The Effectiveness of Flashcard Augmented Reality Media and Game Chick Learn on the Ability to Memorize Vocabulary in English Primary School Students

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This study consists of comparative research with a Quasi Experimental Design approach, which is the type of research that does not allow one to fully control and manipulate all variables that are relevant to the type of Non-equivalent Control Group Design. This study aims to find which is more effective between the use of GCL and FAR media on the ability to memorize English vocabulary. Research was conducted at the Islamic Elementary (Madrasah Ibtidaiyah/MI) Muhammadiyah Gonilan, and the research subjects were 53 students in the second grade. Students were divided into class A as Experimental Class 1, which was subjected to GCL media treatment, and class B as Experimental Class 2, which was subjected to FAR media treatment. The results show that the FAR media was more effective than the GCL media.

Key words: *Flashcard augmented reality, game, vocabulary.*

Introduction

Today, English is an international language that is very important to learn, especially for elementary school students, along with Science and Technology. Vocabulary recognition is fundamental in English learning. In a journal (Komachali, 2012), Laufer (1997) states that vocabulary learning is the brain of language learning and language use. Vocabulary learning is an intrinsic part of language teaching. In other words, vocabulary learning is the most important and fundamental thing to learn. Despite this, the most effective way to learn vocabulary is still unclear (de Groot, 2006).

Vocabulary is the centre of teaching English. Without sufficient vocabulary, students find it difficult to understand the ideas of others and express their own. Wilkins (1972), in (Elyas & Alfaki, 2014), writes ".. while without grammar, very little can be conveyed, without vocabulary nothing can be conveyed" (pp. 111–112). This point reflects that even without grammar, or with just a few useful words and expressions, one can communicate. Griffiths (2003, 2006) (Komachali, 2012) points out that recently the importance of teaching vocabulary has been recognized.

Based on preliminary observations made by researchers at MI Muhammadiyah Gonilan, there were several problems: (1) the low interest of students in learning English, which was proved by the lack of student activities during the teaching and learning process; (2) the low level of mastery in English vocabulary in second-grade students, which is shown from the little students memorize; (3) the monotonous use of instructional media in second-grade classes and, in some instances, the total absence of learning media. If these problems persist, it will negatively impact students and result, for example, in low learning English outcomes. Based on this, the researchers conducted an Experimental study using fun learning media.

Previous research show that learning media can improve student achievement or learning outcomes. These studies use media that have proven to be effective in the classroom such as Flashcard media and educational game media. Both medias are proven to be effective and can improve student learning achievement because they are fun, keeping students excited during the teaching and learning process. The studies were previously conducted by Ayu Tirtayani, Magta, & Gusti Ayu Made Yeni Lestari (2017); Fitriyani & Nulanda (2017); Hanisan (2016); Hssina, Erritali, Bouikhalene, & Merbouha (2014); Intani (2012); Lestari (2012); Lindawati (2018); Mangundayao, McLaughlin, Williams, & Toone (2013); Nurdiana, Rahardian, & Suryadi (2017); Oktavia Triami Putri (2016); Ramansyah (2015); Rohwati (2012); Saurina (2016); Sukirman (2017); Sumantri, Nurjannah, & Siron (2017); Trisnanti, Tirtayani, & Putra (2018). Based on this comparative research, it is necessary to find which media is more effective to improve student learning achievement. Therefore, the researchers provide a comparison of two medias, which researchers have slightly changed to avoid a significant difference between them. To do this the researchers used Flashcard Augmented Reality and Game Chick Learn. The research is arranged into "The Effectiveness of the Flashcard Augmented Reality (FAR) and Game Chick Learn (GCL) Media on the Ability to Memorize English Vocabulary of Second Grade students at MI Muhammadiyah Gonilan, Academic Year 2019/2020".

The purpose of this study is to compare the effectiveness of FAR and GCL media on the ability to master English vocabulary so that the most effective media for students can be obtained and used by teachers as a reference to create a fun learning process.

The hypotheses proposed by the researchers are as follows:

Hypothesis Formula 1:
H_0: FAR media is ineffective in English vocabulary mastery of second-grade students compared to GCL media.
H_a: FAR Media is more effective in English vocabulary mastery of second-grade students compared to GCL Media.

