ENHANCING EAP LEARNERS' ACADEMIC VOCABULARY LEARNING: AN INVESTIGATION OF *WHATSAPP*-BASED REPORTING AND RECEIVING ACTIVITIES

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Abstract

Previous studies have indicated inconsistencies in utilizing the mobile application known as *WhatsApp* in academic vocabulary learning. This study attempts to overcome those inconsistencies by addressing three research aims, namely a) to examine any significant difference of employing vocabulary learning between using *WhatsApp*-based reporting and receiving on the one hand, and traditional-based reporting and receiving strategies on the other; (b) to determine the best predictor of vocabulary learning, and (c) to draw learners' attitudes among the four types of strategies. A mixed randomized experimental type of research with pre-test and post-test design as well as survey design has been consecutively applied for these purposes. The results of the study reveal that English Academic Purposes (EAP) learners who expand their academic vocabulary using *WhatsApp*-based reporting activities achieve better having been exposed to these three different treatments. Learners' endeavours to find out the mixed Indonesian-English vocabulary definitions by themselves, followed by reporting these to their teacher using *WhatsApp* turn out to be the best vocabulary learning predictor. Learners' attitudes observed in this cohort also show positive responses. Since the aspect of familiarity with academic vocabulary learning is not incorporated into this study, future researchers may find filling up this lacuna worth pursuing

Keywords: *WhatsApp*-based reporting; receiving activities; academic vocabulary; EAP learner

1. Introduction

The rapid and massive adoption of text messages by teens, young and adult learners as one of essential means of written communication has invited English Foreign/Second Language (EFL/ESL) researchers and practitioners to integrate texting strategies into second language (L2) teaching and learning, both in formal and informal settings (Anderson & Rainie, 2012;

Arifani, 2020; Li & Cummins, 2019). In the formal setting, the main objectives of integrating texting strategies into EFL/ESL teaching and learning aims at helping L2 learners learn a different aspect of the target language such as listening, speaking, reading, writing, vocabulary, grammar, and pronunciation (Caruso et al., 2019; Kennedy & Levy, 2008) and at promoting their self-regulated learning under the EFL/ESL curriculum (Arifani et al., 2021).

In the domain of vocabulary learning, research applying texting messages has shown a range of intervention strategies and results. The experimental interventions of vocabulary learning are varied, ranging from the types of vocabulary and different types of text messages to instructional designs. Some of the vocabulary types include incidental vocabulary (Arifani, 2020), general academic vocabulary (Cetinkaya & Sütçü, 2018; Kilickaya & Krajka, 2010; Li et al., 2017), technical jargon (Cavus & Ibrahim, 2009) and a different amount of target vocabulary learning (Dashtestani & Stojkovic, 2015; Lu, 2008). Next, the instructional designs in applying vocabulary learning involve the use of both the learners' mother tongue and their second language (L2) to compare its effectiveness. A comprehensive review of previous studies indicates that the use of mixed languages (using the learners' mother tongue and English) through receiving many vocabularies from their teachers (L1 and L2) could be one of the effective vehicles for vocabulary learning (Dashtestani & Stojkovic, 2015) although this practice goes against the concepts of self-regulated learners and active vocabulary learners because learners do not have their initiatives to look for the vocabulary meaning using their gadgets (Arifani, 2020). Another irony is that although the results of experimental designs applying mixed languages in the vocabulary learning remain positive, most of the previous researchers have not followed up those findings with further inquiry.

To date, in a comprehensive review of the previous studies that used texting strategies (SMS or MMS) to teach second language vocabulary learning, several methodological barriers have been identified (Cavus & Ibrahim, 2009; Dashtestani & Stojkovic, 2015; Dehghan et al., 2017; Kilickaya & Krajka, 2010; Lu, 2008). These include inconsistencies in addressing previous research findings, the intervention models, and the negligence of self-active learning concepts of using the texting message because most previous studies applied texting using teacher-driven learning (Arifani et. al., 2020). In this case, the teachers provided a set of vocabulary items to their learners' mobile applications, along with their meanings and definitions. As a result, the learners remained passive since they did not autonomously attempt to find the meanings and definitions by themselves. To address those three main lacunas, the present study examined the effectiveness of an experiment that was designed to teach EFL learners' general academic vocabulary within a learning context using *WhatsApp*. Specifically,

it compared the learners' second language (L2) vocabulary learning with two different types of *WhatsApp* reporting and receiving activities while applying both the learners' first and second languages. In the *WhatsApp*-based reporting activity, the teachers send a set of blind vocabulary items in English with no definitions and meanings to the learners' *WhatsApp*. In this case, the students are assigned to find the meanings and definitions of the vocabulary through their mobile phones and report/send their definitions and meanings to their teachers' *WhatsApp*. By contrast, in the *WhatsApp*-based receiving activity, the learners receive a set of academic vocabulary items with their meanings and definitions via their *WhatsApps*.

