

THE USE OF DUOLINGO APPLICATION TO ENHANCE JUNIOR HIGH SCHOOL STUDENT'S ENGLISH VOCABULARY

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Abstrak

Mengajar kosakata termasuk hal yang menantang dalam konteks pengajaran English as a Foreign Language (EFL). Pembelajar EFL sering melupakan kata-kata dengan mudah karena kurangnya input bahasa target dan sebagian besar kata yang dipelajari melalui pengajaran di kelas sering menyebabkan kebosanan. Oleh karena itu, beberapa studi memutuskan perlunya pendekatan yang lebih efektif untuk mengajar kosakata terhadap murid EFL. Studi ini menyelidiki penggunaan aplikasi *MALL*; Duolingo untuk meningkatkan kemampuan siswa terhadap kosakata dan minat belajar bahasa Inggris melalui teknologi seluler. Penelitian semi-eksperimental diujikan kepada kelas tujuh dengan dua kelompok sampel eksperimental dan kontrol yang masing-masing kelompok terdiri dari 17 siswa. Instrumen penelitian yang digunakan adalah tes yang dikumpulkan dari nilai pre-test dan post-test. Kemudian, data dianalisis menggunakan perhitungan t-test dari SPSS 20 untuk mengidentifikasi peningkatan kosakata dari tiap kelompok. Hasilnya menunjukkan positif karena perhitungan tingkat signifikansi (nilai-p) dari skor post-test eksperimental adalah 0,00. Ini lebih rendah dari 0,05, yang menandakan ada perbedaan yang signifikan pada kelompok eksperimen setelah diberi perlakuan. Selain itu, kelompok eksperimen mendapat skor rata-rata lebih tinggi dari post-test yaitu 87,94 dari kelompok kontrol yaitu 75,52. Kesimpulannya, Duolingo dapat dipercaya sebagai aplikasi pembelajaran bahasa berbasis gamifikasi yang dapat meningkatkan kemampuan kosakata dari kelas tujuh.

Kata Kunci: Kosakata, *MALL*, Aplikasi Duolingo.

Abstract

Teaching vocabulary is demanding in the context of English as a foreign language (EFL). EFL learners often forget words easily due to a lack of target language input, and most words are learned through classroom instruction, which often leads to boredom. Thus, such works suggest the urge for a more effective approach to vocabulary teaching for EFL learners. This study explores the use of *MALL* application; Duolingo to enhance student's knowledge and interest in learning English vocabulary through mobile technologies. Quasi-experimental study was tested to seventh-grader with two group sample experimental and control that each group consist of 17 students. The research instruments used was a test that collected from pre-test and post-test score. Then, the data were analyzed using t-test calculation of SPSS 20 to identify its vocabulary improvement from each group. The results indicate a positive as the calculation of significance level (p-value) from experimental post-test scores is .000. It is lower than .05, which means there is a significant difference in experimental group after given a treatment. In addition, the experimental group got a higher average score of the post-test which is 87.94 than the control group which is 75.52. In conclusion, Duolingo can be believed to be a gamified language learning app that can develop vocabulary skills of the seventh grade.

Keywords: Vocabulary, *MALL*, Duolingo application

1. INTRODUCTION

Teaching vocabulary in English as a foreign language (EFL) sense is thought-provoking throughout the language teaching and learning process. Chen (2019) indicated that the cause EFL learners seem to struggle more with vocabulary learning than L1 learners is because they do not have the same input as L1 learners in

vocabulary acquisition. Students also have few chances to develop vocabulary and practice it in the real sense, as the time for learning English in EFL classes is also restricted; teacher training alone cannot provide sufficient vocabulary for learners or promote language skills. EFL learners therefore easily forget words instantly when recovery processes are not routine.

Meanwhile, Vocabulary skills are also a vital part of studying a foreign language. In leading to the understanding of written and spoken texts, it is one of the linguistic components that influences the development of communication skills and linguistic skills (Goulden, Nation, & Read, 1990). In this context, in order to encourage vocabulary acquisition and consolidation in students, it is important that scholars establish curriculum preparation assisted by technical sources because a restricted vocabulary inhibits the mastery of a language.

