Journal of English Language and Education
ISSN 2597- 6850 (Online), 2502-4132 (Print)
Journal Homepage: https://jele.or.id/index.php/jele/index

OPEN ACCESS Article

The Effect of Digital Flashcard on Students' Vocabulary Mastery

https://doi.org/10.31004/jele.v10i6.1676

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A B S T R A C T

This research aims to enhance the vocabulary mastery of seventh-grade students by applying digital flashcards in English learning at SMP Negeri 20 Palu. A quasi-experimental research design with a non-equivalent control group was employed. The population comprised 106 seventh-grade students, and the samples were selected using cluster random sampling, with class VII A assigned as the experimental group and class VII B as the control group. Data collection was carried out through pre-tests and post-tests to examine students' improvement in vocabulary mastery. The findings revealed that students in the experimental group obtained a higher average post-test score (72.00) compared to those in the control group (56.13). Statistical analysis conducted using SPSS version 25 showed a significance value of p = 0.000, which is lower than 0.05, indicating that the alternative hypothesis was accepted. These results confirm that digital flashcards are effective in improving students' vocabulary mastery. Furthermore, the pedagogical implications of this research indicate that integrating digital media into vocabulary instruction can foster students' motivation, active participation, and independent learning, while also supporting the adoption of technology-based teaching practices in the classroom.

Keywords: *Digital Flashcards, Vocabulary Mastery, Quasi-Experimental Design, Seventh Graders*

Article History:
Received 06th November 2025
Accepted 15th December 2025
Published 17th December 2025

INTRODUCTION

Vocabulary is a crucial component in learning EFL (English as a Foreign Language). Good vocabulary mastery serves as a fundamental foundation for developing overall language skills. Without sufficient vocabulary knowledge, students will encounter difficulties in reading texts, speaking, writing, listening, and expressing ideas in English.

According to Rahmah et al. (2023), vocabulary is defined as a collection of words in a language that are used across various language skills, including reading, speaking, writing, and listening. This definition highlights the central role of vocabulary as an essential element that supports all aspects of language learning.

At the junior high school level, particularly in the seventh grade, strong vocabulary mastery is very important. It functions as a basis for communication, gaining information, and understanding English learning materials both inside and outside the classroom. Vocabulary mastery is also considered a crucial first step before learners can acquire the language as a whole (Munigarim et al., 2024).

SMPN 20 Palu is one of the junior high schools in Palu City that is committed to improving the quality of English language learning. However, based on preliminary observations, it was found that the vocabulary mastery of seventh-grade students is still relatively low and requires greater attention from educators.

This condition is influenced by teaching methods that still rely heavily on traditional approaches, such as lecturing and providing vocabulary lists with limited variation in learning media. As a result, students tend to feel less motivated and have limited opportunities to actively engage in vocabulary learning.

In addition, the use of technology in the learning process, particularly for developing vocabulary mastery, remains very limited. This is unfortunate, considering that current

technological developments offer many opportunities to make learning more effective, interactive, and engaging for students.

One innovative solution offered by technology is the use of digital flashcards. Flashcards are highly suitable for vocabulary learning activities (Hudayani et al., 2025), and digital flashcards are equipped with words, images, audio, and videos (Munigarim et al., 2024). Compared to conventional flashcards, digital flashcards provide more attractive designs, interactive features, easy access, and adaptability to individual learning needs (Wahyuningsih, 2024).

Although technology offers many advantages, teachers must have adequate knowledge and skills to use it effectively in the learning process. Therefore, this study aims to examine how the use of digital flashcards can improve the vocabulary mastery of seventh-grade students at SMPN 20 Palu. The findings are expected to contribute to the development of more effective, engaging, and student-centered vocabulary learning methods that meet the needs of learners in the modern era.

METHOD

This research used a quantitative method and applied a quasi-experimental design, specifically a non-equivalent control group design. In this design, there were two groups: an experimental group that received the treatment, and a control group that did not receive the treatment. Both groups were given a pre-test and a post-test in order to measure the effectiveness of using digital flashcards on vocabulary acquisition. Through this design, the researchers were able to compare the vocabulary achievement of students who used digital flashcards with that of those who learned through conventional methods.

Table 1. The Experimental Design

Groups	Pretest	Independent Variable	Postest
Experimental Group	O_1	X	O_2
Control Group	O_3		O_4

Respondents

The population of this research consisted of seventh-grade students at SMP Negeri 20 Palu. The seventh grade consists of 4 classes, which are divided into classes VIIA, VIIB, VIIC, and VIID. The total number of students is 104 seventh-grade students. this research was conducted at SMPN 20 Palu, which is located in Kayumalue.