2. Literature review

2.1. Inconsistency in intervention with academic vocabulary learning research

When reviewing 12 previous relevant studies, 10 findings illustrate the overall positive results of applying texting interventions for learners' English vocabulary or idiom learning. The only exception is a study conducted by Dehghan et al. (2017) involving 32 Iranian learners at a Language Institute that reports no significant differences in learners' vocabulary learning scores when comparing the experimental group applying *WhatsApp*-based learning and the control group applying traditional-based learning with the monolingual direct explanation of English definitions, synonyms and antonyms. The interventions of vocabulary learning can be further classified into three main areas. The first area involves vocabulary and idiom learning applying monolingual English definitions, synonyms, and antonyms (Basal et al., 2016; Bensalem, 2018; Dehghan et al., 2017; Tabatabaei & Goojani, 2012). The second area of research examines the effectiveness of vocabulary interventions using bilingual intervention strategies using a mixture of the learners' mother tongue and English definitions, synonyms, and antonyms (Cetinkaya & Sütçü, 2018; Dashtestani & Stojkovic, 2015; Hayati et al., 2013; Lin & Yu, 2017; Lu, 2008). The third area involves the implementation of vocabulary software, multimedia learning such as visual, audio, and video-based vocabulary and idiom learning (Cavus & Ibrahim, 2009; Kilickaya & Krajka, 2010; Lin & Yu, 2017; Saran et al., 2012).

In their previous work, most of the researchers in the L2 context employ different strategies to make L2 vocabulary learning much more comprehensible than the traditional learning strategies by using different types of mobile application platform. Their results, however, fail to reach a consensus on the use of learners' mother tongue and target language in vocabulary teaching and learning. Moreover, there is no clear relation between previous research findings and current research practices. Most of the previous positive findings such as

the use of bilingual vocabulary interventions have not been followed up by current researchers. For example, positive results of vocabulary interventions using bilingual definitions, synonyms, and antonyms using Chinese, Persian, and Turkish (the learners' respective mother tongues and English) conducted in Taiwan, Iran, and Turkey (Cetinkaya & Sütçü, 2018; Dashtestani & Stojkovic, 2015; Lu, 2008) are adequately grounded but no follow-up studies have used those interventions as their theoretical basis (Bensalem, 2018; Motlagh et al., 2020). Lastly, the author has been unable to locate studies that apply comprehensive interventions involving *WhatsApp*-based reporting and receiving activities compared to tradition-based vocabulary learning activities.

2.2. *WhatsApp* based-reporting or receiving activities

Since Lu (2008) raised concerns about the effectiveness of learning vocabulary using SMS via mobile phone, the validity of the concept of vocabulary learning mobile phones has stipulated a large body of inquiry that addresses the effectiveness of vocabulary teaching and learning in EFL/ESL contexts. After summarizing the key issues published on the theme, setting, the aims of the study, methods, data analysis and key findings, the summaries illustrate some observations about the effectiveness of vocabulary teaching and learning applying different types of mobile applications and also to identify the lacuna of further research (Appendix 1). One of the themes that can be derived from previous studies is that the use of mobile applications such as *WhatsApp*, SMS, MMS, and *Line* are considered crucial precursors to support vocabulary learning (Li & Cummins, 2019). An understanding of vocabulary learning strategies via mobile phones not only offers guidance for classroom practices and curriculum development but also an opportunity to discover 'an innovative strategy' of vocabulary learning. Second, although conducted in many different cultural settings (most of the above inquiries have been made in the Asian setting, except for those of Li et al. (2017) and Manca (2020)), these studies suggest that the interventions and strategies in applying texting-based vocabulary learning are inconsistent with the concept of self-regulated learning.

What remains uncertain is the argument for this. Some studies (Cavus & Ibrahim, 2009; Dashtestani & Stojkovic, 2015; Dehghan et al., 2017; Kilickaya & Krajka, 2010; Lu, 2008) have tried to examine the effectiveness of vocabulary learning using many different texting strategies. For example, Cavus and Ibrahim (2009) found that their students' technical vocabulary learning with a higher frequency of sending and receiving messages through the MOLT software increased in comparison with those using traditional strategies. Next, Li et al. (2017) also found that learners who were exposed to academic vocabulary three times per day

using SMS-receiving activities learned more target words but showed no difference in the transfer effects. Besides, Dashtestani and Stojkovic (2015) examined EAP learners' vocabulary learning SMS based-glosses involving mixed language definition. The results reveal that learners who received vocabulary items using the mixed definition in both Persian and English reached higher vocabulary scores than two other strategies using either Persian or English. However, the findings of other studies (Dehghan et al., 2017; Derakhshan & Kaivanpanah, 2011) suggest that texting strategies cannot always explain the results and some research reports show contradictory results. For example, Derakhshan and Kaivanpanah (2011) reveal that the students who learned vocabulary using SMS receiving strategies for their instructor did not show any significant difference in terms of vocabulary scores.

Apart from the above concern, this study intends to draw attention to a conceptual ambiguity about the implementation of texting strategies which may threaten the validity of the study. The two-way texting strategies do not apply the concept of self-regulated learning since the teachers always send a set of vocabulary items with their meanings and definitions using synonyms, antonyms, idioms and the students just receive and report them to their teachers without any efforts on their part to find and discuss them by themselves. The students remain remarkably passive during those texting intervention activities.