However, Memorizing English Vocabulary is commonly considered to be unexciting as there is a lack of desire throughout learning activities, which reduces their learning interest and productivity, leading to laziness in English learning (Chen & Chung, 2018). However, Memorizing English Vocabulary is commonly considered to be unexciting as there is a lack of desire throughout learning activities, which reduces their learning interest and productivity, leading to laziness in English learning (Chen & Chung, 2018). Therefore, teaching techniques and methods ought to be strengthened in order to support the learners recover enthusiasm and participation in English learning. EFL educators should think about and introduce the innovative approach and media that will improve the enthusiasm of the students to learn vocabulary. They do use media in teaching, but neglect the fact of the need to promote vocabulary learning with enjoyable media. In this case, teaching the 4 skills along with vocabulary should be provided for language learners so as to prevent several difficulties in learning English.

Nowadays, technology has been evolving and creating numerous devices in this modern age that are useful in helping students learn languages. The method of teaching and learning is gradually being displaced from the conventional classroom into the modern classroom. Mobile devices are one of the sense devices that are common to play an important role in everyday life. This devices may also promote and facilitate in Internet services authentication and prioritization, and simulate, imagine, and communicate with scientific systems, processes, and models. For example, the students could find extra resources from the internet. The accessibility of mobile technology has resulted in increased of mobile-assisted language learning, where learners can study a second language (L2) independently at any moment (e.g. Kukulska-Hulme, Lee & Norris, 2017; Reinders & Benson, 2017).

MALL gives the user a chance to engage in meaningful contact. In addition, integrate formal and informal learning with other individualized elements such as keypads, touch screens, screen size and sound capabilities that may impact the efficiency of mobile

learning (Russell & Cieslik 2012). Mobile technology-assisted language learning may also develop student achievement from these apps, be able to communicate with student needs and become an appealing teaching tool. Learning a foreign language with a mobile app can be a fascinating learner experience. Notably, through some application of language learning, it can learn, practice, and enrich both language skills and knowledge of some language areas that targeted for education.

Duolingo is one of the applications that famous for learning English. This app is a free language-learning platform which includes a website and application for language learning. Duolingo uses an education approach which is highly data driven. The program tests the problem the users struggle with and what kind of errors they make at each move along the way. Then it aggregates the data and learns from the patterns that it recognizes. Furthermore, Duolingo offers written lessons and dictation, enabling more experienced users to develop through speech practice and a vocabulary segment where they can practice learned words. Moreover, the features of Duolingo use a gamification learning style that may engage learners through motivation and competition. This app operates an interactive illustration with a gamified design that blends point-reward to appreciate student's motivation with implicit instruction, explanation, and other best practices (Settles & Meeder, 2016).

Some research done by Loewen (2019), Munday (2017), Chen (2018), Gamlo (2019), and Citrayasa (2019) revealed that Duolingo as a gamified language learning app able to enhance students' vocabulary knowledge that the gamification function reached their educational objective and assisted learners successfully in their vocabulary improvement. Moreover, this app showed a positive connection between the amount of time spent on Duolingo and learning gains that most participant agreed the gamification setting provide incredible elements such as favorable, interactive, and entertaining gamified assessment and game competition mechanisms in fostering learner's vocabulary acquisition efficiency, which satisfy learners with their entertainment element and able to meet their English learning goal.

However, these studies were mostly investigated in countries overseas that use English as the L2 language and are limited in Indonesian country, especially Surabaya. In addition, the participant was primarily from college students and restricted for junior high school students although the gamification of Duolingo may be more enjoyable and beneficial to basic level learners than advanced levels. In particular, who is still a newbie in developing their English language, Duolingo able to help

the learners as it can be easily accessed for any age and the material for the program is universal (Garcia, 2018).

