



## THE EFFECT OF DIGITAL FLASHCARD IMPLEMENTATION ON VOCABULARY MASTERY AMONG GRADE 11 STUDENTS AT SMAN 1 SINGARAJA

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### ABSTRACT

This study aims to measure the effect of implementing digital flashcards on the mastery of lessons in English education language of 11th grade students at SMAN 1 Singaraja. This study is part of a quasi-experimental study with a pre-test and post-test experimental design and a control group. The population of this study was 395 eleventh grade students at SMAN 1 Singaraja and by simple random sampling, 78 students were selected from two classes that were declared normal and homogeneous as samples. The results showed that the use of digital flashcards significantly improved students' mastery of lessons compared to conventional methods. Pre-test and post-test data were analyzed using a t-test, and it was found that the average post-test score of the experimental group (82.46) was higher than that of the control group (72.19). The significance value obtained ( $p < 0.05$ ) indicated a significant difference in learning outcomes between the two groups. In addition, students in the experimental group showed higher learning motivation and active involvement during learning. This study makes an important contribution to understanding the effectiveness of technology in language learning and provides practical recommendations for educators to improve teaching methods through interactive media.

**Keyword:** *Vocabulary, Digital Flashcard, English Education Language*

### INTRODUCTION

SMAN 1 Singaraja, as one of the first secondary schools in Indonesia, faces the same challenges in teaching English comprehension to grade 11 students. English is one of the compulsory subjects at SMAN 1 Singaraja, in accordance with the national curriculum. Learning English in grade 11 covers various aspects, including grammar, reading comprehension, writing, speaking and listening. Mastery of skills is the main focus because it is the foundation that supports these

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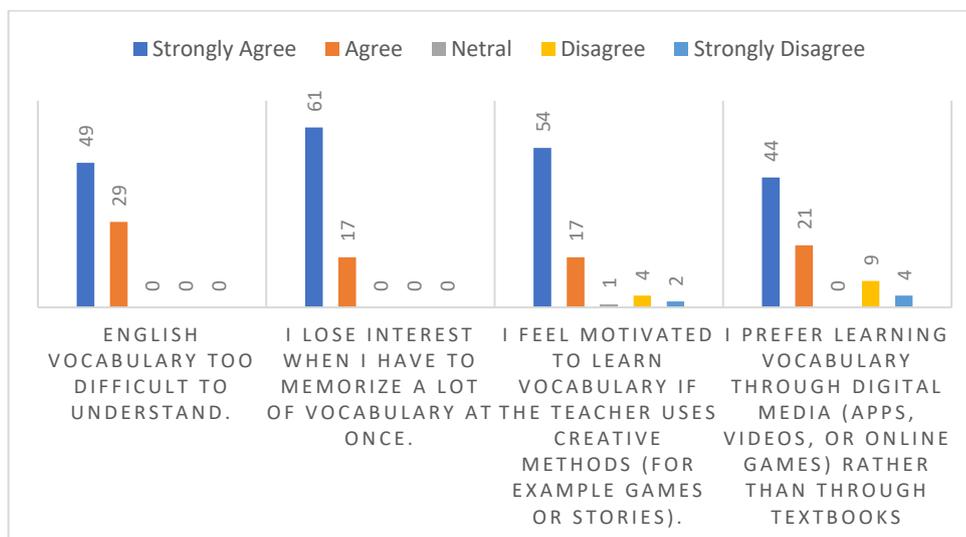
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four language skills. Vocabulary teaching methods at SMAN 1 Singaraja generally use conventional approaches such as direct learning in class, use of textbooks, and written exercises. Even though this method is quite effective, some students still experience difficulties in memorizing and applying new understanding in everyday contexts. Some students show a lack of motivation in learning English, especially in memorizing vocabulary which is considered difficult and boring.

Various challenges encourage teachers to continue to innovate in teaching methods so that students can more easily understand and apply English (Maolida et al. 2025). One approach that is starting to be introduced is the use of technology in learning, such as interactive learning applications and online platforms designed to increase student engagement (Helmie, Nurviyani, and W 2024). In addition, teachers also encourage the implementation of project-based learning, where students can work in groups to complete creative tasks, such as making videos, presentations, or written works in English. This approach not only improves language skills, but also students' collaboration and critical thinking skills.