Method

Research Type and Design

This research is a comparative study with Quasi Experimental Design approach, which is a type of research that does not allow one to fully control and manipulate all relevant variables with the Non-equivalent Control Group Design type. A comparative research method is a study that compares the existence of variables in two or more different samples, or at different times (Sugiyono, 2013: 57).

The dependent variable is the score of students' English vocabulary mastery (Y1) and the independent variable is the learning treatment using the learning medium. The design in this study is to compare Experiment group 1 and Experiment group 2. Before the research proceeded, a matching was conducted between Experiment group 1 and Experiment group 2 to ensure that both groups departed from the same point.

Table 1: Research Population

Group	Total of Students	Pre-test (no media)	Treatment	Post-test
Experiment 1 (2A)	26	Yes	*GCL*	Yes
Experiment 2 (2B)	27	Yes	*FAR*	Yes

Table 2: Research Design

| Initial State	Group	Treatment	End State
Pre-test	Experiment group 1	GCL	Post-test
Pre-test	Experiment group 2	FAR	Post-test

The treatment variable in Experiment group 1 used GCL Media (X1) and Experiment group 2 (X2) used FAR Media, while the students' English vocabulary mastery scores (Y1) were obtained from Oral Test results. Students were grouped into two groups. The first group is the group of students with GCL Media treatment and the second group is the group of students with FAR Media treatment.

The research steps are explained as follows:
- Select a test unit
- Divide the experimental unit into two groups: one group is given GCL Media treatment (Experiment group 1), and the second group receive FAR Media treatment (Experiment group 2).
- Conduct pre-test of mastering English vocabulary orally to both groups without the presence of media.
- Conducted learning by applying GCL media treatment to Experiment group 1 and FAR media to Experiment group 2.
- Observe an increase in vocabulary size of English during learning and conduct the Final Oral Test (post-test).
- Analyse the implementation of the Experiments and the results based on the results of observations and the final test.

The research design is shown in Figure 1:

Figure 1. Research Design
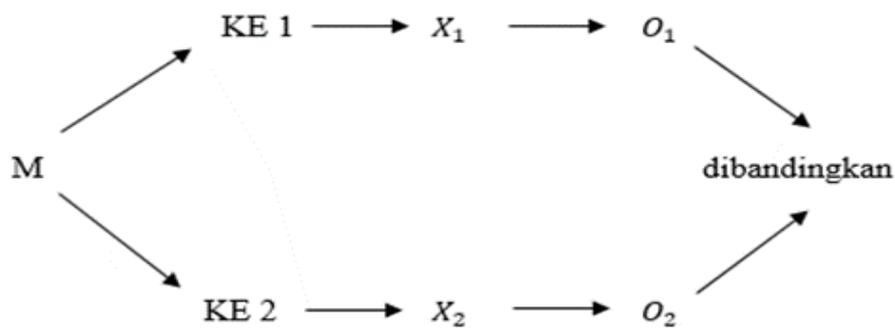
- Dibandingkan: Comparing

Information:

M: Synchronizing two classes
KE 1: Experiment group 1
KE 2: Experiment group 2
X_1: Treatment with GCL media
X_2: Treatment with FAR media
O_1 and O_2: Final test after treatment

Place and Time of Research

This research was conducted at MI Muhammadiyah Gonilan, which is located in Tuwak RT.01 RW.02, Gonilan, Kartasura, Sukoharjo 57169. Tel. (0271) 730749. Research was conducted on July 18 - July 26, 2019.

Subject

The subjects in this study were all students of Second Grade MI Muhammadiyah Gonilan academic year 2019/2020 with a total of 51 students. Second-grade students were divided into two classes, namely class 2A and 2B. Class 2A students contained 26 students and class 2B was 27 students.

Data Collection Techniques and Instruments

Data collection technique is a method used to collect data in a study. The main data in this experimental research are the scores of students' English vocabulary mastery before the media was given and after GCL media and FAR media treatment in the form of Oral Tests for Pre-test and Post-test. As a research data collection instrument, the researchers must ensure the quality of the measuring instrument in terms of its validity and reliability. Validity and reliability tests are needed to maximize the quality of measuring instruments and to minimize errors in making measurements.