Table 2. The Distribution of the Students

No.	Class	Number
1.	VIIA	32
2.	VIIB	31
3.	VIIC	21
4.	VIID	20
	Total	104

This research used a cluster random sampling technique, which was a sampling method where intact groups (clusters) were randomly selected rather than individuals. In this study, the population consisted of all seventh-grade classes at SMPN 20 Palu. Among the available classes, two classes were randomly selected to serve as the sample. One of the selected classes was assigned as the experimental group, and the other as the control group. For instance, if Class VIIA and Class VIIB were randomly chosen, Class VIIA served as the experimental group using digital flashcards, while Class VIIB served as the control group using conventional methods. This research aimed to examine the impact of digital flashcards on students' vocabulary acquisition.

Instruments

The research instrument was a vocabulary mastery test consisting of 20 multiple-choice questions and 10 matching questions, with a total of 30 items. This test was used to measure students' knowledge of nouns and verbs before and after the treatment. The validity and reliability of the instrument were examined using normality tests (Kolmogorov–Smirnov and Shapiro–Wilk) and a homogeneity test (Levene's Test), which indicated that the data were normally distributed and had homogeneous variances.

Table 3. Scoring Rubric

No.	Test	Number of test	Score of Each Item	Maximum Score
1	Multiple Choice	20 Items	1	20
2	Matching test	10 Items	1	10
	Total	**30 Item**		**30**

Procedures

The treatment was conducted over six learning sessions, with each session lasting 2 × 40 minutes. Learning activities utilized Canva-based digital flashcards that displayed words, images, and example sentences. The main learning platform was Canva, which was used to present materials and interactive activities. The activities included discussions, pronunciation practice, word classification games, and learning reflection.

In the first session, students were introduced to nouns and verbs through guided discussions, visual support, and pronunciation practice. The second session emphasized vocabulary classification by distinguishing between nouns and verbs. The third session discussed common types of nouns and verbs, accompanied by practice in pronunciation and word usage. The fourth session focused on constructing simple sentences using the vocabulary that had been learned. In the fifth session, students were asked to identify nouns and verbs in short texts to strengthen their contextual understanding of vocabulary. The final session consisted of vocabulary games and reflection activities, creating an enjoyable and interactive learning atmosphere for students to review and consolidate their learning outcomes

Data analysis

The data analysis employed an independent samples t-test to examine differences in pre-test and post-test scores between the experimental and control groups. The statistical analysis was carried out using SPSS version 25, with the assumption that the data followed a normal distribution and exhibited homogeneous variances.

FINDINGS AND DISCUSSION

At the beginning of the research, a pre-test was administered to the experimental group in order to determine the students' starting level of vocabulary mastery before applying digital flashcards. The test provided the baseline data for evaluating students' improvement over the course of the study. Conducted on Friday, August 4, 2025, the pre-test comprised 30 questions, including 20 multiple-choice items and 10 matching tasks, targeting their knowledge of nouns and verbs.

The Result of Pre-tests and Post-tests of an Experimental

Before the treatment was conducted, the researchers gave a pre-test to the experimental group and control group on August 5, 2025, to measure the students' initial level of vocabulary mastery. The experimental group consisted of 32 students, each completing a test containing 30 items (20 multiple-choice and 10 matching questions) with a maximum possible score of 30. The students' raw scores were then converted into a 100-point scale.

The total score achieved in the pre-test was 1,480, resulting in an average score of 46.22. These results indicate that the students' vocabulary proficiency was still quite low prior to the implementation of digital flashcards. Following the treatment, a post-test with the same format and scoring system was administered. The total score obtained in this phase increased to 2,301, with the mean score rising to 72.00. This considerable improvement demonstrates that the application of digital flashcards had a positive and effective impact on enhancing students' vocabulary mastery. A comparison of the initial and final test results of the experimental group is shown in Table 4.

Table 4. Experimental Group's score on Pre-test and Post-test

Test Type	Number of Students	Maximum Score	Total Obtained Score	Mean Score
Pre- test	32	30	1,480	46,22
Post-tets	32	30	2.301	72,00

The findings clearly indicate a significant improvement in students' vocabulary performance following the use of digital flashcards. The average score rose by 25.78 points, from 46.22 to 72.00. This implies that digital flashcards were highly effective in enhancing

students' ability to remember and comprehend vocabulary, while also fostering a more engaging and enjoyable learning environment throughout the lessons.