**Figure 1 Pra-Sruvei (Observ)**



Source: Researcher (2024)

Students' motivation to learn about English vocabulary is still relatively low, this is in accordance with the pre-survey statement conducted on 30 random students where the students felt that learning to understand English vocabulary was difficult, as well as memorizing a lot of vocabulary. Apart from that, students are motivated to learn English vocabulary using learning methods in the form of games and also through online media. Teaching methods that are not varied often cannot accommodate all learning styles. Although there are efforts to implement



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technology in learning, not all students have the same access to digital devices at home, which can affect the effectiveness of learning.

Researchers chose to introduce digital flash cards as a new and innovative method for teaching vocabulary. It is hoped that digital flashcards can attract students' interest through visual and interactive elements, as well as make it easier for them to memorize and understand new words (Iskandar, Helmie, and Saepuloh 2024). Digital flashcards allow teachers to create more interesting and dynamic learning materials, including the use of images, sounds and animations that can be adapted to students' needs. The use of special applications or platforms for digital flashcards can provide immediate feedback to students, which helps them correct mistakes and strengthen memory (Pradana & Santosa, 2020).

Previous studies on the use of digital flashcards have explored different educational settings and demographic groups. These studies often involved elementary, middle, and high school students in different subjects. For example, studies conducted by Hwang and Chang (2011) and Hung (2015) focused on elementary school students learning English vocabulary in class. Similarly, Lu (2008) investigated the impact of mobile flashcards on college students learning a foreign language. The effectiveness of digital flashcards in vocabulary acquisition has been widely documented. Hwang and Chang (2011) found that digital flashcards significantly improved vocabulary retention among elementary school students compared to traditional methods. Learning using digital flashcards is done to accommodate the various learning styles of students such as visual, auditory, and kinesthetic. Also to determine the impact generated by using this approach. By discussing these aspects, this study is expected to provide comprehensive insights into the effectiveness of digital flashcards in teaching vocabulary. This report proposes practical strategies to overcome the challenges faced by students and teachers at SMAN 1 Singaraja in learning English.

Research on the effectiveness of digital flash cards has been conducted in various contexts and shows positive results. For example, research by Ashcroft and Imrie (2014) shows that the use of digital flashcards can significantly increase the broadening of students' horizons compared to conventional methods. Ashcroft (2019) found that the use of digital flash cards can significantly increase students' vocabulary mastery compared to conventional methods. This research also shows that students are more motivated and engaged in the learning process when using digital flashcards.

Chien (2020) revealed that the use of flashcards, both digital and physical, helps elementary school students remember vocabulary faster and longer. Digital flashcards, in particular, provide the added benefit of interactive features that simplify the learning process. Tsai (2019) this research shows that students who use digital flash cards have better vocabulary achievements than students who use traditional methods. Digital flashcards allow for a more interesting and fun presentation of words for students. Chen, H. (2021), Chen researched the effects of using digital flashcards on vocabulary learning among EFL students in Taiwan. The research results showed a significant increase in vocabulary mastery and also



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an increase in students' learning motivation. However, further research is still needed to see how this method works in various different educational environments, including at SMAN 1 Singaraja.

Despite the positive findings, there are still some gaps between this research and previous literature. First, the research conducted by the above research was within the scope of students in other schools and outside the Singaraja area (Hwang & Chang, 2011; Ashcroft and Imrie, 2014; Hung, 2015; Tsai, 2019; Chen, H, 2021) whereas in This research uses students from SMAN 1 Singaraja. Second, although many studies highlight the benefits of digital flash cards, only a few studies discuss long-term vocabulary retention and integration. these tools into regular classroom activities.

This study aims to measure the effect of implementing digital flashcards on vocabulary mastery of grade 11 students at SMAN 1 Singaraja. It is expected that this study can contribute to understanding the effectiveness of using technology in language learning and provide practical recommendations for teachers and other educational institutions. With the background that has been explained, this study has high relevance in the context of English language learning in Indonesia. This study is also expected for the use of digital flashcards can be an innovative solution to improve students' vocabulary mastery, so that they can communicate in English more confidently and effectively.

