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Article

An Empirical Study on Vocabulary Recall and Learner Autonomy through Mobile-Assisted Language Learning in Blended Learning Settings

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Abstract

This study aims to examine the efficacy of Mobile-Assisted Language Learning (MALL) of English as a foreign or second language (L2) through two perspectives: learning gain and learner autonomy. Previous studies have shown that L2 learning combined with media could activate the learning processes, resulting in an easier recall of the target vocabulary required in L2. In addition, mobile-assisted L2 learning could also enhance autonomous learning inasmuch as successful MALL would have to rely mainly on the autonomous learner even in learning contexts where the goal and task are already fixed. Based on this standpoint, the study hypothesizes that the engagement in L2 learning with mobile devices along with a classroom-based writing course could make L2 learners not only achieve the target L2 lexis effectively, leading to better L2 writing performance, but also help them to be more autonomous even in a setting when the task and goal are fixed. To test this hypothesis, both empirical and questionnaire studies were conducted for Japanese undergraduates (n=94). Based on the results of three weeks of L2 academic writing practice between groups learning with and without mobile devices, the findings of our *t*-test analyses of

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learners' vocabulary recall and a questionnaire survey about learner autonomy suggested that MALL significantly contributed not only to L2 vocabulary recall in comprehensive and productive tests, but also to enhancing positive attitudes towards autonomous learning.

Keywords: mobile-assisted language learning; vocabulary recall; academic writing; learner autonomy; motivation; blended learning.

1. Introduction

1.1 Advantages of MALL

Along with the rapid spread of mobile devices, the advantages of Mobile-Assisted Language Learning (MALL) have been advocated. Many of the studies claim that the MALL advantage lies in multimodal interfaces of such media as pictures, animation, and sound (Sato & Suzuki, 2010; Sato, 2016; Yeh & Wang, 2003). Sato, Matsunuma and Suzuki (2013), for example, demonstrate that prompt feedback of a mobile learning application can enhance the automatization of vocabulary recall, allowing the vocabulary to be reapplied toward reading activities and thus leading to successful L2 reading comprehension. Mobility is also defined as one of the MALL advantages. As Laurillard (2007) claims, the mobility of digital technologies provides learners a wide range of choices of what, when, and how to learn; MALL offers different ways of learning from that in a classroom.

Several recent studies support the benefits of MALL, especially on L2 vocabulary learning and the positive learning effects (Burston, 2015; Çakmak & Erçetin, 2018; Chen, Liu, & Huang, 2019; Loewen et al., 2019; Rosell-Aguilar, 2018).

The successful L2 learning that these previous MALL studies demonstrated, however, might have failed to consider what is happening to learners when engaging in MALL. Therefore, the concept of the agency (Pachler, Bachmair, & Cook, 2010) or autonomy (Holec, 1981) of learners seems to be vital in making MALL a more positive and meaningful experience for learners. The concept of learner autonomy is defined by Holec (1981, p. 3) as "the ability to take charge of one's own learning," where the learners are expected to take responsibility for decisions when determining the objectives of learning, evaluating what has been acquired, and so on.

Learning with technology and learner autonomy are principally compatible because technology affords the opportunity to carry out such processes (Dang, 2012; Lee, 2016; Reinders, 2011; Reinders & Hubbard, 2013; Ushioda, 2013) because of the nature of mobile learning, such as prompt feedback outside the

classroom. Therefore, the more learner autonomy is fostered through the use of technology, the more actions and choices learners can take on their own (Schwienhorst, 2003).

Using learners' own devices also fosters learner autonomy (Kukulska-Hulme, 2015). Choosing the contents and strategies for learning and actively searching for resources can be seen as essential qualities of autonomous learners (Benson, 2001). In that respect, MALL may require learners to be autonomous while, at the same time, it may offer learners the opportunity to autonomously engage in L2 learning (Kukulska-Hulme, 2015; Reinders & White, 2011). Through such characteristics, MALL can encourage high-quality involvement in learning (Ushioda, 2013) and higher learning gains.

1.2 Learner Autonomy in Blended Learning Settings

Despite the advantages of MALL shown above, autonomous learning with mobile devices is rarely, if ever, combined with classroom-oriented education, since classroom activities are conducted and controlled by instructors. They tend not to give learners much responsibility for learning but ask the learners to complete only the assigned tasks or exercises. This may lead to few trials of implementing mobile technology in blended learning settings in which formal and informal learning are integrated, especially to enhance learner autonomy (Reinders & White, 2016).

However, along with the popularity of Bring Your Own Device (BYOD) in recent years, MALL has been incorporated within blended learning settings; learners are allowed to bring and use their mobile devices to efficiently support activities in their language classrooms. As such, the shift facilitates a combination of classroom-oriented learning with out-of-class learning using mobile devices, and different types of autonomy could be fostered, as shown from previous studies. Lyddon (2016), for example, describes the characteristics of autonomous learners[1] who are required to use mobile devices in classroom-based compulsory learning contexts and demonstrates that the least autonomous learners do not participate in a classroom activity, whereas the more autonomous ones try to find value from the activity and then strive to complete it. Lyddon's argument is that learners enhance their autonomy in the process of blended learning combining classroom-based learning and MALL, even if the task is assigned by teachers and their learning goal is also fixed.