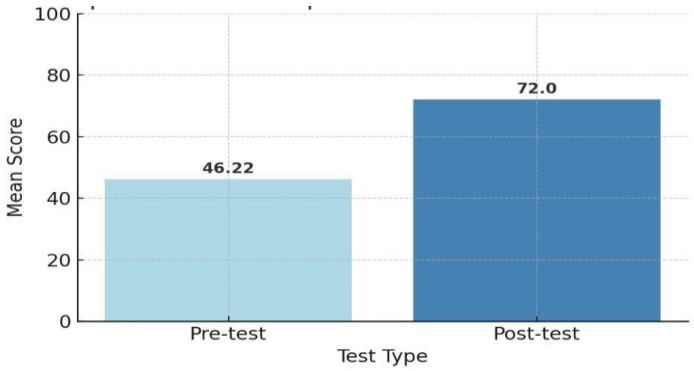

Figure 1. Grafik Results Experimental Group's Pre-test and Post-test

The bar graph above illustrates the comparison of the average pre-test and post-test scores in the experimental group. In the pre-test, the average score was 46.22, indicating that the students' initial vocabulary mastery was still low before the treatment was given. After learning with digital flashcards, the post-test average score increased significantly to 72.00. The 25.78-point increase demonstrates a substantial improvement in the students' vocabulary mastery.

The Result of Pre-tests and Post-tests of a Control

Before the treatment was administered, the control group took a pre-test on August 6th, 2025, to assess the students' initial level of vocabulary mastery. This group consisted of 31 students, and the test included 30 questions (20 multiple-choice and 10 matching items) with a maximum score of 30. The total score obtained from this test was 1,480, resulting in a mean score of 46.00. These findings indicate that the students' vocabulary mastery was still relatively low before any learning intervention was applied.

After the learning period ended, a post-test was conducted using the same structure and scoring system. The total score increased to 1,740, and the mean score rose to 56.00. Although the improvement was not as substantial as that of the experimental group, the results still demonstrated progress in the students' vocabulary comprehension.

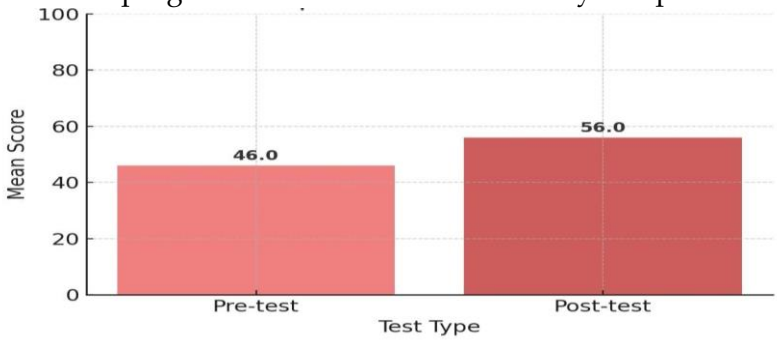

Figure 2. Control Group's score on Pre-test and Post-test

The bar graph above compares the pre-test and post-test mean scores of the control group. It shows a slight improvement in students' vocabulary mastery after conventional learning. The mean score increased from 46.00 to 56.00, demonstrating a modest enhancement in performance. This visual evidence reinforces that traditional teaching methods can aid learning, but the improvement is less pronounced compared to the group that utilized digital flashcards.

Descriptive analysis

Descriptive analysis serves as the initial stage in data processing using SPSS. This analysis describes the distribution of data by presenting the minimum, maximum, and average values, which helps researchers understand the overall variation in students' vocabulary mastery. Table 4. presents descriptive statistics for the pre-test and post-test scores of the experimental group, and Table 5. presents the pre-test and post-test scores of the control group.

Table 5. Pre-test Results of Experimental and Control Groups

	N	Minumum	Maximum	Mean	Std.Deviation
Pre-test Experimental	32	27	60	46.22	8.526
Pre- test Control	31	27	57	40.45	8.318
Valid N (listwose)	31				

The pre-test results revealed a difference in the average scores between the experimental and control groups. In the experimental group, which consisted of 32 students, the lowest score was 27 and the highest was 60, with a mean of 46.22 and a standard deviation of 8.526. In comparison, the control group, made up of 31 students, recorded a minimum score of 27 and a maximum of 57, with an average score of 40.45 and a standard deviation of 8.318.