## **THEORETICAL FRAMEWORK**

### **Vocabulary Mastery**

According to Godwin-Jones, R. (2020), With advances in technology, knowledge learning can now be enhanced through digital tools such as learning applications, educational games, and digital flashcards. Recent research shows that technology can increase student engagement and Mastery in vocabulary learning. Technology enables personalization of learning, provides instant feedback, and creates an interactive learning environment. Adaptive vocabulary learning apps can adjust difficulty levels based on student performance, increasing learning effectiveness. Research in neuroplasticity shows that the brain has the ability to change and adapt in response to learning experiences. This approach emphasizes the importance of practice and repetition to strengthen the neural pathways associated with new vocabulary. Repeated practice and active use of new vocabulary in meaningful contexts can improve Mastery. Methods such as spaced repetition and using vocabulary in various contexts help strengthen long-term memory (Draganski, 2021).

Vocabulary mastery is an important component in developing overall language skills (Sendjaja, 2021). Vocabulary mastery theory emphasizes that effective and structured vocabulary learning can have a significant impact on improving students' language proficiency. According to this theory, vocabulary learning involves not only memorizing word definitions but also understanding how words are used in different contexts (Nyalanesia, 2022). Learning strategies that are student-centered, interactive, and utilize visual aids, such as digital



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flashcards, are considered more effective in improving students' vocabulary mastery.

Vocabulary mastery theory also emphasizes the importance of detailed and systematic vocabulary learning, taking into account students' stages of language development. Appropriate interventions at critical stages, such as in grade 11, can maximize students' progress in vocabulary mastery. In addition, this theory also emphasizes the importance of vocabulary learning integrated with various disciplines, so that students can apply and strengthen their vocabulary mastery in various contexts (Nyalanesia, 2022). This can improve retention and transfer of vocabulary knowledge better.

### **Learning Media**

Learning media are tools or instruments used to facilitate learning processes, making them more effective and engaging. According to Heinich et al. (2022), learning media can be categorized into several types: visual (e.g., pictures, diagrams), auditory (e.g., recordings, podcasts), and kinesthetic (e.g., models, physical activities). Examples include traditional textbooks, educational videos, interactive simulations, and digital applications.

Learning media are physical means used to deliver learning materials such as books, videos, audio, or other visual aids that can increase the effectiveness of learning (Ikhbal & Musril, 2020). Learning media are anything that can be used to convey messages from sender to recipient so that they can stimulate students' thoughts, feelings, attention, and interest in learning (Maghfiroh et al., 2024). Samura (2023) said that learning media includes various types of components used in the teaching and learning process, including equipment and materials used to convey information to students.

Based on the three definitions above, learning media can be understood as tools, means, or components used in the learning process to convey material from educators to students. This learning media includes various physical and digital forms, such as books, audio, video, and visual aids, which function to stimulate students' understanding, attention, and involvement in the learning process. Learning media is an important instrument in the education process that functions as an intermediary to increase the effectiveness of learning. By using appropriate media, teachers can deliver material more interestingly, motivate students, and help them understand concepts better.

### **Digital Flashcard**

Digital flashcards are an electronic version of traditional flashcards that usually consist of two sides: one side with questions or words, and the other side with answers or definitions. The main advantage of digital flashcards over physical flashcards is their flexibility and interactivity. Digital flashcards can be accessed anytime and anywhere via devices such as smartphones, tablets or computers. They allow the integration of various media formats (text, images, audio, video)



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that can help in multisensory learning. This increases student engagement and Mastery (Brodsky, 2020).

Digital flashcards provide the possibility of easier and faster material customization. Users can create, edit, or delete flashcards according to their needs and desired level of difficulty. With special applications or software, students and teachers can easily organize learning content into various categories, such as subjects, topics, or difficulty levels, making it easier to revise and structure learning. This provides more convenience in managing learning materials, both for students who want to repeat the material regularly and for teachers who want to adjust the level of difficulty according to student development (Yasin et al., 2023).

Digital flashcards offer a progress tracking feature that allows users to monitor how well they have mastered the material being studied (Maghfirah et al., 2024). Many digital flashcard applications are equipped with an algorithm system that can adjust the frequency of card repetition based on the student's level of mastery. With this system, cards that are difficult to remember will appear more often, while cards that have been mastered will appear less often. This maximizes the efficiency of learning time and ensures that students get more attention to material that requires repetition.