Therefore, due to the fact that using Duolingo app is entertaining and promising to be applied for language learning, this study aims to investigate student's vocabulary improvement through the gamification of Duolingo as a language learning platform which the research question is defined as:

1. Is Duolingo as a gamified language learning application able to improve seventh-graders vocabulary?

LITERATURE REVIEW

Vocabulary is the most important component of language. It is critical part that help learner to understand the language knowledge and to hold a better communication. Chen & Chung (2008) inform that vocabulary can be defined as a word within a particular language that is known to the person. And also, it may be a list or set of alphabetically ordered and described terms and phrases used by an individual related to a specific subject. Through this concept of vocabulary, it can be inferred that vocabulary are a basic prerequisite for language learning because it is the path to comprehend the other primary four skills of listening, reading, speaking, and writing, which is a necessary competence in a language. In addition, as the knowledge of the lexicon is important for communication skills and the learning of a second language; vocabulary capacity enables the use of language and vice versa, the use of language contributes to an increase in vocabulary (Susanto, 2016).

MALL is a new trend approach in language learning that use information technology, such as computers, tablet, and smartphones. This approach aims to spread the language learning environment beyond the classroom: to offer students opportunities to be involved in authentic communication and to participate in formal and informal learning (Kulkuska-Hulme, 2009). Also, this approach has an effective elements that able to share file of photos, videos, audio recording, and etc from the mobile technologies. Besides from its flexible accessibility, according to Bogdan (2016) inform that mobile learning through the connectivity of wireless networks able to combine the language knowledge with the knowledge of technology and able to provide opportunities for interaction with the worldwide users.

Duolingo is a free app developed in November 2011 by Luis Von Ahn and Severin Hacker, with the slogan "Free language education for the world." It offers a number of

languages for both English speakers and non-English speakers, which provide many activities from learning vocabulary, translation, pronunciation, and dictation related to the main four language skills. This platform was accessed through a website or mobile app that both of these have the same basic functions with some modification of their user interfaces. As Mehtala (2015) has said, the center of Duolingo's language learning is its lessons, which have been categorized into small sets called skills and presented in a top-down training called the skill tree. Every of these skills requires one to ten short courses, which typically contain 20 exercises. In addition, Duolingo materials also adopted based on CEFR (the Common European Framework of Reference for Languages) course, which means the material of Duolingo is universal and can be easily used for any ages.

METHOD

Based on the research questions and the objectives of the study, the researcher used Quasi-experimental study as the research design. This study was conducted to find out whether the use of Duolingo had good effects on students' vocabulary achievement to the seventh-grader or not. This research was done by conducting two groups of study. They were experimental and control groups. Then, the researcher gave pre-test to make sure that both groups were equal and post-test to find the difference after being given the treatment to the experimental group only.

The variable that comes first and influences or predicts is called the independent variable. Dependent variable is the variable that is affected by or is predicted by the independent variable. The independent variable of this study was the use of Duolingo as a language learning application and the dependent variable was the students' vocabulary achievement.

The population of this study was the seventh-grader of extracurricular student in SMPN 21 Surabaya. The researcher chose this school because the English teacher face some difficulties with some of the students that have low English vocabulary knowledge as they tend to join this English club for improving their English skills outside the classroom without any payment needed and the English teachers at that school had not used this method yet.

Thirty-four students were divided into two groups (EEC 1 & EEC 2) that each group was matched on certain characteristics; both classes are on the same topic (English Club), offered at the same school, and taught by the same topic (English language). Purposive sampling is used in this study based on the teacher recommendation regarding to the student's English score. Before collecting the data, the researcher had administered tryout

to measure the validity and reliability of the test that used as a pre-and post-test. It held before the pre-test was conducted to another class group who did not belong to the group samples. Then after three days, the researcher administered the pre-test to measure how far student's vocabulary skill has been learned and it aims to identify their understanding of the material given for both group sample. The test consist of 30 multiple-choice questions. The next procedure was giving the treatment to the experimental group by implementing Duolingo in six meeting lessons for learning together that lasted for three weeks. When the treatment was done, the researcher administered post-test and the data could be got. The data is in the form of scores which is calculated statistically.