These results suggest that, prior to the treatment, the experimental group had a higher mean score than the control group. This shows that the initial conditions of the two groups were not completely equivalent, which needs to be considered in subsequent analyses to maintain the validity of the findings. However, the nearly identical standard deviations indicate that score variations within both groups were fairly consistent.

In summary, the pre-test data offer an overview of students' initial abilities before the intervention. The difference in mean scores between the two groups should be taken into account when interpreting the post-test results in order to accurately evaluate the effectiveness of the treatment. Thus, further analysis is necessary to determine whether the treatment had a significant impact on improving students' learning outcomes.

Table 6. Post-test Results of Experimental and Control Groups

	N	Minimum	Maximum	Mean	Std. Deviation
Post-test Experimental	32	50	90	72.00	11.262
Post-test Control	31	43	67	56.13	5.982
Valid N (listwise)	31				

Based on the post-test results of the experimental and control groups, there was a significant difference in their average scores. The experimental group, consisting of 32 students, obtained a minimum score of 50 and a maximum score of 90, with an average of 72.00 and a standard deviation of 11.262. Meanwhile, the control group, consisting of 31 students, obtained a minimum score of 43 and a maximum score of 67, with an average of 56.13 and a standard deviation of 5.982.

The data show that after the treatment was given, the experimental group experienced a much greater increase in scores than the control group. The average post-test score of the experimental group reached 72.00, while the control group only scored 56.13. In addition, the greater standard deviation in the experimental group indicates a wider variation in scores among the participants in that group.

Thus, these post-test results indicate that the treatment given to the experimental group has the potential to have a positive effect on improving student learning outcomes. The striking difference in the average scores between the two groups also supports the hypothesis that the intervention used is effective in improving learning achievement compared to the group that did not receive the treatment. However, further statistical analysis is still needed to formally test the significance of these differences.

Table 7. Normality Test the Results

Tests of Normality							
	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Vocabulary Mastery	Pre-test Experimental (Digital flashcard)	.140	32	.112	.962	32	.320
	Post-test Experimental (Digital flashcard)	.140	32	.111	.953	32	.173
	Pre-test Control	.139	31	.131	.950	31	.158
	Post-test Control	.151	31	.069	.961	31	.308

Based on the table above, the results of the normality test using Kolmogorov-Smirnov and Shapiro-Wilk show that the data distribution in this study varied between the pre-test and post-test in the experimental and control classes. For the experimental class pre-test, the

significance value of the Kolmogorov-Smirnov test was 0.112, and the Shapiro-Wilk test was 0.320.

Since both values are greater than 0.05, it can be concluded that the pre-test data in the experimental class are normally distributed. In the post-test of the experimental class, the significance value of the Kolmogorov-Smirnov test was 0.111, and the Shapiro-Wilk test was 0.173. These values are also greater than 0.05, indicating that the post-test data in the experimental class are normally distributed. For the control class pre-test, the significance value of the Kolmogorov-Smirnov test was 0.131, and the Shapiro-Wilk test was 0.158. As both values are greater than 0.05, the data are considered to be normally distributed. Meanwhile, in the post-test of the control class, the Kolmogorov-Smirnov test showed a significance value of 0.069, and the Shapiro-Wilk test showed 0.308. Since both values are also greater than 0.05, the post-test data in the control class are normally distributed.

Table 8. Test of Homogeneity of Variances

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
Vocabulary Mastery	Based on Mean	.022	1	61	.881
	Based on Median	.028	1	61	.869
	Based on Median and with adjusted df	.028	1	60.947	.869
	Based on trimmed mean	.022	1	61	.882

Based on the results of the homogeneity of variance test using Levene's Test on the vocabulary mastery data, the significance values obtained were 0.881 (based on the mean), 0.869 (based on the median), 0.869 (median with adjusted df), and 0.882 (based on the trimmed mean). Since all of these values are greater than 0.05, it can be concluded that the variances between the groups are homogeneous. In other words, the assumption of homogeneity of variance is met, which means that further statistical analyses requiring equal variances can be carried out validly.

Discussion

The findings of this research reveal that the implementation of digital flashcards had a significant positive impact on improving the vocabulary mastery of the seventh-grade students at SMPN 20 Palu. The statistical results showed a clear difference between the experimental and control groups, in which the experimental group obtained a much higher post-test mean score (72.00) compared to the control group (56.13). The t-test result with a significance value of 0.000 < 0.05 indicates that this difference was statistically significant. These results confirm that using digital flashcards effectively enhanced students' vocabulary learning outcomes. The improvement in students' vocabulary mastery can be attributed to several pedagogical and psychological factors. First, the multisensory characteristics of digital flashcards, combining images, sounds, colors, and interactive elements, helped strengthen students' memory and concentration. The visual features allowed students to associate words with pictures, while repetition and pronunciation exercises supported long-term vocabulary retention. Second, the interactive nature of Canva-based flashcards increased student engagement during the learning process. Unlike traditional methods that rely on rote memorization, digital flashcards encourage students to be actively involved in recognizing, pronouncing, and using new vocabulary. This active learning process not only improved comprehension but also made the classroom atmosphere more dynamic and enjoyable.