Another advantage of digital flashcards is their ability to encourage collaborative learning (Logayah et al., 2023). Many flashcard applications allow students to share the flashcards they have created with classmates or teachers, or even access collections of flashcards that have been compiled by others. This collaborative learning enriches the learning experience, provides new perspectives, and allows students to learn from a variety of sources that can help their understanding of a topic. In addition, through the discussion or comment feature, students can exchange ideas and discuss the material they are studying, strengthening the understanding process. Digital flashcards greatly support independent and flexible learning (Soleh et al., 2024). Because they can be accessed through digital devices, students are no longer limited by time or place to study. This allows them to study independently whenever they have free time, without having to rely on formal class schedules. In this way, digital flashcards function as a tool that facilitates continuous learning and can be done more personally, according to the speed and learning style of each student (Hoerudin, 2023). This is very important in supporting the diversity of student learning needs in this digital era.

## **METHOD**

Quasi-experimental research design is a method used to evaluate the effects of an intervention or treatment without using full randomization. In the context of research on the effect of digital flashcard implementation on vocabulary mastery, this design is very relevant because it allows researchers to compare groups that receive treatment with control groups that do not receive treatment.



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**Table 1. Quasi Experiment Design**

Group	Pre-test	Treatment	Post-Test
Experiment	YE	X	YE
Control	YK	-	YE

Source: Rachmawati (2024)

**Description:**

YE = Data from the experimental class pre-test/post-test results

YK = Data from the control class pre-test/post-test results

X = Treatment Using Digital Flashcard

The population of this research is the students in the eleventh grade of SMA N 1 Singaraja in the academic year 2024/2025, which consists of 395 students that are divided into eleven classes. The population of the students in the eleventh grade of SMAN 1 Singaraja in the academic year of 2024/2025. A sample is a part of the population that is taken to represent the entire population in a study. In this study, the sample will be taken using a random sampling technique to ensure that the sample taken is representative and reliable. This technique helps in reducing bias and ensuring that both groups (treatment and control) are homogeneous and at the same level.

**Table 2. Research Sample**

Classes	Students
XI B	39
XI D	39
<b>Total</b>	<b>78</b>

Source: Researcher (2024)

This research uses an experimental group and a control group, where to see the results of digital flashcard media learning, a pre-test and post-test will be carried out. In this research, the instrument used are teaching plan, pre-test, and post-test. In this study, the instruments used to collect data were vocabulary mastery tests and digital flashcards. The following is a detailed explanation of each instrument, the reasons for their selection, and the theories underlying their use.

**FINDINGS AND DISCUSSION**

**FINDINGS**

**Description**

The experimental group in this research was conducted on 39 students at SMA Negeri 1 Singaraja class 11-B. In this experimental group, testing was carried out using questions given in accordance with the first stage, namely the pre-test stage to determine students' understanding before being given treatment. The control group was carried out on 39 students of SMA Negeri 1 Singaraja, the control group was used in this study to determine the treatment given to the experimental group whether there was a difference or not after using flashcards in learning.



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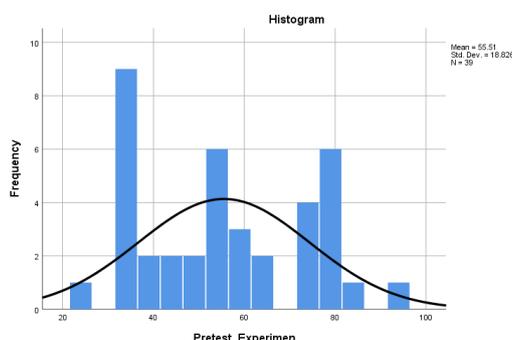
**Table 3. Frequency Pre-Test Experiment Group**

Interval		Frekuensi	%
24	34	7	17.95
35	45	7	17.95
46	56	8	20.51
57	67	5	12.82
68	78	6	15.38
79	89	5	12.82
90	100	1	2.56
<b>Total</b>		<b>39</b>	<b>100.00</b>
<b>Average</b>		<b>55.52</b>	
<b>Standard Deviation</b>		<b>18.826</b>	

Source: Researcher (2024)

Based on the frequency distribution table of pre-test results for the experimental group, the majority of participants' scores were centered in the interval 46–56 with the highest frequency being 8 students (20.51%). This interval shows that the majority of students had a fairly good initial performance before the treatment was given. In contrast, only a few students obtained a score above 90, with the lowest frequency being 1 student (2.56%), which reflects that very high scores are rare. The average pre-test score for the experimental group was 55.52. This value is close to the upper limit of the 46–56 interval, indicating that most students fall in a fairly stable range of scores in the middle of the distribution. Even so, there is quite a large variation in values, as can be seen from the standard deviation of 18.826. This variation shows that there are significant differences between students with low scores and students with high scores in the experimental group.