Considering the increasing trend of BYOD in formal language learning, our study explores the impact of MALL in blended learning settings in terms of learner autonomy as well as learning effect. In this study we focus on mobile-assisted vocabulary learning along with classroom-based writing activities. This is primarily because previous MALL studies have not addressed writing

skills (Burston, 2015) and therefore have not investigated how MALL can help to recall the target vocabulary in L2 writing.

1.3 Research Questions

Research on learner autonomy has faced several challenges, such as measuring learner autonomy or the effectiveness of using technology in fostering learner autonomy (Reinders, 2011; Reinders & White, 2011). This is due to the difficulty of defining learner autonomy, so that different researchers have different views of learner autonomy (Dang, 2012). Oxford (2003) defined learner autonomy along four dimensions: psychological, technical, socio-cultural, and political-critical, but no study was found to measure each dimension of autonomy in an empirical manner.

This study, therefore, examines the effectiveness of MALL, based on our claim that successful mobile-assisted L2 vocabulary learning enhances not only L2 learning gains but also learner autonomy in blended learning settings. Based on this claim, this study compared L2 learners who used mobile devices with those who used paper-based lists of expressions for academic writing, followed by research to measure improvements in their learner autonomy with a questionnaire developed to measure learner autonomy (Murase, 2015).

Our focus on writing to examine learner autonomy follows the claim of Collentine (2011) that writing as learners' output reflects their linguistic awareness derived from their autonomous learning. While we developed mobile-based materials to help students learn the expressions required for writing academic essays of several paragraphs, empirical research was conducted to examine the following three research questions (RQs):

1. If, during a given period, L2 learners study expressions for academic essays with a mobile-based application, would they recall more expressions on the written test than those studying with a paper-based list did?
2. If L2 learners study these expressions with the application, would they use more of those expressions in writing an essay than those with the paper list?
3. If L2 learners study these expressions with the application, how would their learner autonomy and attitudes towards MALL change, compared with those with the paper list?

2. Method

2.1 Participants

A total of 94 (80 male and 14 female) undergraduate students enrolled in a compulsory English writing course participated in this research, most of whom were sophomores from the faculty of engineering in the Japanese university where the authors of this paper taught English as a foreign language. The students' majors, which included the life sciences, chemical sciences, physics, and electrical engineering, are not related to English studies; yet their English language skills were sufficient for composing several English sentences by themselves due to the fact that they had studied English for at least seven years and passed the entrance examination which included an essay writing component. Given all of the participants had a score approaching "mastery" level in G-TELP Level 2 (two out of three skills exceed 75%), which corresponds to a score of between 600–800 in the TOEIC test according to the official page of G-TELP (n.d.), their English proficiencies were assumed to be approximately at an intermediate level.

Participants were divided into two groups, a control group (n = 54) and an experimental group (n = 40). They enrolled in three different classes and were taught by two different instructors. One instructor taught one class of the experimental group and one class of the control group, while the other instructor taught only one class, which was divided into an experimental and a control group. As the groups were divided according to their English writing classes within their respective departments, the English language skill levels in each group were expected to be equivalent, although no test was conducted to corroborate this assumption.

2.2 Target Expressions

All the participants were asked to learn 100 expressions frequently used in academic writing (see Appendix A for the list of expressions). These were extracted from several textbooks and reference books for L2 learners (Steinberg, 2008) and consisted mainly of words or phrases used to clarify the logical flow of an essay. To confirm the difficulty level of the expressions for the participants, we conducted a paper-based questionnaire survey before the research; the participants were asked to answer on a four-point Likert scale the degree to which they had already known each expression ("know the expression well," "know it roughly," "don't know it well," and "don't know it at all"). According to the survey results, we developed recall tests to ask the participants the expressions they didn't know well or at all before the treatment.

2.3 Treatment

Considering Kukulska-Hulme's (2015) claim of the importance of MALL in offering supplementary tasks to extend classroom-oriented learning, all participants were asked to learn the expressions as their preparation for the end-of-term writing test. Those in the control group were asked to memorize the expressions with their corresponding Japanese translations from a paper-based expression list (see Figure 1). The participants were supposed to memorize the expressions and translations outside the classroom.


1. Accordingly その結果、それに応じて
2. Additionally さらに、追加として
3. Adjacent 隣接した
4. Afterward 後で
5. All in all 全部で、全体から見ると、概して
6. All of a sudden 突然・不意に
7. Alongside~ ~と並行して・と同時に
8. As I have noted 前に述べたように
9. As I have stated above すでに上で述べた通り
10. As in~ ~のように
43. In brief つまり、すなわち
44. In comparison (with~) (~と)比べると
45. In short 要約すれば
46. In spite of ～ ～にもかかわらず
47. In the course of~ ~の最中で、過程で
48. In the first place 最初の段階で、そもそも
49. In the meantime そうこうしているうちに、その一方で
50. In the same way (as~) (~と)同様に
51. In this respect この点で
52. Initially 最初は

Figure 1. A screenshot of the paper-based phrase list.