Furthermore, most of the researchers have dedicated their efforts to finding effective texting-based instructional strategies using different types of mobile applications such as SMS and MMS which are now considered more costly than the *WhatsApp*-based platform for the betterment of vocabulary acquisition. A review study conducted by Manca (2020) indicates that the *WhatsApp*-based platform is favoured over all of the other mobile applications available. Reputable scholarly journals indexed in Scopus and WoS databases contain 654 papers using the *WhatsApp* platform on teaching and learning in higher education.

Therefore, this inquiry aims to address the above issues. First, the conceptualization of texting activities should centre on the constructs of self-regulated learning and effective platform usage (Barak, 2010; Kauffman et al., 2011; Manca, 2020). By synthesizing the previous work on similar studies, as shown above, the implementation of texting activities involves a complex constellation of an effective strategy, frequency of vocabulary tasks, and language use related to taking charge of vocabulary teaching and learning. Those vital dimensions are good precursors of vocabulary teaching and learning using texting or *WhatsApp*-based activities. In this study, *WhatsApp*-based reporting activities are defined as the extent to which learners learn their academic vocabulary by themselves through self-exploration of meanings and definitions (Arifani et. al., 2020). Then, they report the vocabulary

that they have learned previously to their teachers. *WhatsApp*-based receiving activities refer to the extent to which learners receive some vocabulary items with no definition and meaning from their teachers. Finally, the positive results of previous studies on vocabulary intervention strategies involving the learners' mother tongue and target language have not been wisely applied as a basis of vocabulary learning in the current research.

3. Methodology

3.1. The aim of the study

This study attempts to fill up the lacunas mentioned above by realigning the concept of self-regulated learning (Barak, 2010; Kauffman et al., 2011), and incorporating mixed L1 and L2 into vocabulary learning (Dashtestani & Stojkovic, 2015). This inquiry specifically addresses the following questions:

1. Is there any significant difference between learners' academic vocabulary learning applying the four different methods of SMS-based activities (i.e., WAB reporting, WAB Receiving, Traditional-based reporting (TB reporting) and Traditional-based receiving (TB receiving) activities)?
2. Which one of the four treatments is the best predictor for learners' academic vocabulary learning?
3. What are the learners' attitudes towards the four different vocabulary learning strategies? Are there any significant differences among the EAP learners' attitudes?

3.2. Participants and context

A total of 80 EAP learners (29 male and 51 female ranging from 19 to 21 years old) who attended an English for Academic Purposes (EAP) course for two consecutive semesters at a private university in Gresik, East Java, participated in this inquiry. The EAP courses consisted of six main subjects namely vocabulary, grammar, listening, speaking, reading and writing. This course was designed to equip all EAP learners' with English communication skills for supporting their future careers. The four-month experiment was a part of the entire vocabulary course. The participants were selected using a placement test administered before the experiment, using the World English test initiated by Laufer and Nation (1995) to arrive at four equal classes out of a total of six EAP classes majoring in the Management department. Based on this researcher's previous project, the learners who obtained the placement test scores ranged from 6.5 to 7.5 were selected as the research participants. To support the validity of the

learners' placement test score, the author also used the study repports from the university language center as an additional consideration of the study. The research participants were then randomly assigned to four different groups. The first 20 learners were plotted as the *WhatsApp*-Based Reporting (WAB Reporting) group. The second group consisted of 20 learners who were labelled as the *WhatsApp*-Based Receiving (WAB Receiving) group. The third 20 group learners were assigned as the Traditional-Based Reporting (TB Reporting) group, and the remaining 20 learners were categorized into the Traditional-Based Receiving (TB Receiving) group.

3.3. Instrument

To assess learners' academic vocabulary scores enhancement, two types of general academic vocabulary tests (GAVT type 1 and GAVT type 2) were simultaneously applied in the pre-and post-test sessions. The GAVT type 1 consisted of 19 vocabulary question items, and the GAVT type 2 contained 19 items. Each GAVT question type contained three matching questions. Meanwhile, the six different definition options from a to f were presented in the right column of the questions. To answer the GAVT's questions, the learners were asked to write the letter (a, b, c, d, e or f) corresponding to one best option in the left column. These two different types of GAVT tests type 1 and type 2 had been adopted from Pecorari et al. (2019). The original Cronbach's alpha reliability level of these two test types amounts to .96. Meanwhile, after the two different types of GAVT tests had been tried out to different participants, the attainments of the internal reliability index using Cronbach's alpha measure for the present study amounted to .92, which indicates excellent internal consistency.