Validity test

Item Validity Test is performed to determine the validity of items. In this study to analyse the validity of items from the test results of the instrument, researchers used the Product Moment Correlation formula from Karl Pearson.

The testing with Karl Pearson Product Moment Correlation is as follows:

$$r_{xy} = \frac{\sum xy}{\sqrt{(X^2 \sum Y^2)}}$$

1) Compare $r_{calculate}$ with r_{tabel}. If $r_{calculate} \geq r_{table}$, then the item is valid. r_{table} is searched using formula df = n-2, for α 5%

Information:

r_{xy} = correlation between variables x and y

x $\quad = x_1 - \bar{x}$
y $\quad = y_1 - \bar{y}$

Reliability Test

To find out whether the data is reliable or not, a Reliability Test is performed using the alpha Cronbach technique with the following steps:

Calculating Variance per item, using the following formula:

$$S_1^2 = \frac{\sum X^2 - \frac{(\sum X)^2}{n}}{n}$$

After calculating the Variance in all items, then add all the Variance per item and the total Variance per item obtained is $\sum S_i^2$

Total Variance Calculation
Alpha value calculation

$$r_1 = \frac{k}{(k-1)}\{1 - \frac{\sum S_i^2}{S_t^2}\}$$

Information:

r_1 $\quad$ = instrument reliability coefficient
k $\quad$ = number of statement items
$\sum S\_i \wedge 2$ = total item variance
$S\_t \wedge 2$ = total variance

Item is reliable if the $r_{calculate} \geq r_{table}$ with $\alpha = 5\%$, otherwise if the value of the $r_{calculated} < r_{table}$, the item is not reliable. Finding r_{tabel}, the provision of df = n-2 applies.

Level of Difficulty

Difficulty index analysis for each item is performed to determine the level of difficulty of each item. According to Susanti (2017), the difficulty index on each item uses the formula:
IK $=\frac{X}{SMI}$

Information:

IK   = Difficulty Index
X   = Average Score
SMI   = Ideal maximum score for each item

Data Analysis Technique

Data analysis is the process of simplifying data to become easier to read and interpret and the statistical process is commonly used. After obtaining data, the next step is to process the data by analysing, describing and drawing conclusions.

Analysis Test Prerequisite:
a. Normality test

To test the data normality, Kolmogorov Smirnov One-sample test is used with the Kolmogorov Smirnov Test Significance as follows:

1. Test significance, the highest value $|F_T - F_S|$ or D_n compared to the Kolmogorov Smirnov Table value.
2. If the highest value $|F_T - F_S|$ (D_n) < Kolmogorov Smirnov table value, then H_0 is accepted, and H_a is rejected. So the data is normally distributed.
3. If the highest value $|F_T - F_S|$ (D_n) > Kolmogorov Smirnov table value, then H_0 is rejected, and H_a is accepted. So the data is not normally distributed.

b. F test

F test is done to test whether the variance of data is homogeneous or not on each class sample. To find out the results of the F-Test, the following is the formula used:

$$F = \frac{highest\ variance}{lowest\ variance}$$

Variance can be obtained through the formula:

$$S^2 = \frac{n\sum X_i^2 - (\sum X_i)^2}{n(n-1)}$$

The provision of deciding the homogeneity variance test results is if the value of $F_{calculate}$ < F_{table} then the data is homogeneous. If the value of $F_{calculate}$ > F_{table}, the data is not homogeneous.

c. Difference Test

The formula used to answer which media is more effective between GCL and FAR uses the Comparison of two independent samples of the Separated Variance formula. The formula used in Separated Variance is as follows:

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}}}$$

X_1 = sample mean value (experiment class 1)
X_2 = sample mean value (experiment class 2)
S_1^2 = data variance (experiment class 1)
S_2^2 = data variance (experiment class 2)
N_1 = number of students (experiment class 1)
N_2 = number of students (experiment class 2)

Hypothesis Testing

Hypothesis testing uses the independent samples t-test method to determine the difference in vocabulary between students who use GCL and FAR media. The hypotheses are written as follows:

Hypothesis Formulation 1
H_o : FAR media is ineffective on the ability of English vocabulary mastery of second-grade students compared to GCL media.
H_a : FAR Media is more effective on the ability of English vocabulary mastery of second-grade students compared to GCL Media.