**Figure 2 Pre-Test Histogram Experiment Group**





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Through the histogram presented, the distribution of values looks quite spread out, although there is a greater concentration in the middle values. Intervals with high frequencies represent the peak of the distribution, while intervals at extreme values have lower bars, illustrating fewer students with very low or very high performance. This distribution provides a general picture of the variation in student performance before the intervention was implemented. Overall, the experimental group's pre-test data showed a varied distribution of scores, with a tendency centered on moderate scores. This can be a basis for analyzing the effect of treatment on this group, as well as assessing the effectiveness of the intervention on their final results. These varying scores also demonstrate the importance of individual evaluation in understanding overall learning outcomes.

The experimental group in this research was conducted on 39 students at SMA Negeri 1 Singaraja class 11-B. In this experimental group, testing was carried out using questions given after the first stage, namely the pre-test stage, and then testing was carried out using questions after the treatment to find out the post-test results for students.

**Table 4 Frequency Post Test Experimen Group**

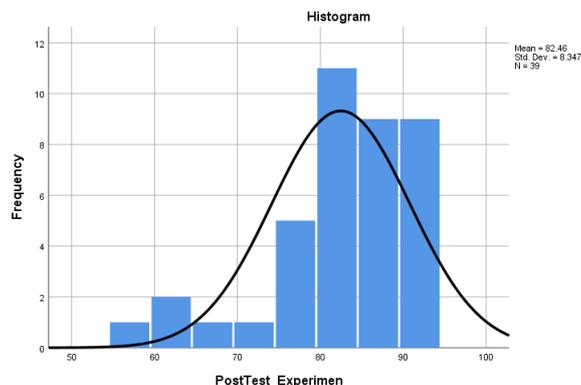
Interval	Frekuensi	Presentasi	
57	62	1	2.56
63	68	3	7.69
69	74	1	2.56
75	80	7	17.95
81	86	13	33.33
87	92	13	33.33
93	98	1	2.56
<b>Total</b>	<b>39</b>	<b>100.00</b>	
<b>Average</b>	<b>82.46</b>		
<b>Std. Dev</b>	<b>8.347</b>		

Source: Researcher (2024)

Based on the results of the table and histogram from the experimental group's post-test, it can be seen that the distribution of participants' scores tends to be centered on a higher value interval compared to the pre-test. Most students obtained scores in the intervals 81–86 and 87–92, each with the highest frequency of 13 students (33.33%). In contrast, low grade intervals, such as 57–62 and 69–74, only had 1 student (2.56%) in each interval. This shows that the majority of students experienced an increase in performance after the intervention was carried out. The average post-test score was 82.46, which was much higher than the average score on the pre-test (55.52). This increase reflects the positive impact of the treatment given to the experimental group. The standard deviation of 8.347 shows that the variation in scores between students is relatively smaller than during the pre-test, indicating that the participants' scores are increasingly centered around the mean.

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**Figure 3. Post Test Histogram Experiment Group**



Based on the histogram, the distribution of scores on the post-test is more focused on the high interval, which is indicated by higher bars in the intervals 81–86 and 87–92. This is different from the pre-test distribution which is more spread across various value intervals. This distribution indicates that most students succeeded in achieving optimal performance after receiving treatment, with only a few students falling outside the average score. The results of this post-test showed a significant increase in performance in the experimental group. The increase in the average score, accompanied by a more even distribution of scores at high intervals, confirms that the treatment provided is effective in improving student learning outcomes. Smaller variations in values also indicate better homogeneity of performance after the intervention.