Students in the experimental group, on the other hand, were asked to learn the expressions on their smartphones. For that purpose, learning materials were developed using Quizlet (https://quizlet.com/), a free online learning tool, available on mobile devices such as iPhone and Android phones at the time of the present study, that is used to generate vocabulary learning resources. As shown in Figures 2 and 3, the online resource provides different kinds of quizzes for the expressions, such as matching expressions with their translations. These quizzes were available to any students who had Internet access on their smartphones. After being provided with instructions on installing, registering, and using the resource on their own mobile devices, the experimental group was asked to learn the expressions outside the classroom. However, it was found that some of the participants in the experimental group didn't use Quizlet but used the paper list to learn the expressions, so they were categorized as part of the control group.

In both groups, the instructors did not instruct the students of the group how to use their learning tools. The instructors only introduced "flashcard" as the most popular exercise on Quizlet. This was because the present study aimed to afford students the opportunity to use each learning tool in their own ways, which is vital in fostering learner autonomy, as discussed above. To encourage out-of-class learning in each treatment, however, the instructors announced

that the test for the expressions would be held three weeks later, and the scores would count as part of their grades in the writing class.

Figure 2. An example of the quizzes developed by Quizlet (matching).

Figure 3. Another example of the quizzes developed by Quizlet (fill-in-the-blanks).

2.4 Learner Autonomy Questionnaire Survey

Just after the introduction of the learning materials, all participants were asked to answer an Internet-based questionnaire written in Japanese about their attitudes toward and views of learning English, which was designed to measure the technical and psychological dimensions of learner autonomy (Murase, 2015). Students accessed the designated website developed by Google Forms and then answered the questionnaire outside the classroom via their mobile devices or PCs (see Appendix B for the English translation of the questionnaire items). The same questionnaire was administered after the end-of-semester writing test.

The questionnaire used in this study was designed to measure two dimensions of learner autonomy, technical and psychological (Benson, 1997; Dang, 2012; Oxford, 2003; Pennycook, 1997), which consist of a total of 49 items on a five-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree). A response of "strongly agree" obtains the highest score (scored 5) and "strongly disagree" the lowest (scored 1); high scores indicate high learner autonomy. To briefly summarize, the technical dimension of autonomy refers to the learners' act of learning a language on their own outside the classroom without the aid of a teacher, and also to situations in which learners are obliged to take control of their learning for some reason, while the psychological dimension refers to the "capacity" of individual learners that "allows learners to take more responsibility for their own learning" (Benson, 1997).

This questionnaire survey was developed based on extensive reviews of existing definitions of learner autonomy in the literature. Furthermore, the test for the internal consistency of each dimension showed a statistically reasonable level of reliability (α = .936 for all the questionnaire items), while the validity of the questionnaire was investigated by a series of confirmatory factor analyses using structuring equation modeling and the Goodness-of-Fit statistics showed an acceptable level of validity (Murase, 2015). Therefore, the questionnaire can be seen as one of the most valid and reliable tools available for measuring learner autonomy.

2.5 Procedure

Three weeks after the introduction of the materials and the questionnaire survey on learner autonomy, a test of the expressions and an essay writing task were conducted during a total period of 90 minutes. During the first ten minutes of the class period, the participants were asked to answer 20 fill-in-the-blank questions created from the 100 expressions. The expressions in the questions were selected based on the results of the questionnaire carried out

before the introduction of the materials, and consisted of the expressions that participants had the least prior knowledge of; 80% of the participants had answered "I don't know it well" or "I don't know it at all" for these items (in bold in Appendix A). The test was graded according to the number of correct answers (writing an appropriate word with correct spelling in each blank), so the total possible score for the test was 20.

A timed essay writing task was then given. The participants were asked to pick one of the following four topics given by the instructors:

- Science college students should learn English.
- Japanese universities should change to meet the needs of globalization.
- The Tokyo Olympics should be held as planned.
- The voting age should be lowered from 20 to 18.

They were then asked to write an essay of at least three paragraphs presenting their opinions about the topic they had chosen and to include as many expressions they had studied as possible. As these topics were given on the spot, the participants were not able to prepare beforehand. Although they were not allowed to refer to any dictionaries, several keywords related to the essay topics were given by the instructors. They were given 75 minutes for this task.

The essays were analyzed to determine the quality of writing. For this purpose, all the essays were graded by one of the authors whose native language is English, according to the IELTS band descriptors for the writing sections. In the IELTS test, essays (in Writing Test 1) are graded on a band scale ranging from one to nine, referring to the four criterion areas: task achievement, coherence and cohesion, lexical resource, and grammatical range and accuracy. This analysis was conducted to examine whether the quality of the essays changed between the groups based on our presupposition that the quality of the essays both groups wrote would not differ except for the use of the expressions they learned in different ways.