Results and Discussion
Pre-test Data

a. Pre-test Instrument Trial Data Analysis:

Pre-test Validity Test
The results of the validity calculation per item are as follows:

Table 3: Item Validity Results

No Item	Value $r_{calculate}$	Value r_{table} $\alpha = 5\%$	Information
1	0.9925		Valid
2	0.9748	0.276	Valid
3	0.9757		Valid

Item Validity Test is performed to determine the validity of items that have been given. If all items states are in accordance with the criteria of $r_{calculate} \geq r_{table}$, the item is valid. The English vocabulary mastery test was conducted using an oral test consisting of 3 items. After the item Validity Test was completed, based on Table 3 $r_{calculate}$ value for all items is higher than the r_{table} value, so the test instrument is valid.

Pre-test Reliability Test

In the item reliability test, all items are calculated using alpha Cronbach technique in Experiment 1 and Experiment 2. After analysing the data, the total Variance per item is $\sum s_{i^2} = 0.5824$. The total variance value is $s_{t^2} = 0.9619$. After finding the number item variance and total variance, the alpha value obtained is 0.5918 and the instrument reliability coefficient is 0.5918, which has reliable criteria if $r_{calculate} > r_{table}$. The r_{table} value for n = 53 and df = n-2 using $\alpha = 5\%$ is 0.276. Then the pre-test data is reliable because of 0.5918 > 0.276.

Pre-test Level of Difficulty

The following is the difficulty index for each item:

Table 4: Pre-test Item Grain Difficulty Index

No Item	Index Difficulty Value	Interpretation
1	0.618	Medium
2	0.613	Medium
3	0.524	Medium

Based on the item index difficulty calculation, it shows that items 1, 2, and 3 have medium value.

b. Pre-test Data Analysis:

Pre-test Normality Test

To test data normality, Kolmogorov Smirnov One-sample test is used with the Kolmogorov Smirnov Test Significance as follows:

1. Test significance, the highest value $|F_T - F_S|$ or D_n is compared to the Smirnov Kolmogorov Table value.
2. If the highest value $|F_T - F_S|$ or (D_n) < Kolmogorov Smirnov table value, then H_0 is accepted, and H_a is rejected. Thus, the data is normally distributed.
3. If the highest value $|F_T - F_S|$ or (D_n) > Kolmogorov Smirnov table value, then H_0 is rejected, and H_a is accepted. Thus, the data is not normally distributed.

Table 5: Kolmogorov Smirnov Pre-test Normality Test

Statistics	Experiment Class 1	Experiment Class 2
Sample N	26	27
Mean	57	59.9
Standard Deviation	6.999	9.337
D_n	0.252	0.223
KS Table	0.267	0.262
Conclusion	Normal	

In Table 5, pre-test normality was taken from the pre-test data of the experimental class 1 and experimental class 2. Given D_n values of both experimental class 1 and experiment class 2 are smaller than the KS table value, it can be concluded that the student pre-test data is normally distributed.

Pre-test F Test

The F test is used to test whether the variance in a data is homogeneous or not using the formula:

$$F = \frac{highest\ variance}{lowest\ variance}$$

Then,

$$F = \frac{87.18}{48.99} = 1.78$$

Numerator Dk (27-1) = 26
Denominator DK (26-1) = 25
With α 5%, we obtain $F_{(26.25)} = 1.95$
$F_{calculate} = 1.78 \le F_{table} = 1.95$

The pre-test F test uses pre-test data of experimental class 1 and experimental 2. The provision of decision making in the F test is H_0 accepted if $F_{calculate} \le F_{table}$ with a significance level (sig.)

of 0.05. Data analysis obtains F = 1.78 with dk formulated as (n-1), then the numerator dk = 26 and the denominator dk = 25. By using a significance level of 5% , then $F_{(26.25)}$ = 1.95. Thus, H$_0$ is accepted.