Next, to address the learners' attitudes towards the four different experimental designs, WAB reporting, WAB receiving, TB reporting, and TB receiving treatments, a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) with 15 question items was also applied after the post-test session. The questionnaire had been adapted from Dashtestani & Stojkovic (2015) with some minor amendments. For example, in the original questionnaire item, the words "learning academic vocabulary through SMS is interesting for me" were amended into "learning academic vocabulary through WhatsApp-based reporting activities is interesting for me", and "learning academic vocabulary through WhatsApp-based receiving is interesting for me". This had been applied to the entire set of questionnaire items. Before it was administered to the learners, the researcher conducted a try-out session involving 20 learners from a different experimental group to attain the acceptable reliability index. After the analysis

using a Cronbach's Alpha test, the consistency level amounted to 0.90, which indicates a very satisfactory index of reliability.

3.4. Design, procedure, and data analysis

This study aimedto examine the effect of individual *WhatsApp*-based reporting activities, *WhatsApp*-based receiving activities, traditional-based reporting activities and traditional-based receiving activities on EAP learners' general academic vocabulary learning and their attitudes towards the implementation of four different treatments. Therefore, this study essentially employed a mixed-method using both experimental and non-experimental survey designs to explore learners' academic vocabulary enhancement and identify various attitudes. Randomized experimental research with pre-test and post-test design consisting of four different group treatments had been employed to attain the research aims.

The descriptive data from the surveys had been collected to identify the attitudes of the learners towards the four different treatments. The first group received a set of the academic vocabulary without meanings, definitions and synonyms via *WhatsApp* from their teacher and then reported the received vocabulary with their definitions and meanings in mixed Indonesian and English simultaneously. The second group received the same vocabulary words with their meanings, definitions, and synonyms in mixed Indonesian and English via *WhatsApp* from their teacher but they were not assigned to report them to their teacher. The third group received a set of printed vocabulary words without their definitions, meanings, and synonyms using paper-based media. Afterwards, they filled in the meanings, definitions and possible synonyms in mixed Indonesian and English and reported them to their teacher. Meanwhile, the rest of the group received the same printed vocabulary words with the meanings, definitions, and synonyms in Indonesian and English using the same paper-based media without being assigned to report them to their teacher.

The 120 academic vocabulary words had been cautiously selected from the EAP book and were prepared by two different senior English teachers who taught an English vocabulary course at the same university. The preparations were divided into two different formats. The first format, for the academic vocabulary with and without definitions, meanings and synonyms were separated into two categories for both the WAB receiving and WAB reporting cohorts. In the second format, the printed academic vocabulary with and without definitions, meanings and synonyms were separated into two categories for both the TB receiving and TB reporting cohorts. Regularly, twice a week (on every Tuesday and Friday from 09.00 to 11 a.m.), each group received 20 academic vocabulary items per week (10 words on Tuesday and 10 words on

Friday). These interventions were administered for two months from December to February 2020. Group 1 (the WAB reporting group) sent a *WhatsApp* message containing 20 academic vocabulary items and their meaning in common Indonesian and English to teacher 1 every week. Group 2 (WAB receiving) received a *WhatsApp* message containing 20 academic vocabulary items with their English definitions, meanings and synonyms from teacher 1 each week. Group 3 (TB reporting) sent 20 academic words, their Indonesian and English meanings, definitions (synonyms) via printed (paper-based media) to their English teacher 2 every week. Group 4 (TB receiving) received 20 academic words, their Indonesian and English meanings, definitions (synonyms) via printed (paper-based media) from their English teacher 2 every week. During the two-month experiment, all of the teachers were involved in the study.

Two types of general academic vocabulary test (GAVT) initiated by Pecorari et al. (2019) had been applied before the experiment as the pre-test and after the experiment as the post-test. They are GAVT type 1 and 2, which consisted of 38 matching words and their definition-related questions. Besides, learners' attitudes towards the implementations of the four experimental designs had also been assessed using a five-Likert attitude scale proposed by Dashtestani and Stojkovic (2015). The questionnaire was administered after the post-test session. In order to meet the ethical principles, a consent letter proposed by Mackey & Gass (2015) to maintain participants' confidentiality, study purpose, and anonymity was applied to avoid misunderstandings after it had been translated into the Indonesian language. To examine the significant differences among the four different groups' academic vocabulary scores, a one-way ANOVA was employed to draw the level of score differences after the criteria of normality and homogeneity of the data were met. Following this, an independent sample of the t-test was also conducted to interpret the significant differences of the learners' academic vocabulary scores among the four groups as well as the significant differences of attitudes observed in the four different groups derived from the learners' questionnaire.

3.5. Results

The normality and homogeneity tests were calculated as the primary requirements before explaining the significant differences of scores among the four different interventions using the ANOVA test. It was administered to estimate the normality and homogeneity of the data using one-sample Kolmogorov-Smirnov's and Levene's tests. The results of the homogeneity test are presented below.