**Table 5 Frequency Pre-Test Control Group**

Interval	Frekuensi	Presentasi	
20	28	3	7.69
29	37	2	5.13
38	46	8	20.51
47	55	8	20.51
56	64	8	20.51
65	73	8	20.51
74	82	2	5.13
<b>Total</b>	<b>39</b>	<b>100.00</b>	
<b>Average</b>		<b>63.87</b>	
<b>Std. Dev</b>		<b>16.593</b>	

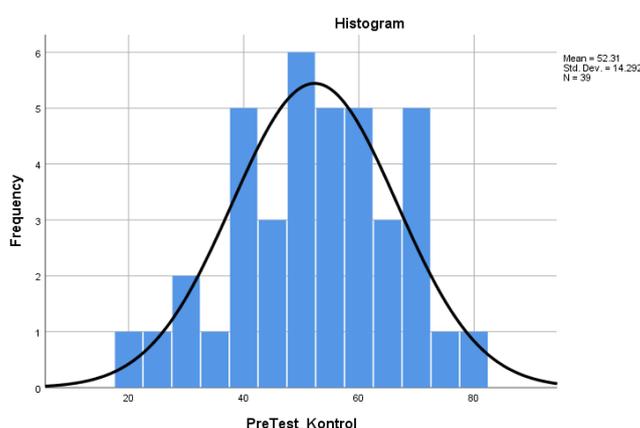
Source: Researcher (2024)

Based on the results of the control group's pre-test table and histogram, the distribution of scores looks quite even in certain intervals. The value intervals 38–

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46, 47–55, 56–64, and 65–73 each had the highest frequency of 8 students (20.51%). On the other hand, very low (20–28) and very high (74–82) scores have a much smaller frequency, respectively 3 students (7.69%) and 2 students (5.13%). This distribution shows that the majority of students have initial performance that is in the middle range. The average pre-test score of the control group was 63.87, which shows that the students' initial performance was quite good, slightly higher than the average pre-test score of the experimental group (55.52). Although the mean score is higher, the standard deviation of 16.593 indicates that there is significant variation in scores among students. This shows that some students have grades well above or below average.

Figure 4. Post Test Histogram Experiment Group



The pre-test histogram shows a fairly stable distribution, with almost uniform bars in the middle value intervals. This distribution indicates that student performance tends to be evenly spread across the 38–73 grade range, which covers more than 80% of students. Extreme values, both low and high, were rarely found in this control group. These results provide an initial picture that the control group has a relatively uniform level of ability, with scores tending to be centered in the middle grades. This fairly even distribution of values can be a benchmark for evaluating the effectiveness of the treatment given to the experimental group, especially in comparing changes in performance between the two groups.

Table 6. Frequency Post Test Control Group

Interval	Frequency	%
50	56	15.38
57	63	10.26
64	70	17.95
71	77	28.21
78	84	10.26
85	91	12.82



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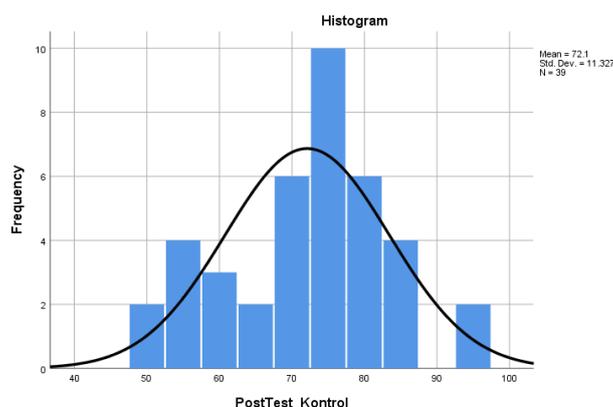
92	98	2	5.13
<b>Total</b>		<b>72</b>	<b>100</b>
<b>Average</b>			<b>72.1</b>
<b>Std. Dev</b>			<b>11.327</b>

Source: Researcher (2024)

The data provided reflects the post-test results of the control group in a study. The distribution of these values is presented in a frequency table and a histogram, which provides an overview of the distribution of the group's values. The mean score was 72.1 with a standard deviation of 11.327, indicating that the values were implemented moderately around the mean. The most frequently filled score interval was 71-77, with a frequency of 11 participants (28.21%). In the table, it can be seen that there are several groups of intervals with lower frequencies, such as 78-84 and 85-91, each of which only have one and two participants. This shows that there are a small number of participants who have scores higher than the group average. The highest score was achieved in the 92-98 interval with two participants (5.13%). The distribution of this data can be said to tend to be normal but is slightly skewed to the left, indicating that there is a proportion of participants whose performance is lower than the average. This is reflected in the fact that there were more participants whose scores were closer to the lower limit (50-56) than the upper limit (92-98).