After finishing the writing task, they were asked to answer the Internet-based questionnaire again within a few days. In addition to the same 49 items on learner autonomy as with the pre-questionnaire, a section was added asking about their vocabulary learning experiences in terms of the frequency of the students' learning, the place of learning, and their motivation towards learning (see Appendix C for questions in the additional section). In the four-point Likert scale questionnaire on frequency and motivation, more positive statements (e.g., scored 4 for "I studied almost every day") indicate a more positive attitude towards learning.

3. Findings

All the data collected in this research were analyzed to investigate the differences between the control and experimental groups, as well as changes in learner autonomy within the groups.

3.1 Fill-In-The-Blank

First, in order to answer the first RQ, the scores on the fill-in-the-blank test (total score: 20) were compared between the two groups, as shown in Table 1. In the control group (n = 54), the mean score on the test was 6.48 (SD = 5.79, max = 18, min = 0), whereas the mean score of the experimental group (n = 40) was 10.01 (SD = 6.50, max = 20, min = 0). A t-test showed significant differences between the groups with respect to the mean score ($t(92) = 2.82$, $p < .05$, $d = .58$). This result demonstrates that the participants who studied the target expressions with their mobile devices recalled significantly more expressions than those who used the paper list.

Table 1
T-test Results of the Fill-In-The-Blank Test

	n	*M*	*SD*	*df*	*t*	*Sig.*	*d*
Control	54	6.48	5.79	92	2.82	.006**	.58
Experimental	40	10.01	6.5				

*$p < .05$ ** $p < .01$

3.2 Essay Writing Test

To answer the second RQ, we analyzed the essays written by the participants (n = 94) and compared them between the two groups. First, the number of expressions appearing in each essay was counted and compared between the groups, as shown in Table 2. In the control group (n = 54), the mean number of the expressions used in an essay was 1.48 (SD = 1.71, max = 5, min = 0), while in the experimental group (n = 40) it was 2.60 (SD = 1.70, max = 8, min = 0). A t-test found a significant difference between the groups ($t(92) = 3.15$, $p < .05$, $d = .66$). This result shows that the participants who studied with Quizlet used more expressions in their essays than those who studied with the paper list.

Table 2
T-test Result of the Number of Expressions Used in the Learners' Essays

	n	*M*	*SD*	*df*	*t*	*Sig.*	*d*
Control	54	1.48	1.71	92	3.15	.002**	.66
Experimental	40	2.6	1.7				

*$p < .05$ **$p < .01$

To verify our presupposition that the different treatments affect only the expressions, but other qualities of the essays would not be different, the scores on each criterion were compared between the two groups (see Table 3). Since no statistically significant difference was observed between the two groups, the qualities of the essays were not affected by the different treatments except for the expressions they could recall.

Table 3
T-test Results of the Scores on Learners' Essays based on the IELTS Criteria

	M (*SD*)				
	Control (*n* = 54)	**Experimental (*n* = 40)**	***df***	***t***	***Sig.***
Task achievement	5.85 (0.76)	6.05 (0.81)	92	1.21	0.23
Cohesion and coherence	5.82 (0.55)	5.96 (0.62)	92	1.32	0.19
Lexical resources	5.85 (0.56)	6.05 (0.64)	92	1.59	0.11
Grammar accuracy	5.56 (0.54)	5.7 (0.56)	92	1.26	0.21

3.3 Questionnaire on Learner Autonomy

In order to answer the third RQ, the results of the Internet-based questionnaire about learner autonomy, which was administered before the treatment (pretest) and after the treatment (posttest), were compared between groups and also within groups over time.

3.3.1 Comparison Between Groups

In the pretest, 66 out of the 94 participants of this study responded to all the questionnaire items and were therefore valid. In contrast, in the posttest, 76 participants answered all the questionnaire items and were valid.

When comparing the two groups on the 49 individual items, in the pretest, a *t*-test found no significant difference between the control group ($n = 33$) and the experimental group ($n = 33$). In the posttest, there was no significant

difference between the control group (n = 46) and the experimental group (n = 30), except for two items (Q17 and Q21), for which the control group had higher scores. For Q17 ("I take notes about how much time I spent on my English study"), the mean score of the control group was 2.24 (SD = 1.78), while the mean score of the experimental group was 1.77 (SD = .82). A t-test found a significant difference between groups ($t(74) = 2.06$, $p < .05$). On Q21 ("I take notes of my feelings while I am studying English"), the mean scores of the control and experimental groups were 1.76 (SD = 1.04) and 1.33 (SD = .66), for which a t-test found a significant difference between groups ($t(74) = 2.12$, $p < .05$). As both items are concerned with taking notes while learning, it may be assumed that it was easier for those working with the paper-based list to physically take notes.

As described earlier, the 49 questionnaire items were originally designed to measure two different dimensions of learner autonomy: the technical (Q1–21) and psychological (Q22–49) dimensions. Thus, the results were also compared between groups on each of the two dimensions. In the technical dimension, the mean scores of the control and experimental groups were 2.60 (SD = .57) and 2.38 (SD = .59), respectively. The t-test found no significant difference between groups ($t(74) = 1.67$, $p > .05$). As for the psychological dimension, the mean scores of the control and experimental groups were 3.34 (SD = .51) and 3.40 (SD = .40, respectively). A t-test showed no significant difference between groups ($t(74) = .491$, $p > .05$).