To analyze the data, the researcher calculated the scores using t-test procedures. This procedures were applied in order to know whether there was significant difference in students' vocabulary achievement between the experimental and control group. The procedures were described below:

1. Record the data of the pretest and posttest results from the students who participate in the research used MS Excel.
2. Measure the differences between the two groups (t-test) to decide if the procedure has to do with improved outcomes of the experimental group using IMB SPSS 20 for Windows.
3. Compare the mean values between pre- and post-test of the experimental and the control group.
4. Discover the significance value for both pre- and post-test in the Sig. (2-tailed) part of t-test for equality of means table. When the significance value is less than .05, it means that both group samples have significance difference of the ability that has been investigated.
5. Calculate the effect size of the treatment using the Cohen's d formula

RESULT AND DISCUSSION

Within this segment, the researcher discusses the findings and discussions that were gathered during the investigation. Pre-test and post-test scores are available for both control and experimental classes, as well as the calculation, as well as the description of the results obtained. The researcher used t-test method to recognize the efficacy of Duolingo on the achievement of the students' vocabulary. First, for each category, the researcher calculated the means and then calculated the t-value. Second, the t-value was correlated with the t-table, in order to learn the important difference. If the t-value is higher than the t-table, the difference is significant. On the other hand, if the t-value is lower than the t-table, the

difference is not significant. Lastly, if t-test findings revealed a major impact in learning with Duolingo, then the effect size will be investigated that presented by Cohens'd.

After several phases of analyzing the data, the result presented in this study was positive as the gamification setting of Duolingo able to improve seventh-graders' vocabulary. To provide a clear explanation; the findings of the study are elaborated as follows:

Control Group Data Analysis

Table 1
T-test Analysis of Control Group

	Mean	N	Std. Deviation	df	Sig. (2-tailed)
Pre-test	58.6471	17	9.05498	16	.000
Post-test	75.5294	17	10.63084		

The table 4.1 presented the control groups' mean score of the pre- and post-test and its significance result. Based on the table above, it showed that the pre-test mean score was 58.6 (SD = 9.0) and the post-test mean score was lifted up to 75.5 (SD = 10.6). The difference between the mean scores was found to be statistically significant with df got 16. In accordance with the fact, the significant level in Sig. (2-tailed) value was $.000 < 0.05$ which means significant results have been achieved for control group after learning with conventional technique.

Experimental Group Data Analysis

Table 2
T-test Analysis of Experimental Group

	Mean	N	Std. Deviation	df	Sig. (2-tailed)
Pre-test	60.5882	17	10.96619	16	.000
Post-test	87.9412	17	7.76588		

The table 2 provides the experimental groups' mean score of the pre- and post-test. Based on the table above, it showed that the pre-test mean score was 60.5 (SD = 10.9) and the post-test mean score was lifted up to 87.9 (SD = 7.7). The difference between the mean scores was found to be statistically significant. In accordance with the fact, the significant level in Sig. (2-tailed) value was $.000 < 0.05$ (see table 4.4) which means significant results also have been achieved for experimental group after learning with Duolingo application. This may be inferred that Duolingo's treatment is able to help seventh-graders in developing their vocabulary.

Effect Size Calculation

As the t-test findings revealed a major impact of Duolingo language learning application on the capacity of seventh grade vocabulary knowledge, then the effect size will be investigated. The researcher might use the effect size formula defined by Cohens (2007) to determine the given effect size using Microsoft excel. The effect size can be established if there was a large difference in the results of the post-test results. Thus, the formula for calculating the size of the t-test effect is as follows:

$$\text{Effect Size} = [\text{mean of experimental group}] - [\text{mean of control group}]$$

Cohen's standard	Effect Size	verage Stand ard Deviati on d =
>1.00	Strong effect	
0.51 – 1.00	Moderate effect	
0.21 – 0.50	Modest effect	
0 - 0.20	Weak effect	

$$\frac{87.9412 - 75.5294}{8.923717}$$

$$d = 1.390874 = 1.3 \text{ (Strong effect)}$$

From the calculation above, it can be identified that the Cohen's d value was 1.3, which means the treatments given successfully gave strong effect to the experimental group. It can be seen from the range scale guideline which is proposed by Cohen (2007), they are:

