

Advanced-Level Foreign Language Acquisition in Experimental MALL Studies

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How to cite this paper: Burston, J. (2024). Advanced-Level Foreign Language Acquisition in Experimental MALL Studies. *Open Journal of Modern Linguistics*, 14, 267-289.

<https://doi.org/10.4236/ojml.2024.143015>

Received: March 11, 2024

Accepted: May 26, 2024

Published: May 29, 2024

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Abstract

The focus of this investigation is upon the extent to which experimental Mobile-Assisted Language Learning (MALL) studies have been concerned with advanced-level second/foreign language acquisition (AL2) and in what ways, if any, the exploitation and outcomes of MALL for AL2 differs from its application at non-advanced-levels. Consistent with the marginal status of advanced-level language learning in classroom practice, AL2 has very much been on the fringes of experimental MALL studies. Although MALL has been the subject of more than 5500 studies over the past three decades, little more than a quarter of this massive output describes experimental research, and of this very little has targeted AL2. In fact, of the 1470 experimental MALL studies appearing between 1994-2023 that were consulted for this inquiry, AL2 accounts for only 69, i.e., less than 5% of the total. These experimental AL2 MALL studies are notable for their atheoretical nature, small sample sizes and short treatment durations. Likewise, they are resolutely concentrated on vocabulary acquisition. So, too, tutorial exercises are the most frequent activity type. Not surprisingly, such activities rarely involve collaborative interaction. Moreover, whatever the activity type, individual engagement accounts for the great majority of experimental AL2 MALL. Communicative language learning undertakings are very much the exception. As far as language learning outcomes are concerned, overall, experimental AL2 MALL studies result in substantially fewer unequivocally positive results than do MALL studies that do not specifically target advanced-level learners. Despite their shortcomings, experimental MALL treatments are held in very high regard by participants, AL2 groups no less so than non-advanced-level ones.

Keywords

Mobile-Assisted Language Learning, MALL, Experimental MALL, Advanced-Level Second Language Learning, AL2

1. Introduction

The focus of this investigation is upon the extent to which experimental Mobile-Assisted Language Learning (MALL) studies have been concerned with the advanced-level learning of second/foreign languages, i.e., non-native languages that may or may not be generally spoken in the local community, AL2 for short. Of particular interest in this study are the ways, if any, that the exploitation and outcomes of AL2 MALL differ from its application at non-advanced levels.

AL2 represents the ultimate stage of non-native language acquisition attainment, so whatever contributions MALL can make to this achievement are worthy of attention and evaluation. This is all the more the case given the anywhere/anytime nature of MALL implementations and their ability to sustain independent study. The application of MALL has the potential to overcome the practical constraints of small enrolments that otherwise prevent AL2 courses from being offered. Notwithstanding, to date not a single MALL overview has addressed its application to AL2 learning. This study endeavors to begin the process of filling this gap.

In large part, the lack of interest in accounting for experimental AL2 MALL is a consequence of the marginal status of AL2 teaching itself. Worldwide, the defining characteristic of AL2 instruction is its rarity. The more advanced the level of language learning, the fewer the students there are. The situation in the USA is a good example of this. According to the most recent MLA Report (Lusin, Peterson, Sulewski, & Zafer 2023), only about 13% of college/university students enroll in foreign language classes. Of these, a mere 17% (i.e., 2% of university students) continue on to upper division (i.e., third/fourth-year) courses. Moreover, just how linguistically advanced these courses are is open to question. Judging by the most comprehensive study of results of university graduates seeking language teacher certification based on ACTFL/NCATE Program Standards, only about half (54.8%) meet the minimal certified oral proficiency interview (OPI) standard of Advanced-low in commonly taught languages or Intermediate-high in Arabic, Chinese, Japanese, and Korean (Glisan, Swender, & Surface 2013). Even this may be an overestimate given that Kissau, in his 2014 study (Kissau, 2014), found that only 30% of non-native teacher candidates reached Advanced-low. Neither is there any more recent evidence of any progress in this regard. So, too, the OPI is only the tip of the AL2 iceberg and leaves unassessed many of the features of advanced oral performance and, by design, completely ignores reading and writing competency.