3.3.2 Comparison Within Groups

In order to examine possible changes in learner autonomy over time, the scores on the two dimensions in the pretest and the posttest were compared within groups. For this part of the analysis, the data of 51 out of the 94 participants who responded to both the pretest and posttest completely were analyzed: 32 participants in the control group and 19 participants in the experimental group.

For the control group, there was no significant difference between the two tests on either dimension (see Table 4). For the experimental group (see Table 5), there was no significant difference observed between the two tests on the technical dimension ($t(18) = .578$, $p > .05$). However, there was a significant difference between the two tests on the psychological dimension ($t(18) = 2.36$, $p < .05$, $d = .46$).

Thus, when comparing the results of the pretest and the posttest, both groups obtained higher scores (suggesting a higher autonomy) on the post-test. However, there was no significant difference between the scores on the two tests except for the experimental group, in terms of the psychological dimension of autonomy.

Table 4
T-test Results of Comparing Two Tests on Two Dimensions (Control Group, *n* = 32)

	M	*SD*	*df*	*t*	*Sig.*
Technical					
Pretest	2.40	.454	31	1.401	.171
Posttest	2.52	.477			
Psychological					
Pretest	3.16	.431	31	1.733	.093
Posttest	3.30	.466			

Table 5
T-test Results of Comparing Two Tests on Two Dimensions (Experimental Group, *n* = 19)

	M	*SD*	*df*	*t*	*Sig.*	*d*
Technical						
Pretest	2.41	.682	18	.578	.570	.05
Posttest	2.44	.567				
Psychological						
Pretest	3.25	.373	18	2.356	.030*	.46
Posttest	3.42	.368				

*$p < .05$

3.4 Vocabulary Learning Experiences

An additional section was added to the posttest questionnaire with questions about vocabulary learning experiences (see Appendix C), and the results were compared between groups in terms of frequency, place, and motivation. The data collected from 76 participants, who answered all the posttest questions, were analyzed.

3.4.1 Frequency of Learning

In order to examine the frequency of learning during the three weeks, the participants' responses to Q1 ("During the last three weeks, how often (on average) did you study the expressions?") were analyzed. A *t*-test showed that the mean

scores of the control and experimental groups were 1.78 (SD = .51) and 1.87 (SD = .51), respectively, and no significant difference was found between the control group (n = 46) and the experimental group (n = 30) in the frequency of their learning ($t(74) = .702$, $p > .05$).

3.4.2 Place of Learning

As for where the participants studied, their responses to the question "Where did you mainly study?" were analyzed. As shown in Table 6, while 26% of the students in the control group reported they studied at university, no students in the experimental group studied at university. The results also showed that there were more students in the experimental group who studied on the train or bus than the control group. The results indicate that learning with mobile devices could facilitate ubiquitous learning and help to combine formal learning with learning outside university, leading to blended learning, while paper-based learning seems to be related more to formal learning settings such as home and university.

Table 6
Responses about the Place of Learning (n = 76)

	At home	At university	On the train or bus	Other
Control (n = 46)	27 (59%)	12 (26%)	7 (15%)	0
Experimental (n = 30)	13 (43.3%)	0	14 (46.7%)	3* (10%)

Note. Other responses included "In my free time" and "At a family restaurant."

3.4.3 Motivation Towards Learning

Finally, to examine the motivation for vocabulary learning, students' responses to the question "By using a paper list (or mobile devices), did you feel motivated towards learning essay phrases?" were analyzed. A t-test showed that there was a significant difference concerning their motivation towards vocabulary learning ($t(74) = 2.01$, $p < .05$, $d = 0.47$). This indicates that students in the experimental group (M = 2.93, SD = .64) felt higher motivation towards vocabulary learning on mobile devices than those who used the traditional paper-based list (M = 2.63, SD = .65). This correlates to the improvement of learner autonomy in the psychological dimension after three-weeks of mobile learning, as described in 3.3.2.

Table 7
Responses about the Motivation Towards Learning

	n	*M*	*SD*	*df*	*t*	*Sig.*	*d*
Control	46	2.63	0.645	74	2.01	.048*	.47
Experimental	30	2.93	0.64				

*$p < .05$

4. Discussion

This section will discuss the three RQs addressed in this study, followed by the limitations of the study.

The answer to our first RQ is yes. The analysis of the fill-in-the-blank test data showed that those who used mobile devices could recall more expressions than those who studied with the paper-based list. The better vocabulary recall obtained here underpins the previous studies of mobile-assisted L2 vocabulary learning (i.e. Burston, 2015). As for the second RQ, our answer is also yes. The analysis of the essays showed that those who studied with Quizlet were able to use more expressions when writing an essay than those studied with the paper list. This seems reasonable, as those who studied with the application could recall more expressions than those who studied with the paper list. According to the analysis of the essays based on the IELTS criteria, it was shown that there was no significant difference between the groups in terms of the quality of the writing, indicating that students in both groups had the same or similar levels of writing and that the differences in recalling and using the expressions were purely the results of the treatment. In sum, learning expressions with a mobile application enhanced not only recall but also the participants' ability to apply the vocabulary to writing activities as well as reading activities (Sato et al., 2013).