Based on the result above, the experimental group has performed better than the control group. It can be seen from the mean score of the experimental group (see table 4.3) that got 87.9 (SD = 7.7), while the control group (see table 4.1) got 75.5 (SD = 10.6). However, the significance level of both sample groups showed a positive significance differences as Sig. (2-tailed) value was .000 which not less than or equal to .05. It meant there was a significant difference between the two sample groups in the post-test score. Even so, the effect size of Cohen's d in the treatment given to the experimental group was found to be 1.3, which means that Duolingo had a very large effect on seventh grade vocabulary knowledge.

In consequence, the alternative hypothesis (Ha) that stated Duolingo application could improve seventh-graders' vocabulary skills is accepted and the null hypothesis (Ho) that stated Duolingo application could not improve seventh-graders' vocabulary skills is rejected.

Discussion

From the result above, this study appeared to have a significant improvement to the students who were taught using Duolingo rather than students who were taught using conventional method. So that, in this case, the null hypothesis (Ho) in this research is rejected and the alternative hypothesis (Ha) is accepted.

The result of this study supports the theory stated by Chen (2019) & Gamlo (2019) that game-based learning which provided in Duolingo features for language learning especially in vocabulary improvement, shows a positive beneficial result. The gamification setting provided by the application can encourage and maintain student's motivation to good learning results. Also, game-based learning is advantageous in terms of simple, demanding objectives, curiosity development, enjoyable and sensory stimulation. This can be seen when the researcher applied the Duolingo treatment to the experimental group as they agreed that the interleaving approach in Duolingo material helps the students memorize the English words easily as the words repeatedly appears in the exercise section whether in the form of listening, speaking, and writing exercises. Also, most of the students feels comfortable with the app as they can practice to pronounce the english word with confident to the phone rather than in front of people. Thus, this kind of enjoyment learning that provided by the app make experimental class able to have higher scores rather than control class.

In a previous study conducted by Citrayasa (2019) proved that learning language through mobile platforms able to assist student as their learning assistant and become an autonomous learners as they able to manage their own learning time to be more valuable with enjoyable learning style. It can be seen when the treatment was conducted, all of the students focused on their language learning process by submitting their tree chart progress and Duolingo every weekend, even if the teachers are not around instructing them to learn with Duolingo continually. The experimental students confirmed that learning with Duolingo is enjoyable compared to the regular teaching without using any digital media. This happens because the students were engaged to collect the lingot (Duolingo's reward as it currency) to foster their English level achievement and to modify their DuoBird avatar. Therefore, the experimental students feels amused in the learning process as it leading to a better input of language learning knowledge and a higher mean score of post-test than the control group.

However, in reality, regardless of students 'new experience in learning through mobile apps, shallow participation in mobile learning was considered to be one of its weaknesses. Smart devices, such as smartphones in

particular, have a restricted interface to their small screen size. In this situation, despite the high costs that a smartphone can afford, completing tasks involving a significant amount of time for high-level analysis is more difficult than doing so on a larger device like a computer.

Therefore, casual interaction was likely to be viewed as one of the learning types that define mobile learning. It does not mean, though, that its value was less beneficial. Ushioda (2013) pointed out that, rather than a deep level of engagement, the possible values for learning through mobile technology lie in the regular interaction through language learning and the use of language resources, as this can play an important role once learners understand that they can see the advantages of this informal learning. In this case, the researcher is confident that the learners' experience of using Duolingo to learn English on their own would make the students have greater experience of learning English through mobile application as it can respond to the Indonesian ministry of education which learners must be able to operate technology for learning process and teacher must provide additional sources so students can broaden and strengthen their knowledge that has been gathered from the classroom

Thus, since the statistical data showed that alternative hypothesis was accepted ($t_{observed} > t_{table}$) it is indicated that using Duolingo is effective on students' vocabulary mastery and able to assist their language learning process.