Table 1. Normality test

		Pre-TB Reporting Group	Post-TB Reporting Group	Pre-TB Receiving group	Post-TB Receiving group	Pre-WAB Reporting Group	Post-WAB Reporting Group	Pre-WAB Receiving Group	Post-WAB Receiving Group
N		20	20	20	20	20	20	20	20
Normal Parameters [a,b]	Mean	67.6500	77.8500	63.8000	68.3000	70.9500	77.0000	66.5000	70.3500
	Std. Deviation	5.68724	4.51051	1.73509	4.84605	7.48665	6.54539	5.01052	5.22418
Most Extreme Differences	Absolute	.264	.217	.204	.213	.246	.239	.210	.277
	Positive	.264	.217	.204	.213	.246	.087	.210	.277
	Negative	-.161	-.097	-.150	-.098	-.156	-.239	-.142	-.161
Test Statistic		.264	.217	.204	.213	.246	.239	.210	.277
Asymp. Sig. (2-tailed)		.001[c]	.001[c]	.002[c]	.001[c]	.003[c]	.004[c]	.002[c]	.000[c]

Table 1 describes the outputs of the normality test. The normality test outputs illustrate significant values among the four different cohorts. The significant values of these four groups (TB Reporting .001, receiving .002, WAB Reporting .003, and Receiving groups .000) are lower than the alpha value of .005. Therefore, it was confirmed that the data distributions are normal.

Next, the test of homogeneity of variances was also implemented as the second requirement for conducting the ANOVA test to explain the significant differences of scores among the four different groups. The results of the homogeneity test are presented below.

Table 2. Test of homogeneity of variances

Levene Statistic	df1	df2	Sig.
4.474	3	76	.106

Table 2 depicts the output scores of homogeneity test. The test score results of the homogeneity test reveal that the data distributions among the four groups are also homogeneous. Therefore, the ANOVA test may be administered to explain the significant differences of scores among the four groups.

Research Question (RQ1): Is there any significant difference among learners' academic vocabulary learning applying the four different methods of SMS-based activities (i.e., WAB reporting, WAB Receiving, Traditional-based reporting (TB reporting) and Traditional-based receiving (TB receiving) activities)?

To address the first research question, the ANOVA test was administered to explain the significant differences of scores among the four different cohorts. The results of the test reveal

that there are significant differences among the four groups in terms of their general academic vocabulary scores. The results of the ANOVA test are presented below.

Table 3. Results of the t-test between and within groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1849.050	3	616.350	19.963	.000
Within Groups	2346.500	76	30.875		
Total	4195.550	79			

Table 3 presents the significant differences in learners' general academic scores among the four cohorts. The test calculation depicts that there are significant differences in vocabulary score among the four different groups of learning vocabulary through TB reporting, receiving, WAB reporting, and receiving since the obtained significant values .000 are below the alpha score of .005.

Research Question (RQ2): Which one of the four treatments is the best predictor for learners' academic vocabulary learning?

To address the second research objective, a descriptive statistics test was run to estimate the level of respective score differences between the four different vocabulary treatments. The following table indicates the results of the descriptive test.

Table 4. Results of descriptive statistics test

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Post TB Reporting Group	20	77.50	4.123	.922	75.57	79.43	68	88
Post TB Receiving group	20	66.80	4.225	.945	64.82	68.78	60	80
Post-WAB Reporting Group	20	77.75	7.926	1.772	74.04	81.46	65	90
Post-WAB Receiving Group	20	69.65	5.081	1.136	67.27	72.03	64	86
Total	80	72.93	7.288	.815	71.30	74.55	60	90

Table 4 elaborates upon the results of the descriptive test to estimate the level of score differences among the four treatments. The estimation results indicate that there were significant differences in learners' vocabulary scores of those who were taught using TB reporting, receiving, WAB reporting, and receiving strategies. The mean scores also indicate the effectiveness of strategies implemented in fostering EFL learners' vocabulary learning applying the four different treatments in mixed English and Indonesian definitions. In terms of effectiveness among the four different treatments, the WAB reporting strategies held the

highest vocabulary scores attainment (77.75). The second position rested on TB reporting strategies (77.50). Meanwhile, the WAB receiving and TB receiving deserved to come third (69.80) and fourth, respectively (66.80).

Research Question (RQ3): What are the learners' attitudes towards the four different vocabulary learning strategies? Are there any significant differences among the EAP learners' attitudes?

To achieve the third research goal, a normality test, a t-test, and a descriptive statistics test were run to calculate learners' attitudes and differences of attitudes between the four different vocabulary treatments. The following table gives the analysis results.

Table 5. Comparison of learners' attitudes

Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max	Sig.
					Lower Bound	Upper Bound			
WAB Reporting	20	4.60	.754	.169	4.25	4.95	2	5	.031
WAB Receiving	20	4.05	1.191	.266	3.49	4.61	1	5	.000
TB Reporting	20	4.20	1.196	.268	3.64	4.76	1	5	.000
TB Receiving	20	3.75	1.482	.331	3.06	4.44	1	5	.000
Total	80	4.15	1.202	.134	3.88	4.42	1	5	.000

Table 5 draws the comparisons of learners' attitudes from the four different cohorts. Among the four groups, the significant difference in attitudes is convincing, since the significant values rank below 0.05. Further, the results illustrate that the WAB reporting holds the first position with the mean scores of (4.60), TB reporting (4.20), WAB receiving (4.05), and TB receiving (3.75).