As for the third RQ. The results of the two questionnaire surveys indicated different tendencies between the two groups. According to the pretest, there was no significant difference between the groups, indicating that both groups were homogeneous in terms of learner autonomy at the beginning of this study. Comparing the pretest and the posttest, among those who learned the expressions with the paper list, there was no significant difference between the two tests, while there was a significant difference between the tests regarding the psychological dimension of learner autonomy among those who learned on the mobile devices. In addition, according to the additional part of the posttest questionnaire, it was shown that the experimental group felt greater motivation towards learning the expressions than the control group. Considering

motivation and learner autonomy are closely related to each other and motivation strengthens autonomy (Dörnyei, 2001), the significant improvement of motivation through MALL to support classroom-based learning could trigger an enhancement of learner autonomy.

The places where the devices were used are also suggestive. While paper-based learning is connected with formal learning contexts, mobile-based learning seems to create new learning environments which traditional learning does not offer. The shift of learning environment enhanced learners' motivation and the psychological dimension of autonomy, leading to successful blended L2 learning.

This study was not free from limitations. One major difficulty in this study was the grouping of the participants. After the posttest questionnaire which asked whether the participants used the paper list or Quizlet, it turned out that eleven students in the experimental group used the paper list. Therefore, to reflect their actual learning experience, they had to be labeled as the control group when analyzing the data.

What seemed to underlie this was the participants' initial hesitancy or resistance to the use of mobile devices. It can be assumed that those who were in the experimental group but did not like to learn on mobile devices chose to learn with the paper list, possibly obtaining the list from their classmates in the control group. Although the treatment is a core part of the study that should have been carefully controlled, this incident impressed on us the realization that there might be some students who viewed using mobile devices for learning negatively. More careful division into the groups should be conducted in any future study.

Furthermore, the difference in the number of valid participants in each questionnaire analysis was a limitation. This was because answering 49 questions proved so time-consuming and troublesome that some of the participants did not answer all questions. Thorough instructions to complete the questionnaire in any future study would make our analyses more convincing. The length of the research may also be worth considering because participants might feel burdened in learning 100 expressions in only a relatively short period.

5. Conclusions

This study examined the advantages of MALL from two perspectives: vocabulary recall and autonomy. It explored whether blended L2 learning would help learners to recall target expressions and also stimulate learner autonomy. To this end, an experimental study and a questionnaire survey were conducted.

The findings of the study showed that the advantages of MALL lay in bolstering the recall of the target expressions in both receptive and productive tests. Furthermore, MALL brought about a significantly higher level of learner autonomy in the psychological dimension and also higher motivation towards L2 vocabulary learning, which would indicate the fostering of autonomy. Thus, it appears likely that MALL has advantages in L2 vocabulary recall and, to some degree, in the enhancement of learner autonomy in blended L2 learning settings.

These findings appear to imply that L2 learning with advanced technology should be examined not merely in respect of L2 learning gains but also motivational effect, which would make the use of mobile devices for L2 learning more effective, even in blended learning contexts. Thus, it is surely meaningful to provide students with access to MALL regardless of their initial hesitancy or resistance, as was experienced in this study. Nevertheless, a longer-term study would be necessary to see more meaningful changes in learner autonomy.

Notes

1. Five characteristics of autonomous learners in a classroom are: compliance, competence, cognizance, introspection, and diplomacy (Lyddon, 2016). Lyddon claims that mobile learning in a classroom generates different autonomous behaviors from mobile learning independently conducted outside the classroom.

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References

Benson, P. (1997). The philosophy and politics of learner autonomy. In P. Benson & P. Voller (Eds.), *Autonomy and independence in language learning* (pp. 18–34). London, England: Longman.

Benson, P. (2001). *Teaching and researching autonomy in language learning.* Harlow, England: Pearson Education.

Burston, J. (2015). Twenty years of MALL project implementation: A meta-analysis of learning outcomes. *ReCALL*, *27*(1), 4–20. https://doi.org/10.1017/S0958344014000159

Çakmak, F., & Erçetin, G. (2018). Effects of gloss type on text recall and incidental vocabulary learning in mobile-assisted L2 listening. *ReCALL*, *30*(1), 24–47. https://doi.org/10.1017/S0958344017000155

Chen, C. M., Liu, H., & Huang, H. B. (2019). Effects of a mobile game-based English vocabulary learning app on learners' perceptions and learning performance: A case study of Taiwanese EFL learners. *ReCALL*, *31*(2), 170–188. https://doi.org/10.1017/S0958344018000228

Collentine, K. (2011). Learner autonomy in a task-based 3D world and production. *Language Learning & Technology, 15*(3), 50–67.

Dang, T. T. (2012). Learner autonomy: A synthesis of theory and practice. *The Internet Journal of Language, Culture & Society, 35*, 52–67.

Dörnyei, Z. (2001). *Motivational strategies in the language classroom*. Cambridge, England: Cambridge University Press.