The histogram accompanying the table provides a visual illustration of the distribution of values, with the height of the bars reflecting the frequency in each interval. The highest bar is in the 71-77 interval, which dominates the data distribution. Meanwhile, the bars for the highest interval (92-98) and some other intervals such as 78-84 appear very low. These data indicate that most participants in the control group performed around average or slightly below. Only a handful of participants had very high scores, creating a rather short distribution with long tails on the high score side.

Figure 5. Histogram Post-Test Control Group





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The histogram accompanying the table provides a visual illustration of the distribution of values, with the height of the bars reflecting the frequency in each interval. The highest bar is in the 71-77 interval, which dominates the data distribution. Meanwhile, the bars for the highest interval (92-98) and some other intervals such as 78-84 appear very low. These data indicate that most participants in the control group performed around average or slightly below. Only a handful of participants had very high scores, creating a rather short distribution with long tails on the high score side.

### Normality Test

According to Ghozali (2018), the normality test is a test on items in the model, testing the assumptions of the regression model on the variables used to determine whether the data is normally distributed or not, whether on the independent variable or the dependent variable according to the researcher's use. The significance value in this research is 0.05, so if the test result value on Asymp.sig (2-tailed) exceeds this significance value then the data is normally distributed or vice versa if the test result value is smaller than 0.05 then the data is not normally distributed.

**Table 7. Result of Normality Test**

Kolmogorov Smirnov Test		
Variable	Sig	Asymp. Sig (2-Tailed)
Pre-Test	0.05	0.200
Post-Test		0.200

Source: Researcher (2024)

Based on the results of normality testing on the data used by researchers in this study, it is known that the significance value is 0.05 and the Asymp value. sig (2-Tailed) is 0.200. So based on the results of these calculations, both pre-test and post-test data are normally distributed because of the Asymp calculation results. sig (2-Tailed) is greater than the significance value.

### Homogeneity Test

The Homogeneity Test is a test of variant data which is carried out to determine whether one data and other data are similar according to the object or group. This test is important to do to avoid bias in the interpretation of analysis results, so that the conclusions drawn are more accurate and reliable. If data from objects or groups have significantly different variances, alternative methods or data transformation need to be considered so that the analysis remains valid. Data can be said to be homogeneous if the significance value is greater than 0.05 ( $>0.05$ ).

**Table 8. Result of Homogeneity Test**

Post Test	Group	Levene Statistic	df1	Df2	Sig
	Experiment	4.466	1	76	0.289
	Control	4.186	1	76	0.278

Source: Researcher (2024)



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Based on the data in the table above, it is known that the significance values of the two groups, namely experimental and control, each have a significance value of 0.289 and 0.278, which can be said to be homogeneous because the data is greater than the significance value of 0.05.

### Hypothesis

Hypothesis testing is a procedure in statistics that is used to determine whether a statement or claim (hypothesis) about a population can be accepted or rejected based on sample data. This process involves comparing the null hypothesis ( $H_0$ ), which usually states the absence of an effect or difference, with the alternative hypothesis ( $H_1$ ), which states the existence of an effect or difference. The hypotheses in this research are:

$H_0$  : flashcard media has no effect on vocabulary mastery

$H_1$  : flashcard media influences vocabulary mastery

Table 4. 1 t Test Result

	Group	Mean	T Tabel	t Test	Sig.	Inform.
Pre-Test	Experiment	55.51	1.66462	.886	.381	Has no effect
	Control	52.31				
Post Test	Experiment	82.46		5.499	.000	Effect
	Control	72.19				

Source: Researcher (2024)

Based on the results of data analysis, at the pre-test stage, the experimental group had an average score of 55.51, while the control group had an average score of 52.31. The test results show that the calculated t value of 0.886 is smaller than the t table of 1.66462, with a significance value of 0.381 which is greater than 0.05. This shows that there is no significant difference between the experimental group and the control group at the pre-test stage, so it can be concluded that both groups had equivalent initial abilities before being given treatment.