Post-test Data

a. Data Analysis of Post-Test Instrument:
Post-test Validity Test
The calculation results of all items validity in post-test are as follows:

Table 8: Results of Post-test Item Validity

No Item	Value of r$_{calculate}$	Value of r$_{tabel}$ α = 5%	Information
1	0.9823		Valid
2	0.9832	0.276	Valid
3	0.9872		Valid

Item Validity Test is performed to determine the validity of items that have been given. If all items stated are in accordance with the criteria r$_{calculate}$ ≥ r$_{table}$, then the items are considered valid. After the item validity test is done, based on the table above it can be seen that the r$_{calculate}$ value for all items is higher than the r$_{table}$ value (0.276). This means the test instrument is valid/usable.

Post-test Reliability Test

In the item reliability test, all items are calculated using alpha Cronbach technique in Experiment 1 and Experiment 2. After total data analysis conducted, the total Variance per item obtained is $\sum s_{i^2}$ = 1.5158. The total variance value obtained is s_{t^2} = 1.8868. After finding the number of items variance and total variance, alpha value found is 0.2949. The instrument reliability coefficient is 0.2949, which has a reliable criterion if r$_{caculate}$ > r$_{table}$. The r$_{table}$ value for n= 53 with df = n-2 using α = 5% is 0.276. The pre-test data is considered reliable because of 0.2949 > 0.276.

Post-test Level of Difficulty

The difficulty index table for post-test items is as follows:

Table 9: Item Difficulty Index for Post-test Items

No Item	Difficulty Index Value	Interpretation
1	0.788	Easy
2	0.698	Medium
3	0.764	Easy

Based on the item difficulty index of post-test items, items1 and 3 are considered easy, while item 2 is medium.

b. Post-test Data Analysis:

Post-test Normality Test

To test data normality, Kolmogorov Smirnov One-sample test is used with the Kolmogorov Smirnov Test Significance as follows:

1. Test significance, the highest value $|F_T - F_S|$ or D_n is compared to the Smirnov Kolmogorov Table value.
2. If the highest value $|F_T - F_S|$ or (D_n) < Kolmogorov Smirnov table value, then H_0 is accepted, and H_a is rejected. So, the data is normally distributed.
3. If the highest value $|F_T - F_S|$ or (D_n) > Kolmogorov Smirnov table value, then H_0 is rejected, and H_a is accepted. So, the data is not normally distributed.

Table 10: Kolmogorov Smirnov Post-test Normality Test

Statistics	Experiment Class 1	Experiment Class 2
Sample N	26	27
Mean	71.129	78.815
Standard Deviation	10.609	11.395
D_n	0.1902	0.183
KS Table	0.267	0.262
Conclusion	Normal	

In Table 10, it shows that the D_n value of both Experiment class 1 and Experiment class 2 is smaller than KS Table value, so it can be concluded that the post-test data is normally distributed.

Post-Test F Test

The F test can be used to test whether the variance in data is homogeneous or not using the formula:

$$F = \frac{highest\ variance}{lowest\ variance}$$

Then,

$$F = \frac{129.85}{112.562} = 1.154$$

Numerator Dk (27-1) = 26
Denominator DK (26-1) = 25
With α 5%, we obtain $F_{(26.25)} = 1.95$
$F_{calculate} = 1.15 \leq F_{table} = 1.95$

The post-test F test uses post-test data for Experimental Class 1 and Experiment Class 2. The basis for decision making in the F test is H_0 is accepted if $F_{calculate} \leq F_{table}$ with a significance level (sig.) 0.05. In the data analysis F = 1.15 is obtained by formulating dk (n-1), then dk numerator = 26 and dk denominator = 25. By using a significance level of 5%, $F_{(26.25)} = 1.95$ is obtained, thus, H_0 is accepted. It can be concluded that the data variance of English vocabulary post-test results in Experiment 1 and Experiment 2 is homogeneous.

Pre-Test and Post-Test Data

After the pre-test and post-test data analysis prerequisite tests are fulfilled, the next hypothesis test is performed to determine the most effective media between FAR and GCL on students' English vocabulary mastery, thus, the researchers propose the following hypotheses:

H_o : FAR media is ineffective on the ability of English vocabulary mastery in second-grade students compared to GCL media.