G-TELP (n.d.). Overview G-TELP. Retrieved May 19, 2020 from https://g-telp.jp/english/

Holec, H. (1981). *Autonomy and foreign language learning.* Oxford, England: Pergamon Press for Council of Europe.

Kukulska-Hulme, A. (2015). Language as a bridge connecting formal and informal language learning through mobile devices. In L. H. Wong, M. Milrad, & M. Specht (Eds.), *Seamless learning in the age of mobile connectivity* (pp. 281–294). Singapore: Springer.

Laurillard, D. (2007). Pedagogical forms for mobile learning: Framing research questions. In N. Pachler (Ed.), *Mobile learning: Towards a research agenda* (pp. 153–175). London, England: The Institute of Education.

Lee, L. (2016). Autonomous learning through task-based instruction in fully online language courses. *Language Learning & Technology, 20* (2), 81–97.

Loewen, S., Crowther, D., Isbell, D. R., Kim, K. M., Maloney, J., Miller, Z. F., & Rawal, H. (2019). Mobile-assisted language learning: A Duolingo case study. *ReCALL*, *31*(3), 293–311. https://doi.org/10.1017/S0958344019000065

Lyddon, P. A. (2016). Mobile-assisted language learning and language learner autonomy. In S. Papadima-Sophocleous, L. Bradley, & S. Thouësny (Eds.), *Short papers from EUROCALL 2016* (pp. 302–306). Dublin, Ireland: Research-publishing.net.

Murase, F. (2015). Measuring language learner autonomy: Problems and possibilities. In C. J. Everhard & L. Murphy (Eds.), *Assessment and autonomy in language learning* (pp. 35–63). London, England: Palgrave Macmillan.

Oxford, R. L. (2003). Toward a more systematic model of L2 learner autonomy. In D. Palfreyman & R. C. Smith (Eds.), *Learner autonomy across cultures: Language education*

perspectives (pp. 75–91). Basingstoke, England: Palgrave Macmillan.
Pachler, N., Bachmair, B., & Cook, J. (2010). *Mobile learning: Structures, agency, practices.* New York, NY: Springer.
Pennycook, A. (1997). Cultural alternatives and autonomy. In P. Benson & P. Voller (Eds.), *Autonomy and independence in language learning* (pp. 35–53). London, England: Longman.
Reinders, H. (2011). Learner autonomy and new learning environments. *Language Learning & Technology, 15*(3), 1–3.
Reinders, H., & Hubbard, P. (2013). CALL and learner autonomy: Affordances and constraints. In M. Thomas, H. Reinders, & M. Warschauer (Eds.), *Contemporary computer assisted language learning* (pp. 359–375). London, England: Continuum Books.
Reinders, H., & White, C. (2011). Special issue commentary: Learner autonomy and new learning environments. *Language Learning & Technology, 15*(3), 1–3.
Reinders, H., & White, C. (2016). 20 years of autonomy and technology: How far have we come and where to next? *Language Learning and Technology*, *20*(2), 143–154.
Rosell-Aguilar, F. (2018). Autonomous language learning through a mobile application: A user evaluation of the busuu app. *Computer Assisted Language Learning*, *31*(8), 854–881. https://doi.org/10.1080/09588221.2018.1456465
Sato, T. (2016). Applicability of technology-enhanced visual glosses for explicit L2 vocabulary learning: The enhancement of metaphoric competence through the learning of English polysemous words. *Ampersand*, *3*, 43–51. https://doi.org/10.1016/j.amper.2016.03.003
Sato, T., Matsunuma, M., & Suzuki, A. (2013). Enhancement of automatization through vocabulary learning using CALL: Can prompt language processing lead to better comprehension in L2 reading? *ReCALL, 25*(1), 143–158. https://doi.org/10.1017/S0958344012000328
Sato, T., & Suzuki, A. (2010). Do multimedia-oriented visual glosses really facilitate EFL vocabulary learning?: A comparison of planar images with three-dimensional images. *Asian EFL Journal, 12*(4), 160–172.
Schwienhorst, K. (2003). Learner autonomy and tandem learning: Putting principles into practice in synchronous and asynchronous telecommunications environments. *Computer Assisted Language Learning, 16*, 427–443. https://doi.org/10.1076/call.16.5.427.29484
Steinberg, R. G. (2008). *Perfect phrases for the TOEFL speaking and writing sections*. New York, NY: McGraw-Hill.
Ushioda, E. (2013). Motivation matters in mobile language learning: A brief commentary. *Language Learning & Technology, 17*(3), 1–5.
Yeh, Y., & Wang, C.-W. (2003). Effects of multimedia vocabulary annotations and learning styles on vocabulary learning. *CALICO Journal*, *21*(1), 131–144.

Appendix A

The List of Expressions for Essay Writing

The following table shows the 100 expressions for essay writing that the students were asked to learn. The expressions in bold were the 20 expressions the participants had least knowledge of.