To determine the extent and nature of experimental AL2 MALL research, it is, of course, first necessary to define these terms. Early references to mobile devices included PDAs (Personal Digital Assistants), tablets and mobile phones. In the meantime PDAs have disappeared, their functions having been incorporated into smartphones, which in addition provide Internet connectivity and basic portable computer functionality. While tablets have the advantage of larger screen sizes and full computer functionality, owing to their greater mobility, smart-

phones by far represent the lion's share of modern mobile device usage in MALL. MALL literature also makes reference to Augmented Reality (AR) and Virtual Reality (VR) applications. AR entails the superimposition of images and audio on smartphone and tablet screens and speaker output. Since this involves the use of existing personal mobile devices, AR applications fit neatly into the definition of MALL. VR, on the other hand, necessitates the use of very specialized goggle headsets which are quite distinct from everyday smartphones and tablets which language learners would normally possess. Consequently, VR does not fit the definition of MALL any more than would the use of laptop computers. VR applications were thus not included in the following analysis.

Following [Burston & Giannakou \(2021\)](#), an experimental MALL implementation is one that involves the application of mobile-based or mobile-accessible apps and/or mobile device affordances (e.g., audio/video recording, picture/note-taking) for the teaching and learning of languages in a defined learning environment with specified participants and treatment conditions. This definition explicitly excludes from consideration the many studies having to do with teacher training, institutional infrastructure, instructional technology needs, and general surveys of teacher and student perceptions of MALL unrelated to any specific controlled MALL implementation. AL2 competency is defined by reference to two recognized evaluation metrics, the Common European Framework of Reference (CEFR-B2 or above) and the American Council on the Teaching of Foreign Languages (ACTFL-Advanced-low or above) proficiency levels. Standardized test scores such as the Cambridge, IELTS, TOEIC, and TOEFL, all allow conversion to CEFR/ACTFL ratings.

2. Research Questions

Given the absence of any previous AL2 MALL overviews, there is no lack of research questions that could be asked about experimental AL2 MALL studies. The most obvious though is existential: how many have been published, when and where? Equally important, the theoretical basis of experimental AL2 MALL studies needs to be considered, especially given the profoundly atheoretical nature of experimental MALL studies in general ([Burston & Athanasiou, 2020](#)). Is it more or less influenced by learning theory, and by the same or different theories? So, too, the research design of quantitative experimental AL2 MALL studies, specifically the sample size and treatment duration, definitely needs to be evaluated since this has a determining effect upon the credence that can be accorded to the results reported in such studies ([Burston, 2015](#); [Burston & Athanasiou, 2020](#); [Burston & Giannakou, 2021](#)). Likewise, it is important to know the language learning focus of these studies and the MALL activities implemented to engage participants. Needless to say, when language learning outcomes are the focus, the effectiveness of these MALL implementations needs to be assessed. Lastly, as with most MALL meta-analyses, it is informative to determine how participants regard the MALL treatment.

On the basis of the above considerations, the following research questions are asked:

- 1) How many experimental AL2 MALL studies have been undertaken, what is their general nature, what is their publication source and chronological/geographical distribution?
- 2) To what extent has learning theory guided experimental AL2 MALL studies and which theories?
- 3) What are the sample sizes and treatment durations of quantitative experimental AL2 MALL studies?
- 4) What have been the language learning focus and activity types of quantitative experimental AL2 MALL studies?
- 5) What have been the language learning outcomes of quantitative experimental AL2 MALL studies?
- 6) What have been the student reactions to experimental AL2 MALL treatments?

Answering the above research questions requires a comprehensive analysis of published studies, the accuracy and representativeness of the results being proportional to the comprehensiveness of the underlying research bibliography. The greatest challenge encountered in compiling a comprehensive experimental AL2 MALL research bibliography is not the lack of potentially relevant studies but rather the enormous number and diversity of published sources and the topics treated. Locating relevant AL2 MALL studies is very much akin to looking for needles in a haystack. How this was undertaken is described in the following methodology section.

