independent samples t-test have been fulfilled; namely, the data has a normal distribution, and the data variance of the two

groups is homogeneous. The hypotheses are there is no significant difference between the two groups if sig. (2-tailed) > 0.05 and there is a significant difference if sig. (2-tailed) < 0.05. The summary of data analysis results is presented below.

Table 8. The Output of Independent Samples T-test

Variances	Statistics						
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	30.190	0.893	1.370	55	0.176	4.16328	3.03998
Equal variances not assumed			1.370	54.999	0.176	4.16328	3.03778

Table 8 displays the SPSS output findings. The sig. (2-tailed) obtained is 0.176, which indicated that the significance value was more than α (0.176 > 0.05). The null hypothesis (H0) was thus accepted, whereas the alternative hypothesis (Ha) was rejected. In other words, this study found no significant difference in students' vocabulary learning results (post-test mean scores) between the experimental group that employed DGBL and the control group that utilized a conventional vocabulary learning strategy. Although descriptive statistics revealed that the experimental group's average post-test score was higher than that of the control group, the experimental group obtained an average score of 62.86. In contrast, the average value for the control group was 59.29. Comparing the mean post-test scores of the experimental and control groups using an independent samples t-test was not statistically significant. The researchers conducted face-to-face interviews with ten participants in the experimental group after getting the data of the post-test scores. More precisely, one week after the post-test, results were obtained. All interviewees received the same eight questions regarding their points of view on DGBL. According to the interview results, eight of ten interviewees stated they had never used a laptop or smartphone to learn English vocabulary before receiving the treatments. Therefore, DGBL offered vocational students a novel experience.

Responding to researchers' inquiry about how they felt while learning vocabulary with the DGBL strategy, all interviewees said they were extremely pleased. The aforementioned interview excerpts indicated that DGBL can be an engaging and enjoyable strategy for vocational students in learning vocabulary. Some interviewees concurred that learning vocabulary with DGBL is enjoyable because they can play while learning. In addition, since learning vocabulary with DGBL was a new experience for the respondents in the experimental group, most interviewees confessed to having had interesting experiences during the learning. The interviewees' statements indicated that the leaderboard feature at the end of the vocabulary game makes them enthusiastic and motivated to compete for the top ranking. In the vocabulary game with *Wordwall.net*, the number of scores obtained was based on the accuracy of answering questions and the speed of time in answering the questions. Thus, the students who answered questions correctly and faster would get a higher score. The students found this challenging, so they played the vocabulary game repeatedly until they reached the top score.

However, even though the students did individual learning while working on vocabulary games in class, most students reported that there was pretty intensive interaction between them and the teacher. Furthermore, concerning students' views on whether DGBL could increase their vocabulary, one hundred per cent of the respondents believed that playing vocabulary games with *Wordwall.net* could expand their English vocabulary. In addition, some interviewees argued that playing vocabulary games such as *Wordwall.net* is a great way to have fun while learning new words. Related to this, in question 6 of the interview, seven out of ten respondents also mentioned that one of the benefits of learning vocabulary with DGBL is that learning becomes interesting and fun. Furthermore, students can access the game easily through their smartphone if they still have the game URL provided by the teacher and internet access. Regarding the students' difficulties while learning vocabulary with DGBL, most students complained about the internet connection, which was quite bad during vocabulary learning. This is because all 29 students accessed the internet to open the *Wordwall.net* application using the school's hotspot at one time, while its bandwidth capacity was insufficient for that. Thus, poor internet connection remained the biggest barrier to vocabulary learning in remote schools.

Moreover, this study reveals that, not all students in the experimental group had good digital literacy. Based on the researchers' observation during the treatment, some students still found it difficult to operate laptops, connect to the internet, open browser pages, and use the keyboard and touchpad on a laptop. It was proved by one of the interviewees who stated that she found it difficult to run the *Wordwall.net* application on a laptop. In the final item of the interview, the researchers asked the respondents to choose whether they prefer DGBL or conventional vocabulary learning to increase their vocabulary. Intriguingly, the interview results showed that all interviewees chose the DGBL strategy to expand their vocabulary knowledge. Based on the interview results, the researchers concluded that the DGBL strategy could be one of the alternative strategies for

learning vocabulary at vocational schools. However, an unstable internet connection is one of the biggest obstacles in using DGBL *(Wordwall.net)* for vocabulary learning in a rural vocational school.

Discussion

Based on the descriptive analysis and paired sample t-test results, the finding proved that there was a significant increase in the experimental group who received vocabulary enhancement treatment with the *Wordwall.net* platform. The current study's result backed up several previous studies that successfully used the DGBL strategy to expand students' vocabulary (Ali et al., 2022; Ibrahim et al., 2022; Qasim, 2021). For instance, other study found that using DGBL in learning vocabulary can assist students in memorizing some targeted words in a short time; nevertheless, they can still remember these words with long-term memory (Ali et al., 2022). In line with this, the prior investigations demonstrated that the appropriate combination of skills and challenges, clear objectives, and ease of play provided by DGBL positively impact students' concentration and intrinsic motivation. In addition, both concentration and intrinsic motivation positively impact students' learning satisfaction, leading to an increase in their vocabulary mastery (Li et al., 2019; Patra et al., 2022). Therefore, the DGBL merits consideration as one of the powerful strategies for expanding vocational students' vocabulary mastery.