4. Discussion

This study aims to address three research objectives: (a) to seek significant different of four different strategies of vocabulary learning, (b) to determine the best predictor of vocabulary learning using the four strategies, and (c) to examine learners' attitudes of applying WAB reporting, receiving, TB reporting, and TB receiving strategies. The results reveal that there are significant vocabulary score differences between the four different strategies. The WAB reporting strategies using mixed Indonesian-English deserves to be the highest predictor for

academic vocabulary learning. Besides, the results of the study also illustrate that learners' attitudes are positive towards learning academic vocabulary via WAB reporting strategies.

Consequently, the discussion will specifically refer to those three dimensions. First, the possibility of WAB reporting activities is found to be the best predictor for academic vocabulary learning taught using mixed Indonesian and English definitions. The power of blending two languages between the learners' mother tongue and English has also been recognized and successfully applied by previous researchers. Dehghan et al. (2017), for example, scrutinize Iranian learners' vocabulary using monolingual English-English definitions. The results show that the monolingual definition could not enhance learners' vocabulary mastery. Conversely, Dashtestani and Stojkovic (2015) applied an experimental design in a search of effective vocabulary learning using SMS platform. They found that Iranian university learners who learned vocabulary using mixed Persian-English definitions (PED) sent via SMS platform achieved higher vocabulary scores than the ED and PD groups. Some part of this current study corroborates those two previous studies in the aspects of positive attitude and vocabulary learning strategies using mixed Indonesian and English definitions. While that previous study relies on SMS receiving (where learners passively received several academic vocabularies), this present study adds its new insights by actively involving the 'learner's self-search' of vocabulary meaning in mixed Indonesian-English definitions, in addition to actively reporting the vocabulary items via their WhatsApp to their English teacher.

Other responses to different studies of vocabulary learning applying mobile applications such as SMS, Telegram, WhatsApp, Instagram, and Facebook are their inconsistency in applying previous research interventions and results (Dashtestani & Stojkovic, 2015; Kilickaya & Krajka, 2010; Lu, 2008; Motlagh et al., 2020; Tabatabaei & Goojani, 2012). Consequently, the research roadmap of applying a mobile application (*WhatsApp*) and comparing it to a similar platform and to traditional learning strategies could not be linked since the use of mixed mother tongue and English definitions have not been adequately investigated. This study fills up these lacunas by providing new insights of strategies where the positive results of previous studies, in this case "mixed learners' mother tongue and English target language", are equally applied in the experiment using *WhatsApp*-based reporting and receiving strategies. The findings illustrate that learners who learn their academic vocabulary using mixed Indonesian and English definitions perform better than the other three groups.

Also, teaching vocabulary using the various strategies mentioned above is still far removed from the concept of self-regulated learning proposed by Kauffman et al. (2011) and Li

et al. (2017), where most of the research participants in the previous studies applied the so-called 'dropping model', in which the teacher drops some vocabulary items to his/her learners with complete vocabulary definitions using learners' mixed mother tongue-English, English-English as well as mother-tongue definitions. The activities of receiving blind vocabulary words with no definitions and assigning the learners to look for the definitions, meanings, synonyms in a mixture between the learners' mother tongue and English and reporting the results to their teacher via *WhatsApp* are considered an improved model of intervention compared to the previous ones.

The next discussion concerns the learners' different attitudes towards the four interventions. This study finds that the learners who learn vocabulary learning through WAB reporting have more positive attitudes than the other three groups. The main arguments of improving their word retention, stimulating motivation, causing less anxiety and using mixed Indonesian-English definitions they create from their mobile dictionary to be reported to their teachers can cause positive attitudes. Similarly, Dashtestani and Stojkovic (2015) and Lu (2008) found the same positive result of applying *WhatsApp* to vocabulary learning in the Iranian University and Taiwan high school contexts. The previous studies had uncovered the active involvement of EFL learning in searching vocabulary definitions in mixed Indonesian-English languages using their *WhatsApp* compared to using a paper-based dictionary. Since the number of vocabulary items only amounted to 10 words sent twice a week to the learners' *WhatsApp*, this is more flexible and easier than writing them down in a paper-based format and submitting them to their teachers. These activities are predicted to have more positive attitudes in vocabulary learning. Meanwhile, the WAB receiving and traditional receiving groups which only receive the same vocabulary and their given meanings seem very passive since they merely receive the words with their meaning, then all they do is read and comprehend them passively without any endeavors to look for the meaning, definition, and synonym and subsequently report them to their teachers.

5. Conclusion

This study aims to address three research objectives a) to find out significant different of learners' vocabulary learning improvement using the four different strategies, b) to find out the best predictors of strategies, and c) to examine learners' attitudes among the four strategies. The results show that the WAB reporting strategies using mixed Indonesian-English EFL could improve their academic vocabulary learning. This WAB reporting activity using mixed Indonesian-English definitions is also perceived as a positive strategy.