3. Methodology

The starting point of the reference bibliography underlying this investigation was the General MALL Bibliography 1994-2020 (Burston, 2021). This database was compiled without restriction on the target L2 or language in which studies were written. Likewise, all source types were accepted, i.e., journals, conference proceedings, conference presentations, undergraduate and postgraduate dissertations, blogs, etc. This compilation was then expanded by the present author with the same broad range of sources to include L2 MALL studies through the end of 2023. This bibliography exploited three resources. The first, and most extensive, being the *Scopus* research database. Studies of potential relevance were identified using the following keywords: mobile-assisted language learning, MALL, m-learning, mobile learning, mobile device, mobile phone, iPod, iPad, iPhone, smartphone, tablet, digital pen, clicker, audience response system, student response system. Despite its extensive coverage, however, a sizeable proportion of published MALL studies simply do not appear in *Scopus*, or other similar research databases. This is particularly the case for those written in languages other than English. To overcome this shortcoming, a second bibliographical resource was used, the direct consultation of the Table of Contents for

likely candidates in prominent CALL, MALL and educational technology journals. As expected, looking for the same keywords in these publications turned up dozens of additional MALL studies. It is to be noted that, in both the *Scopus* and direct journal searches, *Google Translate* provided an adequate means of understanding materials written in languages not known by the present author.

The basic premise underlying the above keyword searches is that the titles of MALL publications should give some indication of their relationship to mobile-assisted learning. However, not infrequently such is not the case, as the following two experimental L2 MALL examples attest:

- 1) Autonomy in vocabulary learning of Turkish EFL learners
- 2) Collaborative drama-based EFL learning in familiar contexts

Obviously such publications cannot be found through any constrained keyword search of a research database or journal index. In fact, the only practical way of discovering them is through the third resource used in this MALL compilation, bibliographical mining. This involves manually consulting the References in the MALL studies identified through the *Scopus* and journal searches. By definition, any publications listed there are highly likely to be related to MALL implementations. Even if their titles suggest otherwise, they merit a close inspection. When undertaken exhaustively, i.e., until no additional references are discovered in any newfound publications, bibliographical mining also frequently turns up MALL studies missed in the other two resources. In order to compile the data for this comparative evaluation of AL2 MALL, an Excel database was created to catalog all the essential information, i.e., publication details, mobile devices and applications used, the L1 and L2, educational institution, participant number, treatment conditions and duration, guiding theories, activity type, outcome results.

4. Experimental AL2 MALL Studies

Research Question 1:

How many experimental AL2 MALL studies have been undertaken, what is their general nature, what is their publication source and chronological/geographical distribution?

- 1) Number of Experimental AL2 MALL Studies

The above three-pronged bibliographical compilation process brought to 5530 the total number of MALL studies that appeared between 1994-2023. Since it was possible to consult all but 635 of these (i.e., 86%), the database underlying this investigation may confidently be regarded as highly representative. Of the 4895 MALL studies consulted, 1470 met the conditions for consideration as experimental studies. While time-consuming, facilitated by their Abstracts, the identification of experimental L2 studies among these MALL publications was a relatively straightforward process. In comparison, locating the AL2 studies within this very large database was problematic because experimental L2 MALL studies are frustratingly (and inexcusably) silent and imprecise when reporting

the L2 competence level of participants (Burston & Athanasiou, 2020; Burston & Giannakou, 2021). In nearly half (48%) of these studies, L2 competence level is either completely unspecified, simply equated with years of previous L2 study, identified with enrolment at a particular academic level (e.g., fifth grade, first-year university, third-year French, etc.) or impressionistically described (e.g., weak, struggling, limited, good, average, etc.). So, too, even when L2 competence level is specified with standardized designators (e.g., A2, B2, Beginner-high, Advanced-low, Proficiency, etc.), it is rarely substantiated by reference to standardized test results. Needless to say, this poses a serious problem when attempting to put AL2 MALL implementations into perspective with those of non-advanced learners. How should experimental MALL studies with unspecified or imprecisely identified participant competence levels be counted, if at all? Excluding them from consideration would in effect reduce by half the quantitative database upon which any comparative observations can be made. To address this issue, only those studies in which the proficiency level of participants was exclusively and specifically identified as “advanced-level” were included in the AL2 category. Groups that consisted of mixed levels and those the competence level of which was unspecified or imprecisely identified were assigned to the non-advanced category. So, too, of course, were those explicitly identified as exclusively involving beginner or intermediate level language learners. On this basis, it was determined that experimental MALL studies that specifically and exclusively target AL2 account for only 69 studies (contained in 68 papers), i.e., they represent only 5% of the experimental MALL database. Moreover, it needs to be borne in mind that the AL2 level of participants is only substantiated by reference to recognized, standardized, test results in 20 studies, i.e., less than a third (29%) of the time. These experimental AL2 MALL studies are listed in the **Appendix**.