1. Accordingly
2. Additionally
3. **Adjacent**
4. Afterward
5. All in all
6. All of a sudden
7. **Alongside**
8. As I have noted
9. As I have stated above
10. **As in**
11. assert
12. **As with**
13. At first glance
14. At length
15. At present
16. **Bearing…in mind**
17. Beforehand
18. Beside
19. Besides
20. **By and large**
21. By comparison (to)
22. Consequently
23. **contend**
24. contradict
25. Conversely
26. Despite
27. dispute
28. Eventually
29. Facing
30. First and foremost
31. First reason is
32. For one thing
33. For the reasons above
34. Formerly
35. From my point of view
36. From time to time
37. Furthermore
38. Hence
39. I support the idea that
40. In any case
41. In any event
42. In back of
43. In brief
44. In comparison (with)
45. In short
46. In spite of
47. In the course of
48. In the first place
49. In the meantime
50. In the same way (as)
51. In this respect
52. Initially
53. is attributed to
54. **is detrimental to**
55. **is entitled to**
56. **is implemented in**
57. **is invalid**
58. is one reason that
59. is undertaken in order to do
60. **is valid**
61. It is assumed that
62. **It is feasible to do**
63. It is my belief that
64. It is presumed that
65. justify
66. **The legitimacy of…is that**
67. Likewise
68. Meanwhile
69. More specifically
70. Moreover
71. My first concern is
72. **Notwithstanding**
73. Nowadays
74. On the contrary
75. **plead**
76. Presently
77. Primary reason is
78. Provided that~
79. Recently
80. Regarding
81. remain unresolved
82. Since then
83. **test the validity of**
84. **the assertion that**
85. The first and most important… is
86. The foremost reason is
87. The issue of
88. **Thereafter**
89. These days
90. Throughout
91. To begin with
92. To conclude
93. To put it differently
94. To start with
95. To sum up
96. To this end
97. Undoubtedly
98. **warrant**
99. With reference to
100. With regard to

Appendix B

Learner Autonomy Questionnaire (Murase, 2015)

Technical Dimension

1. I set long-term goals in learning English.
2. I make long-term plans for studying English.
3. I set goals for the day before I start studying English.
4. I make study plans for the day before I start studying English.
5. I set achievable goals in learning English.
6. I make study plans that match my goals in learning English.
7. I make realistic plans for studying English.
8. I revise my English study plans if they don't work well.
9. If I have a limited amount of time available for study, I decide in what order the things need to be done.
10. I reflect upon how I studied after I finish studying English for the day.
11. I reflect upon what I learned after I finish studying English for the day.
12. I try to create opportunities to use English outside the classroom.
13. I try to create the conditions under which I can study English best.
14. I evaluate the improvement in my ability to use English effectively.
15. I assess how much of my goal I have achieved.
16. I assess the effectiveness of my English study plans.
17. I take notes about how much time I spent on my English study.
18. I keep records of what kind of methods I used for my English study.
19. I write down what kinds of materials I used for my English study.
20. I keep records of what I learned from my English study.
21. I take notes of my feelings while I am studying English.

Psychological Dimension

22. All students ought to set their own goals in learning English.
23. Every student ought to set long-term goals in learning English.
24. All students ought to make long-term plans for studying English.
25. Every student ought to set goals for the day before he/she starts studying English.
26. All students ought to choose the materials suitable for their goals in learning English.
27. Every student ought to make study plans that match his/her goals in learning English.
28. All students ought to make realistic plans for studying English.
29. Every student ought to create the conditions under which he/she can study English best.

30. Every student ought to reflect upon how he/she studied after he/she finishes studying English for the day.
31. All students ought to reflect upon what they learned after they finish studying English for the day.
32. Every student ought to write down how he/she studied English.
33. A good learner of English keeps records of what he/she learned from his/her English study.
34. Every student ought to evaluate the improvement in his/her ability to use English effectively.
35. Every student ought to assess the effectiveness of his/her English study plans.
36. I know what I need to study to improve my English.
37. I know what I am good at in learning English.
38. If I ask my teacher for help in learning English, I know how I want him/her to help me.
39. I know the conditions under which I can study English best.
40. If I don't feel like studying English, I know the reason.
41. If I don't feel like studying English, I know how I can motivate myself.
42. I want to study overseas in the future.
43. I want to work overseas in the future.
44. I want to get a job where I use my English in the future.
45. I like the English language.
46. I like studying English.
47. I give a higher priority to studying English than studying other academic subjects.
48. The reason that I study English is to pass the exams for English classes.
49. The reason why I study English is that it is an obligatory part of the course.

Appendix C
Items on Learning Experiences

Q1. During the three weeks, how often (on average) did you study the expressions?

- Almost every day
- 3 to 4 times a week
- 1 to 2 times a week
- I hardly studied

Q2. Where did you mainly study?

- At home
- At university
- On the train or bus
- Other

Q3. (For the control group)
By using a paper list, did you feel motivated towards learning essay expressions?

- Very motivated
- A little motivated
- Not very motivated
- Not at all motivated

Q4. (For the experimental group)
By using mobile devices, did you feel motivated towards learning essay expressions?

- Very motivated
- A little motivated
- Not very motivated
- Not at all motivated