At the post-test stage, the experimental group showed an increase in the average score to 82.46, while the control group had an average score of 72.19. The test results show that the calculated t value of 5.499 is greater than the t table of 1.66462, with a significance value of 0.000 which is smaller than 0.05. It can be said that there are significant differences between the two groups after treatment. Thus, the hypothesis is accepted that there is an influence of the use of flashcard media on student learning outcomes, which is shown by a significant increase in the experimental group compared to the control group with conventional learning. Based on the results in the table above and the interpretation of the table above it can be said that  $H_0$  (use of flashcard media has no effect on vocabulary mastery) is rejected, and  $H_1$  (Use of flashcard media has an effect on vocabulary mastery) is accepted.



## DISCUSSION

Vocabulary in English is a collection of words in English that are used to communicate, both orally and in writing. This vocabulary includes basic words, phrases, idioms, and technical terms used in various life contexts (Meidipa et al., 2022). In research conducted at SMAN 1 Singaraja, vocabulary learning used digital flashcards, it is known that the pre-test and post-test distribution scores show significant changes in the experimental group. As research conducted by Hung (2020) resulted in research that digital flash cards significantly increased word retention among elementary school students compared to traditional methods.

In the pre-test, the scores of the majority of experimental group students ranged from 46 to 56 with a mean of 55.52 and a standard deviation of 18.83. However, after implementing digital flashcards, the distribution of post-test scores was more concentrated in the high interval (81-92), with a mean of 82.46 and a lower standard deviation (8.35). This shows an increase in student learning outcomes as well as higher homogeneity of scores after the intervention.

The control group was carried out on students in class 11-D of SMA Negeri 1 Singaraja who used conventional learning methods, showing a smaller increase in scores. In the pre-test, the majority scores were in the interval 38-73 with a mean of 63.87 and a standard deviation of 16.59. After learning, the control group's average post-test score was 72.1 with a distribution that remained spread out, reflecting greater variation in scores compared to the experimental group.

Hypothesis testing is carried out through the t-test. At the pre-test stage, there were no significant differences between the experimental and control groups, with a calculated  $t$  of 0.886 which was smaller than the  $t$  table (1.66462) and a significance value of 0.381 ( $> 0.05$ ). This indicates that the initial abilities of the two groups were equivalent before the intervention. On the other hand, after being given special treatment with the use of flashcard media in the learning of students at SMA Negeri 1 Singaraja grade 11 in the post-test score data, there were significant differences between the two groups. The calculated  $t$  value of 5.499 is much greater than the  $t$  table (1.66462), with a significance value of 0.000 ( $< 0.05$ ). This supports the hypothesis that the use of digital flashcards significantly increases students' vocabulary mastery compared to conventional learning methods.

The increase in the average post-test score for the experimental group (82.46) compared to the control group (72.19) shows the effectiveness of digital flashcards as a learning tool. This difference also reflects the positive impact of technology on learning outcomes, where students find it easier to remember vocabulary through visual and interactive media. Overall, this research provides empirical evidence that digital flashcards have a significant effect on students' vocabulary mastery. The use of this media can significantly improve learning outcomes by creating a more interesting and effective learning experience, especially compared to traditional learning methods.

This study has several limitations, including its focus on one particular school and group of students, so the results may not be widely generalizable. However, these findings provide a strong basis for further research on the use of technology



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in education. In the future, similar research can be carried out involving a larger sample or by applying digital flashcards to other subjects. Research can also explore the combination of digital learning media with traditional learning methods to achieve more optimal results.

## CONCLUSION

Based on the analysis conducted, it can be concluded that there is a significant difference in the learning mastery of grade 11 students of SMAN 1 Singaraja before and after the implementation of digital flashcards between students who were given treatment and those who were not given treatment. At the pre-test stage, there was no significant difference between the experimental and control groups, with average values of 55.51 and 52.31, respectively. The results of the t-test showed a t-count value of 0.886 smaller than the t table (1.66462), with a significance value of 0.381 ( $> 0.05$ ), indicating that the initial abilities of the two groups were equivalent before the intervention. After treatment using digital flashcards, the average post-test score of the experimental group increased significantly to 82.46 compared to the control group which only reached an average of 72.19. The results of the t-test showed a t-count value of 5.499 greater than the t table (1.66462), with a significance value of 0.000 ( $< 0.05$ ). This shows that digital flashcards are effective in improving student learning outcomes compared to conventional learning methods. This significant increase supports the hypothesis that the use of digital flashcards has a positive effect on students' vocabulary mastery. The more homogeneous distribution of scores in the experimental group after the intervention also shows that this media is able to reduce the learning gap between students with different levels of initial ability.

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