H_a : FAR Media is more effective on the ability of English vocabulary mastery of second-grade students compared to GCL Media.

As an effort to make a decision on the hypotheses above, the researchers used the comparative formula of two independent samples tested with the Separated Variance formula in the student's post-test learning outcomes of Experiment 1 and Experiment 2:

$$t = \frac{71.2 - 78.8}{\sqrt{\frac{112.562}{26} + \frac{129.85}{27}}}$$

$$t = \frac{-7.6}{\sqrt{\frac{3039.2 + 3376.1}{702}}}$$

$$t = \frac{-7.6}{\sqrt{\frac{6415.3}{702}}}$$

$$t = \frac{-7.6}{\sqrt{9.14}}$$

$$t = \frac{-7.6}{3.023} = -2.514$$

Data processing obtained the result $t_{calculate}$ = -2.514 with dk = $n_1 + n_2$-2. dk = 51 then obtained t_{table} = 2.00758 which means $t_{calculate} < t_{table}$ (-2.514 < 2.00758). Thus, H_o is rejected. In conclusion, FAR media is more effective in English vocabulary mastering of second-grade students compared to GCL Media.

Discussion

This research is a comparative quantitative study with a quasi-experimental design approach. Comparative research means to compare. The variables researchers compared are FAR and GCL media to find out which of the two media is more effective to be applied to English learning, specifically on the introduction and mastery of vocabulary in second grade MI Muhammadiyah Gonilan.

This study used population sampling technique with a total of 53 students and divided into two classes, classes A and B. Class A as Experiment class 1 GCL media treatment and class B as Experiment class 2 with FAR media treatment.

Analysis prerequisite test on the results of pre-test-post-test data has been fulfilled. The results of the pre-test-post-test data show that the pre-test and post-test data in Experiment 1 and Experiment 2 classes are normally distributed with homogeneous samples.

The results of the data analysis that has been conducted on the post-test data between FAR and GCL media using t separated test Variance show that $t_{calculate}$ = -2.514 with dk= $n_1 + n_2$-2, dk = 51, and that t_{table} = 2.00758 means $t_{calculate} < t_{table}$ (-2.514 <2.00758). Thus, H_o is rejected. Thus, FAR media is more effective on English vocabulary mastery of second-grade students compared to the GCL media. This is in line with research conducted by Eridani, Santosa, &

Ferdiana, (2014) that among the use of educational game methods in the form of 3D, 2D, and conventional, 3D educational games have the best results. This shows the need to develop educational games in the form of 3D as a learning instrument. That way, Flashcards with 3D-based augmented reality features are certainly more easily understood by students.

The advantages of FAR media include: onet, FAR media presents images based on 3 dimensions. Thus, students directly recognize the objects shown with attractive colours and look original. This makes students more interested in the pictures and facilitates memorization of the English vocabulary.

Two, the use of FAR media presents a 2-dimensional image at the beginning of the giving card (flashcard), whjch will be scanned on a cell phone that supports the use of Augmented Reality so that it becomes a 3-dimensional moving-like image. This makes students curious about the image appearing after being scanned via mobile phones, so they are more interested in participating in the entire learning process.

Third, the flashcard has attractive colours and images for students, so the material presented can be more meaningful because of the quality of the picture and colours.

Conclusion

Based on the results of data analysis and the discussion, by comparing the effectiveness of the two media, the pre-test and post-test results obtained show the average pre-test value of Experiment class 1 is 57.0 while Experiment class 2 is 59.9. On the results of the Experiment class, 1 post-test obtained an average of 71.2 and the average of Experiment class 2 post-test is 78.8. Calculation of data using the t-test separated Variance shows $t_{calculate}$ = -2.514 with dk = $n_1 + n_2$-2. dk = 51 t_{tabel} = 2.00758 as then obtained, which means $t_{calculate} < t_{tabel}$ (-2.514 <2.00758). Thus, the conclusion is FAR media is more effective on English vocabulary mastery of second-grade students compared to the GCL media.

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