2) General Nature of Studies

Language learning, needless to say, takes time and so, unsurprisingly, the near totality (90%) of experimental AL2 MALL study participants were late-adolescents or adults. Specifically, 83% were college, university and adult education students. Language centres, which predominantly cater to older learners, accounted for the remaining 7%. High school students constituted another 3% of the AL2 MALL studies. Primary school children surpassed this slightly at 4%. It is to be noted, however, that the claimed “advanced” L2 proficiency level of primary and secondary school students was not substantiated by any formal diagnostic test results and thus needs to be regarded with caution. In three studies, the educational level of participants was unspecified.

As might be expected, given its worldwide lingua franca status, English dominates the linguistic focus of experimental AL2 MALL studies. In fact, only six languages besides English are attested: Chinese, Turkish, French, German, Japanese and Spanish once each. Since the latter four appeared along with English in a single multilingual study (Abdous, Camarena, & Facer, 2009), in reality only

three experimental AL2 MALL implementations have targeted a language other than English. Thus, not only are experimental AL2 MALL studies very rare, they virtually all target English.

Of the total 1470 studies in the experimental MALL database, the near totality (90%) of AL2 study evaluations are focused on quantitative studies, which is the same proportion as in non-advanced level studies. Nearly two-thirds (64%) of quantitative experimental AL2 MALL studies focus on the objective assessment of language learning outcomes. In about half (48%) of these cases, this is accompanied by a quantitative assessment of student perceptions of the MALL treatment. Six experimental AL2 MALL studies report the quantitative results of the subjective assessment of learning results. An additional 14 studies quantitatively evaluate participant perceptions of the MALL treatment without reporting language learning results. Lastly, three studies focus on the quantitative assessment of behavioral outcomes (e.g., motivation, learning strategies, critical thinking) without reporting language learning results.

3) Publication Sources of Studies

In preparing a research database of MALL studies, a very common assumption is that only articles written in English that appear in prominent journals should be taken into consideration. As **Table 1** demonstrates, while journals do constitute by far the largest source of experimental AL2 MALL studies, other sources such as book chapters, conference proceedings, and graduate dissertations combined account for well over a quarter (27%) of all AL2 experimental AL2 MALL studies, far too large a proportion to ignore, all the more so given rarity of AL2 MALL studies. It is to be noted, moreover, that three experimental AL2 MALL journal studies and one MA thesis in the present database are written in a language other than English, i.e., Korean, Spanish and Turkish.

So, too, as can be seen in **Table 2**, over two-thirds of (68%) of experimental AL2 MALL journal articles in fact appear in less prominent publications. Notable also is the absence of any experimental AL2 MALL studies in the *CALICO Journal* and the fact that over half of those published in prominent CALL publications appeared in just one journal, *Computer Assisted Language Learning*.

4) Publication Years of Studies

Given that the first experimental MALL study was published in 1999 (Weschler & Pitts, 1999), it is notable that the first experimental AL2 MALL study did not appear until six years later (Uther et al., 2005). Moreover, prior to 2017, the publication of experimental AL2 MALL studies averaged two per year. Within

Table 1. Experimental AL2 publication sources.

Publication Sources	Studies (N = 69)	Percentage
Journals	50	73%
Books/Chapters	3	4%
Conference Proceedings	13	19%
Graduate Dissertations	3	4%

Table 2. Experimental AL2 MALL prominent journal sources.

Journal	Number of AL2 MALL Studies	Percentage of AL2 MALL Journal Studies (N = 50)
Prominent Journals		
<i>CALICO Journal</i>	0	0%
<i>Computer Assisted Language Learning</i>	9	18%
<i>Language Learning & Technology</i>	3	6%
<i>Multimedia-Assisted Language Learning</i>	2	4%
<i>ReCALL Journal</i>	1	2%
<i>System</i>	1	2%
Total	16	32%
Other Journals		
<i>International Journal of English Language Teaching</i>	2	4%
<i>Lecture Notes in Computer Science</i>	2	4%
Journals with a single experimental AL2 MALL publication	30	60%
Total	34	68%

this time span, only in 2011 did the publication of such studies reach five annually. Between 2017-2023 experimental AL2 MALL studies increased to six per year on average. The interest in MALL at advanced language levels is, thus, very much a recent phenomenon, as may be judged by the fact that 61% of all experimental AL2 MALL studies have appeared in the past seven years.