However, in addition to learning vocabulary through rote memorization, the respondents in the control group were instructed to use the words they had just learned in sentences, both orally and in writing. Some scholars believe that utilizing memory strategies and subsequently incorporating new words or phrases into meaningful sentences could be an effective strategy for mastering both receptive and productive language skills (Abdalrahman, 2022; Afzal, 2019). Based on the descriptive analysis result, the control group who learned vocabulary conventionally also increased the average post-test score. Even though the control group's improved vocabulary learning outcomes did not increase as much as in the experimental group, the results of the paired sample t-test confirmed that the average pre-and post-test scores varied statistically significantly. This means that the therapies during the conventional vocabulary learning positively impacted the control group's vocabulary learning outcomes. Previous studies have revealed that memory strategies are the most popular among language learners (Al-Khresheh & Al-Ruwaili, 2020). After all, the findings indicated that implementing conventional vocabulary learning was still feasible to maintain and was proven to influence students' vocabulary enrichment.

Conversely, the previous experimental studies revealed that the students who learned vocabulary with the DGBL showed better learning outcomes compared to students in the control group who used conventional vocabulary learning strategies (Alhebshi & Gamlo, 2022; Safitri et al., 2022; Setiawan & Wiedarti, 2020). As an example, previous study investigated the impact of implementing the DGBL on the foundation year students' vocabulary acquisition at Saudi Arabia University through the *Quizizz* application (Alhebshi & Gamlo, 2022). The study found that compared to the control group, the experimental group performed much better on the post-test. The experimental group also acknowledged that this strategy was a useful means of facilitating and lowering cognitive burden during vocabulary learning compared to conventional vocabulary learning strategies.

Nevertheless, a few researchers have reported comparable findings in which the use of DGBL was not more effective than conventional strategies in vocabulary learning (Bal, 2018; Çil, 2021). Other study reported that at least three factors resulted in a statistically insignificant difference in learning outcomes between the experimental group, which used the *Wordwall.net* platform to teach vocabulary, and the control group, which used textbook exercises to teach vocabulary (Çil, 2021). Firstly, the intervention could only be completed in a short period of three weeks. As a result, this condition was insufficient to determine whether the teaching strategy was effective. The second reason was that students in both groups were already motivated to learn English and continued to study independently outside of school by enrolling in English courses after school hours. Finally, most students were already familiar with some of the vocabulary they would be taught.

The second reason is that, the internet connection in the school environment is insufficiently stable for this synchronous learning. This problem has also been validated by several students in the interview session. Even though the research site was in a remote area, the researchers ensured that the research could be conducted using school hotspot facilities. The internet bandwidth needed to be increased for the experimental group and the teachers to operate jointly. As a result, most students needed help accessing the *Wordwall.net* program. Then, the researchers used three smartphones as mini-Wi-Fi to tackle this problem. Even yet, the students occasionally complained about the internet network, which caused the *Wordwall.net* application not to work correctly. However, *Wordwall.net* requires a strong internet connection, so it may be used to answer quizzes without a hitch (Arsini et al., 2022; Elaish et al., 2019). Thus, if there were no problems with the internet connection and the application could run smoothly, it might allow for more effective vocabulary learning. Lastly, the participants in the experimental and control groups had never experienced learning vocabulary separately. Usually, vocabulary learning was integrated with other language skills, often in reading and writing learning. Moreover, all students in both groups focused on the targeted words to be learned and tested one week after the end of the intervention period. In a nutshell, the current study employed intentional vocabulary learning, in

which the students learned targeted words from a vocabulary list for a test (Karami & Bowles, 2019; Stratton, 2022). As a result, these conditions influenced both groups to improve their vocabulary mastery after the interventions. In terms of the experimental group's views about the use of DGBL in vocabulary learning, the qualitative data analysis results found that all interviewees viewed that DGBL could expand their vocabulary knowledge. They also highlighted other advantages, such as English learning becoming more fun, increasing eagerness to learn, and reducing boredom in English class. This finding was relevant to the previous studies that reported the positive effects of using DGBL. The application of DGBL was believed to be effective during vocabulary learning to assist the students in enhancing vocabulary, increase motivation and enthusiasm, stimulate competition among students, and create a fun English learning environment by presenting questions packaged in a variety of exciting templates and features (Arsini et al., 2022; Jannah & Syafryadin, 2022). In addition, this strategy also triggers students to become autonomous learners (Rasti-Behbahani, 2021; Setiawan & Wiedarti, 2020). This statement was supported by several interviewees who said that they played back the games at home. For these reasons, all interviewees voiced that DGBL implementation was preferable to conventional strategies in learning vocabulary.

The current study's results have implications that the appropriate vocabulary learning strategies might positively impact students' vocabulary mastery. Since the students often struggle to learn and understand new words, the researchers suggest that language teachers implement various interesting vocabulary learning strategies to trigger students' motivation. In line with students' current demands and needs as digital natives, the DGBL strategy could be an option. Nevertheless, because the DGBL is a form of synchronous learning, using this strategy in the classroom environment must be supported by adequate internet networks and facilities, especially for schools in rural areas with difficulty accessing the internet. That way, vocabulary learning would be more effective. Finally, the researchers recommend comparable researchers to lengthen or increase the number of interventions. Remember that the longer the intervention time, the more valid and reliable the research results will be.

4. CONCLUSION

The results of the quantitative and qualitative data showed that DGBL can be considered as one of the potential strategies to expand vocational students' vocabulary. In addition, the analysis result proved that using conventional vocabulary learning strategies positively impacts the control group's vocabulary development. Nevertheless, even though the experimental and control groups did not demonstrate statistically significant differences in their vocabulary learning outcomes, the experimental group interviews revealed favorable responses to using DGBL. Therefore, the application of DGBL has been revealed effective in enriching vocational students' vocabulary mastery, promoting learning motivation and competitive spirit, creating a joyful learning environment, and reducing boredom in vocabulary learning.

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