The unique contribution of this current research lies in its comprehensive experimental design and the positive results reported in similar previous research. This design includes the active involvement of learners in a self-definition searching from their mobile dictionary using both mixed Indonesian-English definitions before they report it to their teacher, following positive results of the previous studies in terms of mixed English-learners' mother tongue definition in the study, and comprehensive experimental designs involving four different groups, and comparable language proficiency levels. Many of these elements were surely lacking in similar research conducted previously.

To sum up, the power of mixed language applying learners' mother tongue and English, either using a mobile application or the traditional teaching model could facilitate vocabulary learning because sometimes the unfamiliar vocabulary words could not be interpreted and comprehended using monolingual (especially English-English) definitions. Meaning transfer from learner mother tongue and its equivalent to English definitions helps the learners understand the meaning of the unknown academic vocabulary words more easily. Since this intervention study is only conducted within the relatively short time of three months with a small number of participants, it is hard to generalize the result to cover a bigger population. The familiarity of general academic vocabulary words was not investigated so it is relatively too early to draw any conclusions about the vocabulary learning effects. Therefore, it is recommended for future researchers to scrutinize the familiarity of academic vocabulary and learning process to explain how the EFL learners learn their vocabulary through the mixed Indonesian-English definitions applying this mixed method.

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Appendix 1. Summary of the key issues published regarding the mobile application and vocabulary learning

Theme	**Reference**	**Context**	**Purpose**	**Methodology**	**Conclusion**
Mobile application and vocabulary learning	(Lu, 2008)	Vocational high school students in Taiwan	To explore the effectiveness of applying SMS via mobile phone in vocabulary learning and learners' perspective of learning vocabulary via mobile phones	1. Pre-treatment questionnaire and pre-test were applied to find participants uses of mobile phones; 2. The participants (31 students) were asked to recognize 28 target words and 22 non-target words using the Chinese translation; 3. The experimental group received two SMS lessons and the traditional group received paper-based material every day; 4. A post-treatment questionnaire, interview and post-test using 28 target words were administered. 5. A two-tailed t-test was applied to analyze the data.	SMS-based learning could foster students' target words exposures, improved students' motivation and frequency of reading the lessons.
	(Kilickaya & Krajka, 2010)	Upper-intermediate students of Academic English Class at a private university in Ankara, Turkey.	To compare the effectiveness of online vocabulary learning and traditional instruction	1. The students in the experimental group practise vocabulary items in ten reading texts using vocabulary *Word-Champ*; 2. The students in the control group practise vocabulary items from the same passages using vocabulary notebooks, cards, and	The students who learned English vocabulary using *Word-Champ* perform better than the students in the control group.

				a paper dictionary; 3. The three hours of training were conducted within five weeks. 4. An independent t-test was used to analyze the data.	
	(Hayati et al., 2013)	45 Persian learners who had been studying English at a private English language institute.	To compare the effectiveness of idiom-learning using SMS and contextualized learning, self-study approach and to draw learners' perception of learning idioms using SMS	1. Pre-test using 50 multiple choice common English idioms was administered after identifying the participants; 2. Students in the self-study group received English idioms from a printed pamphlet without attending the classroom. The SMS group received the same English idioms. They received four text message containing four English idioms to the 15 participants (60 idioms/day); 3. Post-test using the same English idioms test; 4. The SMS-based group was asked to fill a written survey; 5. Paired-samples t-tests and descriptive statistics were used to analyze the tests and survey.	The common English idioms scores in the SMS-based group were higher than those of students who learned common English idioms using the pamphlet.

	(Tabatabaei & Goojani, 2012)	90 pre-university learners of Shahed high school in Farsan, Iran.	To explain the effectiveness of using text messaging in English vocabulary learning and to learners' attitudes towards the use of SMS in vocabulary learning.	1. Participants (60 out of 90 students) were selected using the Interchange Placement test (Richard, 2005); 2. Students from experimental and control groups were taught using four units of English book within twelve sessions plus pre-test and post-test; 3. Each session, 5 to 6 words were learned; 4. Students from the experimental group sent one original sentence from each given words using SMS and received feedback; 5. Students from the control group sent the same sentence using paper-based and received the same feedback; 6. One sample t-test and descriptive statistics were used to analyze the data.	The results show that there are positive impacts and attitudes of learning vocabulary using SMS.
	(Dashtestani & Stojkovic, 2015)	A total of 60 EAP students a state university in Tehran, Iran.	To assess the effect of SMS-based glosses on students' vocabulary learning and attitudes	1. The students whose IELTS test band scores ranged from 5.5 to 6.5 were selected for the study. 2. The students were classified into three groups (20 students in each group).	The students from the first group who learned vocabulary using SMS in both Persian and English had higher vocabulary scores and