Another factor that contributed to the improvement was the motivational aspect of using digital media. As stated by Sudrajat et al., (2023) Digital learning media can stimulate students' curiosity and enthusiasm by creating a fun and interactive learning environment. This was evident during the treatment process, where students appeared more attentive, motivated, and participative when digital flashcards were applied. In addition, the accessibility of digital flashcards allowed students to review materials independently at home or in their free time, helping them develop autonomous learning habits and improving vocabulary retention.

When compared to previous studies, the findings of this research are consistent with Aini et al., (2024), who found that flashcards significantly improved students' vocabulary mastery at MTsN 3 Padang Pariaman, as reflected in the increase of post-test scores. Likewise, Nursih et al., (2024) concluded that flashcards were effective in enhancing vocabulary learning through interactive repetition and visualization. However, what distinguishes this research is the use of digital flashcards, rather than traditional printed cards. While conventional flashcards depend solely on static images, digital flashcards offer more dynamic content such as animations and sounds, which engage multiple senses and make learning more stimulating.

This study also supports the findings of (Widiarti et al., 2024) who emphasized that Canva-based flashcards could boost students' motivation and creativity in learning English. The integration of technology, colors, and visuals made vocabulary learning more interesting and meaningful. Furthermore, the results strengthen the findings of Munigarim et al., (2024), who stated that digital flashcards effectively help junior high school students acquire new vocabulary through repetitive exposure combined with multimedia features.

Compared to the previous study conducted at SMPN 6 Palu that used manual flashcards, this research achieved greater effectiveness because of the digital aspect. Students were more engaged and motivated when learning through technology-based media that matched their daily learning habits and interests. These results suggest that the effectiveness of flashcards increases when conventional methods are transformed into digital formats that emphasize interactivity, accessibility, and visual appeal.

In conclusion, the improvement in students' vocabulary mastery resulted from the combination of visual stimulation, interactive learning, repetitive practice, and high motivation fostered by digital flashcards. This finding supports the cognitive theory of multimedia learning, which proposes that students learn more effectively when information is presented both visually and verbally. Therefore, the use of digital flashcards not only improved students' vocabulary test scores but also enhanced their learning motivation and independence, making it a modern and effective tool in teaching English vocabulary

CONCLUSIONS

This research concludes that the use of digital flashcards significantly improves the vocabulary mastery of seventh-grade students at SMP Negeri 20 Palu, as evidenced by the pre-test results showing relatively low vocabulary ability in both the experimental and control groups, despite the experimental group having a slightly higher mean score, which indicates that students initially faced difficulties in mastering English vocabulary. After the implementation of the treatment, the post-test results demonstrated a substantial improvement in the experimental group, which achieved a mean score of 72.00 compared to 56.13 in the control group, and the independent samples t-test confirmed that this difference was statistically significant ($p < 0.05$), proving the effectiveness of digital flashcards in helping students remember, understand, and use English vocabulary more effectively. Furthermore, beyond improving learning outcomes, digital flashcards positively influenced the learning process by enhancing students' motivation, engagement, and learning autonomy, as their visual and interactive features created a more enjoyable and stimulating learning environment than conventional methods, thereby facilitating better vocabulary retention. Based on these findings, teachers are encouraged to consistently integrate digital flashcards into vocabulary instruction and develop varied interactive content, while future research is recommended to explore additional features such as audio, video, and interactive quizzes to further maximize the benefits of digital flashcards in EFL learning contexts.

ACKNOWLEDGEMENTS

We sincerely extend our heartfelt gratitude to all those who have supported the completion of this research. Our deepest thanks go to the administration and staff of SMPN 20 Palu for their kind assistance and collaboration during the research process. We also wish to

express our profound appreciation to our supervisor for the continuous guidance, insightful feedback, and motivation throughout the study. We are very grateful to the participants for their cooperation and willingness to be involved in this research. Finally, we convey our sincere thanks to everyone whose help and contributions made this study successfully accomplished.

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