CONCLUSION AND SUGGESTION

Conclusion

As verified by the findings and discussions above, it can be concluded that Duolingo application is able to improve the seventh-graders vocabulary acquisition. This has been proven by the mean score of the students in each phase and the significance calculation in post-test results. In this study, the researcher gathered two results on why duolingo was able to influence the English vocabulary learning process.

First, Duolingo is a platform for gamification of language learning that presents lessons across various skills with a series of short instructions. In addition, the gamifying elements include interactive visual interface, such as leader board, skill tree, accomplishments, rewards and levels that support students to improve their English learning knowledge.

Second, The Duolingo application offers plenty of benefits, such as easy-to-use settings, clear input, good reviews and flexible schedules. It is really interesting for students, as they showed enthusiasm to this submission when the treatment was offered. The platform also provides a clear understanding of the content and the

ability to learn at any time so students can learn when they have free time with a challenging and exciting lesson given in each subject.

Finally, the researcher summarized that the use of Duolingo is beneficial in the development of seventh grade English vocabulary since the platform capable of providing valuable assistance in the learning process.

Suggestion

From on the conclusion above, a range of recommendations can be derived from this research that could be helpful to the reader, the teacher and the students, as well as to other researchers. Here are the suggestions as follows:

1. For the teacher

Teachers should make their teaching more innovative to increase the mastery of vocabulary among students and prevent boredom in classrooms. Teachers have an advantage during this digital era, as many relevant media and applications can be used to improve their teaching. Using Duolingo is suggested as it is proven that it has a positive effect on students' vocabulary of seventh-graders in English extracurricular class. It is wished to make the students having more interest in learning vocabulary.

2. For the student

While learning English vocabulary, the students now have a new media that is Duolingo, a game-based language learning program that makes their learning more enjoyable. Alongside vocabulary, there are also other language elements that can be taught, such as pronunciation, grammar, simple translation, and simple writing. As it can be accessed anywhere and at any time, it is also the students' responsibility to learn vocabulary not only based on the material provided in the classroom, but they must practice more at home.

3. For the future researcher

This study is intended to provide new knowledge for those who read this, and as a guide for other researchers as well. Since there might be a lack in this analysis somewhere, the researcher hopes there will be another researcher either doing a study in the same English skill or different elements provided by Duolingo to improve teaching and learning awareness.