				3. The first group received 120 vocabulary items through SMS in both Persian and English definitions. The second group received the same vocabulary items from SMS in Persian definitions. The third group received similar vocabulary and activities in English definitions. 4. The test of Kruskal-Wallis and descriptive statistics were applied to analyze the data.	attitudes than the rests.
	(Lin & Yu, 2017)	32 eighth-grade learners in central Taiwan who participated in out-of-class vocabulary learning	To examine vocabulary learning gains and retention, learners' cognitive load, and perceptions of the mobile-aided vocabulary learning program	1. Before the program, the participants took a vocabulary survey on target words on Chinese equivalents; 2. During the program, the participants learned four sets of target words in the forms of text mode, text-picture mode, text-sound mode, and text-picture-sound mode; 3. Participants took a vocabulary test and completed a questionnaire of cognitive load. 4. Learner' vocabulary scores from the pre-	Learners' new words' meanings recall improved after two weeks of the program applying audio-input mode and their cognitive load also reduced.

				test and post-test were analyzed using ANOVA and the questionnaire data were analyzed using descriptive statistics.	
	(Basal et al., 2016)	The participants consisted of 50 learners from the English language teaching department of a public university in Turkey	To investigate the effectiveness of mobile application on learners' figurative idioms gains	1. Learners from the experimental group were taught using the mobile application; 2. Learners from the control group were taught using the traditional strategy. 3. The idioms were adopted from the Michigan Corpus of Academic Spoken English (MICASE) (Simpson & Mendis, 2003);	The results reveal that the learners who learned figurative idioms through mobile application perform better than their counterparts.
	(Li et al., 2017)	108 English language learners (ELLs) at a large Canadian University	To explore learners' experiences and their in-depth perspective on the texting feature, intervention content, and suggestions for the development of academic vocabulary instruction	1. The participants were selected based on iBT 80+ and IELTS 60+ admission tests and a Vocabulary test; 2. A number of 189 of the 200 words from *Word Matters* was taught using text messages for more than two months; 3. Learners received three words per day through text messages (one word in the morning, at noon, and afternoon); 4. Each message contained a target	The results reveal that learners read the three text messages four days a week, email once a week and increased their learning interests.

				word, the page reference in the reading passage, definition and example; 5. Learners received an email summary of the three words learned and a game quiz format every night. 6. A 60-item targeted vocabulary pre-test and post-test were administered; 7. Combinations of descriptive analysis and thematic analysis were applied to analyze the post-treatment survey and the qualitative data.	
	(Dehghan et al., 2017)	The research participants involved 32 teenaged learners ranging from 13-16 years old in an Iranian language institute.	To probe the ELF learners' vocabulary knowledge (definitions, direct explanation, synonyms and antonyms) using WhatsApp	1. Learners in the experimental group received vocabulary files contained the meaning, definition, synonym, antonym, and examples; 2. Learners discussed the new words with their group and teacher from the dictionary (pronunciation, picture, expression and special use); 3. Learners in the traditional group received the same strategies using a traditional textbook;	The results reveal that EFL learners' perception of the use of technology were positive but their vocabulary scores did not show any significant difference.

				4. Learners took a vocabulary pre-test and post-test; 5. An independent sample t-test was applied to analyze the data.	
	(Cetinkaya & Sütçü, 2018)	The study participants were 123 ninth- grade learners of a public senior high school in Turkey	This study aims at determining the effects of two different mobile applications (Facebook and WhatsApp) on learners' vocabulary mastery and learners' opinions on the two different approaches.	1. The participants were selected using an achievement test. 2. Information messages in English definitions, Turkish, and samples of English sentences were sent using both WhatsApp and Facebook between 08.00 and 21.30. 3. The post-survey was given to 62 learners in the experimental group the following week after the post-test. 4. The ANOVA test was used to analyse the quantitative data. Meanwhile, the qualitative ones were analyze using a categorical analysis based on Corbin and Strauss (2017)	The results illustrate that the Whatsapp application is more effective in the enhancement of learners' vocabulary learning success than Facebook instruction.
	(Caruso et al., 2019)	50 university students who enrolled in Korean, French and	This study aims to introduce a series of classroom online tools to help learners engage in meaningful feedback, to	1. The 18 online questions survey designed using Qualtrics software were distributed to 162 students but only 50 students completed	The students responded positively towards the video in terms of effectiveness and enjoyment to

		Italian courses participated in the survey study and 7 of them participated in the focus group session	facilitate faster and more individualized feedback on the learners' writing assignment.	the survey. 2. A simple paired t-test and Pearson's correlation were applied to analyze the 5-point Likert scale survey data. 3. A focus group session was also conducted to draw the learners' qualitative view of online learning tools.	foster students' language learning and feedback and learners' responses towards the online data-bank feedback comments were useful for their future course.
	(Motlagh et al., 2020)	61 participants of first and second-year learners of public Health (n=32) and Nutritional sciences (n=29) from the Iranian University of Medical Sciences.	To investigate whether communication between teachers and learners using the Telegram application could enhance their vocabulary mastery	1. An eligibility assessment was applied to recruit the participants of the study 2. A weekly assessment of concept learning was used to monitor learners' participation using the Telegram group. 3. A pre-test and post-test using a 60-question set taken from a TOEFL Practice Test (Matthiesen, 2017) were administered to the two treatments to measure the learners' vocabulary growth. 4. A linear regression model using STATA version was applied.	Learners in the intervention groups using the Telegram group communicated through spoken and written forms more frequently using new vocabulary terms.