5) Geographical Location of Studies

The global interest in MALL may be judged by the exceptionally large number of countries in which experimental MALL studies have been undertaken, 88 in all extending literally from A to Z (Algeria-Zambia)¹. In comparison, the worldwide occurrence of experimental AL2 MALL studies is much more restricted. More specifically, all such studies have been undertaken in just 24 countries. Furthermore, nearly a third (30%) of these MALL implementations were undertaken in just three countries (**Figure 1**), Iran, Korea, and the USA. Ten countries each contributed only one AL2 MALL study each.

Research Question 2:

To what extent has learning theory guided experimental AL2 MALL studies and which theories?

Experimental MALL studies are above all characterized by their lack of attention

¹It is to be noted that the total number of countries is greater than the number of experimental MALL studies. The discrepancy is explained by the fact that some studies were undertaken in more than one country. Due to the multivariate nature of experimental AL2 MALL studies, it frequently happens that the numerical base upon which calculations are made is greater than the total number of studies. For example, other studies target more than one language, have multiple linguistic foci or treatment activities, etc.

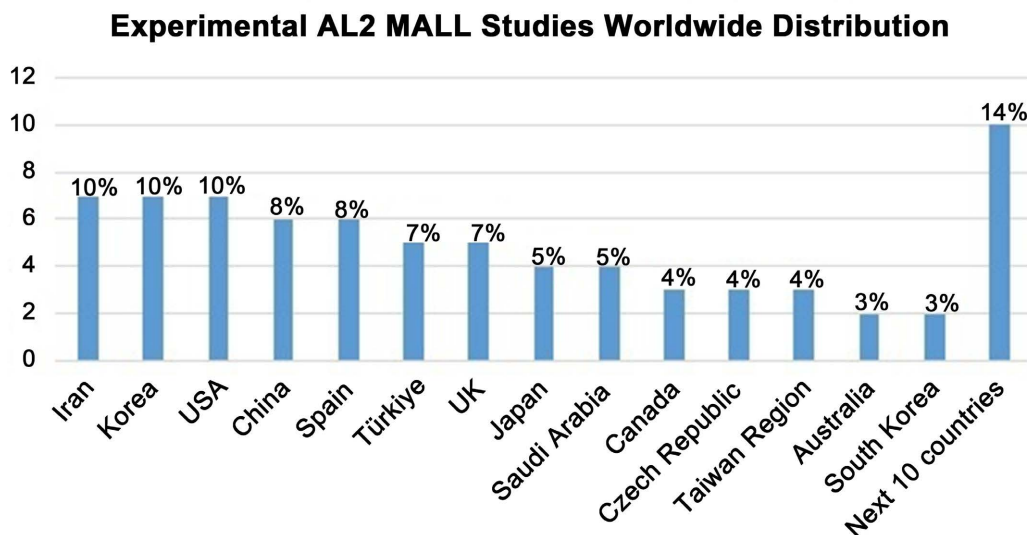


Figure 1. Experimental AL2 MALL studies by countries and regions.

to learning theory. Whatever the L2 proficiency level of students, nearly two-thirds (65%) of all MALL experimental studies make no reference at all to any guiding theory. When theory is mentioned, Social Constructivism is by far the most frequently referenced. With AL2 learners, it accounts for well over a third (38%) of the references, much more than the 21% observed with non-advanced-level students. Also remarkable with regard to learning theories is the extremely large number that are cited, over several dozen in all! In experimental MALL studies targeting non-advanced L2 learners, the second most cited theory is Situated Learning, but at 8% in a very distant second place. Sociocultural learning theory occupies the second position in experimental AL2 MALL studies, at a more robust 12%. Interestingly, at 8% Behaviorism is referenced twice as frequently relative to advanced-level learning than non-advanced (4%). On the other hand, at 4% reference to Situated Learning is only half that observed with non-advanced language learners. Task-based learning, which is referenced 4% of the time in non-advanced language studies is not mentioned at all in AL2 studies. This lack of theoretical guidance with regard to situated task-based learning is all the more surprising (and disappointing) for AL2 studies, given the oft touted anywhere/anytime learning potential of MALL.