REFERENCES

- Ary, D., Jacobs, L. C., Sorensen, C. K., & Razavieh, A. (2010). *Introduction to Research in Education 8th Edition*. Belmont, CA: Wadsworth, Cengage Learning.
- Bogdan, D. (2016). *Duolingo as an "Aid" to Second-language Learning An Individual Case Study*. New York: Pearson Education Group.
- Bogdan, R. C., & Biklen, S. K. (2003). *Qualitative Research for Education: An Introduction to Theories and Methods*. New York: Pearson Education Group.
- Cavus, C., & Ibrahim, D. (2009). *M-Learning: An experiment in using SMS to support learning new English language words*. British Journal of Educational Technology, 40(1), 78-91.
- Chen, C. (2019). *Effects of a mobile game-based English vocabulary learning app on learners' perceptions and learning performance: A case study of Taiwanese EFL learners*. Computer Assisted Language Learning, 31, 170-188. <https://doi.org/10.1017/S0958344018000228>
- Chen, C., Chen, L., & Yang, S. (2018). *An English vocabulary learning app with self-regulated learning mechanism to improve learning performance and motivation regulated learning mechanism to improve learning*. Computer Assisted Language Learning, 0(0), 1-24. <https://doi.org/10.1080/09588221.2018.1485708>
- Cheng, C., & Chen, C. (2019). *Investigating the impacts of using a mobile interactive English learning system on the learning achievements and learning perceptions of student with different backgrounds*. Computer Assisted Language Learning, 0(0), 1-26. <https://doi.org/10.1080/09588221.2019.1671460>
- Chukharev-Hudilainen, E. and T. A. Klepikova. 2016. "The Effectiveness of Computer-Based Spaced Repetition in Foreign Language Vocabulary Instruction: A Double-Blind Study." *Calico Journal* 33 (3): 334-354.
- Citrayasa, V. (2019). *JUNIOR HIGH SCHOOL STUDENTS' LIVED EXPERIENCES OF LEARNING ENGLISH USING BUSUU*. 5(2). <https://doi.org/10.25134/ieflj.v5i2.1900>
- Gamlo, N. (2019). *The Impact of Mobile Game-Based Language Learning Apps on EFL Learners' Motivation*. 12(4). Singapore: Springer. <https://doi.org/10.5539/elt.v12n4p49>
- Kukulska-Hulme, A. (2009). *Will mobile learning change language learning?* ReCALL, 21(2), 157-165. <http://dx.doi.org/10.1017/S0958344009000202>
- Kukulska-Hulme, A. (2015). *Language as a bridge connecting formal and informal language learning through mobile devices*. In Wong, L. H., Millard, M., Specht, M. (eds) *Seamless learning in the age of mobile connectivity* (pp. 281-294). Singapore: Springer.
- Loewen, S., Isbell, D. R., Kim, K. M., Maloney, J., & Miller, Z. F. (2019). *Mobile-assisted language learning: A Duolingo case study*. 1-19. <https://doi.org/10.1017/S0958344019000065>
- Mehtala. (2015). *The Affordances of Duolingo for Mobile-Assisted Language Learning*. Jultika. Retrieved from <http://jultika.oulu.fi/files/nbnfioulu-201512182309>
- Min, H. T. (2008). *EFL vocabulary acquisition and retention: Reading plus vocabulary enhancement activities and narrow reading*. Language Learning, 58(1), 73-115. <https://doi.org/10.1111/j.1467-9922.2007.00435>
- Mofareh, A. (2015). *The importance of vocabulary in language learning and how to be taught*. International Journal of Teaching and Education
- Munday, P. (2016). "The Case for Using Duolingo as Part of the Language Classroom Experience." *RIED. Revista iberoamericana de educación a distancia* 16 (1): 83-101.
- Munday, P. (2017). *Duolingo . Gamified learning through translation*. 7797(December). <https://doi.org/10.1080/23247797.2017.1396071>
- Read, J. (2000). *Assessing vocabulary*. Cambridge: Cambridge University Press
- Rosell-Aguilar, F. (2017). *State of the app: A taxonomy and framework for evaluating language learning mobile applications*. The CALICO Journal, 34(2), 243-258.
- Santoso, Singgih. (2014). *Statistik Multivariat Edisi Revisi*. Jakarta: PT Elex Media Komputindo
- Susanto (2016). *English Vocabulary Acquisition through Vocabulary Learning Strategy and Socio-Educational Factors: A Review*. Applied Science Technology
- Settles, B. and B. Meeder. (2016). "A Trainable Spaced Repetition Model for Language Learning." In *Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics*, ed. A. van den Bosch, 1848-1858. Berlin: Association for Computational Linguistics.
- Thomson, R., & Mehring, J. (2015). *Better Vocabulary Study Strategies for Long-Term Learning*. Japanese

EFL students' vocabulary study methods. Kwansei Gakuin University Humanities Review, 20, 133–141.

Tsai, Y., & Tsai, C. (2018). *Computers & Education Digital game-based second-language vocabulary learning and conditions of research designs : A meta-analysis study*. Computers & Education, 125(August 2017), 345–357.
<https://doi.org/10.1016/j.compedu.2018.06.020>

Ushioda, Ema. (2013). *Motivation matters in mobile language learning: A brief commentary*. Language, Learning and Technology. 17.

Wang, Y. H., & Young, S. S. C. (2014). *A study of the design and implementation of the ASR-based iCASL system with corrective feedback to facilitate English learning*. Educational Technology & Society, 17(2), 219–233.