Research Question 3:

What are the sample sizes and treatment durations of quantitative experimental AL2 MALL studies?

As has been noted in a number of MALL meta-analyses (Burston & Athanissou, 2020; Burston & Giannakou, 2021; Chwo, Marek, & Wu, 2018; Elgort, 2018; Lee, 2022; Shadiev, Liu, & Hwang, 2020; Viberg & Grönlund, 2012), owing to their extensive reliance upon existing class organization, the research design of experimental MALL studies in general is characterized by small sample sizes and short treatment durations. This is of particular concern to experimental MALL studies that report quantitative outcomes because small sample sizes can affect

statistical validity and short treatment durations can exaggerate positive outcomes owing to the novelty effect. Since 90% of all experimental MALL studies involve the quantitative analysis of outcome results, their sample sizes and treatment durations are of critical importance.

1) Sample Size

Although it is a widely accepted tenant of quantitative research design (Creswell, 2014) that a minimal sample size of 15 per treatment group (i.e., 30 with an experimental and control group) should be maintained, over a quarter (26%) of quantitative experimental AL2 MALL studies fail to meet this requirement. A dozen (1%) experimental MALL studies with non-advanced level L2 learners don't even specify their sample size. Among those that do, nearly half as many (14%) as with AL2 studies are below the recommended minimum. Given the reliance of experimental MALL studies upon convenience sampling based on existing classes, smaller class sizes at advanced levels undoubtedly are a major contributing factor to this result.

Sample sizes often vary when there are multiple experimental groups or separate experimental and control groups in a study. For calculation purposes, in these cases, the smallest number is used to determine the sample size. Whatever the learner L2 proficiency level, the most frequent specified sample size in experimental MALL studies is 20 - 29. In AL2 implementations, this amounts to 31% compared to 24% with non-advanced level language learners. This difference between the advanced versus non-advanced language learner sample sizes evens out when sizes between 15-19 are added to the calculation, i.e. 34% (21/62) for AL2 compared to 35% (438/1254) with non-advanced L2 learners. Consequently, sample sizes below 30 account for nearly half (46%) of the quantitative experimental AL2 MALL studies that meet or exceed the minimum 15-subject requirement. In MALL studies targeting non-advanced level L2 learners, sample sizes between 15 - 29 only account for 41% of those meeting the minimal requirement. Thus, not only do quantitative experimental AL2 MALL studies more frequently fail to meet the minimum 15-subject requirement, when they do so a greater proportion of sample sizes fall between 15 - 29. This trend continues for sample sizes from 15 - 49, which account for 83% of quantitative experimental AL2 MALL studies meeting the minimal requirement. In comparison, the corresponding 15 - 49 proportion is only 75% for experimental MALL studies targeting non-advanced L2 learners. Lastly, at 17% AL2 MALL studies operating with a sample size of at least 50 occur considerably less frequently than the 26% encountered with non-advanced level language learners.

2) Treatment Duration

In order to offset the novelty effects of technology usage, to which experimental MALL studies are intrinsically susceptible, it is recommended that treatment duration last at least eight weeks (Burston & Athanisou, 2020; Burston & Giannakou, 2021; Chwo, Marek, & Wu, 2018; Clark & Sugrue, 1991). Unfortunately, however, there is no standard measurement unit for intervention dura-

tion in MALL studies. This can be indicated in sessions, classes, days, weeks and months as well as academic terms, semesters and years. For purposes of calculating intervention duration, where given in sessions or days (unless otherwise indicated), it is assumed that classes would normally meet 3 times a week, with twenty-four sessions/days thus equating to eight weeks. So, too, two months is taken to equal eight weeks and academic terms, semesters, and years all in excess of eight weeks.

Even more so than with regard to sample size, treatment duration in quantitative experimental MALL studies leaves much to be desired, though slightly less so for AL2 than for studies targeting non-advanced L2 learners. Firstly, it is to be noted that 2% of the time AL2 studies didn't even specify the treatment duration. With non-advanced students this omission amounted to 5%. Among the quantitative experimental AL2 MALL studies with a specified duration, only 52% met the eight-week requirement. In studies with non-advanced language learners the compliance rate was even lower at 44%. Whatever the L2 proficiency level of students, the most striking aspect of treatments in quantitative experimental MALL studies is the extreme brevity of their duration. With non-advanced students, 45% of the MALL implementations lasted less than six weeks. So did 40% of their AL2 counterparts. Among these studies, 14% involved only a single session with non-advanced learners and 8% with AL2 students. Moreover, a number of these sessions lasted a mere ten minutes. On the other hand, among the experimental MALL studies that met the treatment duration requirement, it is noteworthy that a fifth lasted a whole term/semester or more. In sum, treatment duration in experimental quantitative MALL studies only met the minimal eight-week requirement about half the time and often involved only a single session, but it is also characterized by a substantial number of treatments extending over a semester or more.

Research Question 4:

What have been the language learning focus and activity types of quantitative experimental AL2 MALL studies?

In order to fully understand the language learning focus and treatment activities of quantitative experimental AL2 MALL studies, it is necessary to compare them closely with those of non-advanced level studies. However, advanced and non-advanced level studies alike sometimes fail to specify the linguistic focus and learning activities of their interventions. In non-advanced language level studies the omission rate for the specification of linguistic focus was 7% and for AL2 it was 4% (**Figure 2**). The specification of activity was missing in 4% of the studies with non-advanced students and 3% with AL2 language learners (**Figure 3**). Typically, these omissions were the result of simply identifying the MALL app (e.g., *DuoLingo*, *Hello English*, etc.) that was used without describing its contents or what learners did with it. In most cases, these apps were tutorial in nature and targeted vocabulary and grammar. However, since these details were not made explicit in the published research, they were not included in the following calculations.

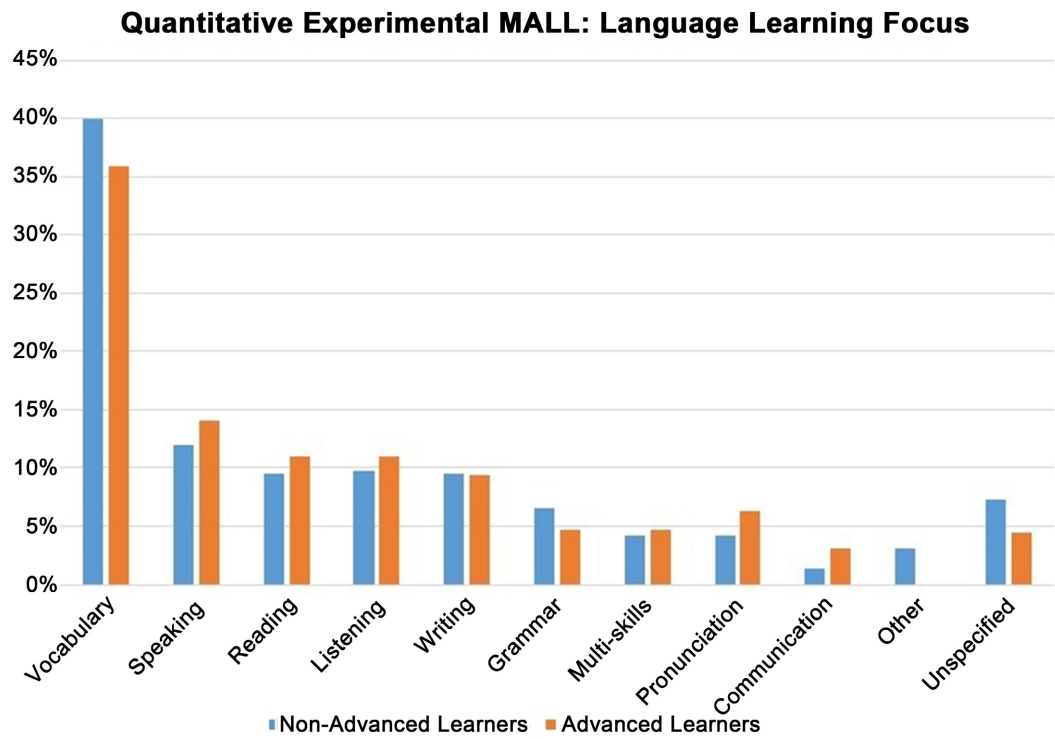


Figure 2. Quantitative experimental MALL study language focus.

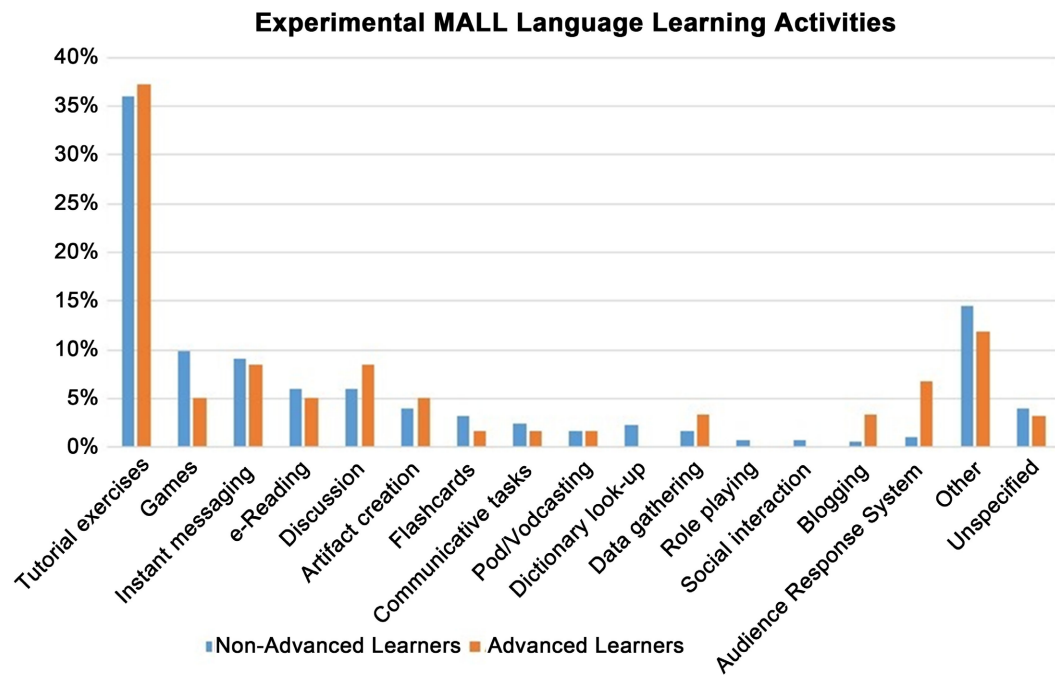


Figure 3. Experimental MALL study learning activity types.

1) Language Learning Focus

Whatever the proficiency level of the learner group, vocabulary acquisition is by far the most frequently targeted linguistic focus. Vocabulary-based studies occurred about three times more often than those with the second most frequent

linguistic focus, speaking (**Figure 2**). AL2 studies devoted more attention to speaking, reading and listening skill development than did experimental MALL studies with non-advanced level learners, but only slightly more so. The greatest difference in this regard is to be observed with speaking, in particular pronunciation. On the other hand, the learning of grammar is noticeably less frequent in AL2 MALL studies, presumably because the basics are assumed to be already mastered. The attention of non-advanced level students is drawn to a number of other language learning goals which include spelling, character writing, translation and preparation for external exams (e.g., TOEIC, CASEC). However, as a proportion of all quantitative experimental MALL studies, combined such learning goals are quite rare (3%). Even more remarkable than the high focus on vocabulary acquisition, is the lack of attention paid at all language competence levels to developing interpersonal communicative language skills. Such a linguistic focus is virtually non-existent with students below the advanced level (1%) and even in AL2 studies accounts for only 3% of the quantitative experimental MALL studies. Such an absence of interest in fostering interpersonal communication is all the more regrettable given that student-owned smartphones have been the default mobile device in MALL studies for the past decade.

2) Language Learning Activity Types

Despite the widespread, virtually universal, use of mobile phones in MALL studies since the very beginning, communication-based implementations (i.e., instant messaging) accounted for less than 10% of specified quantitative experimental MALL activities whatever the L2 proficiency level of students. More specifically, it amounted to only 8% with AL2 students and 9% with non-advanced level learners (**Figure 3**).

Tutorial exercises, the most frequently occurring MALL activity, were over four times more frequent than those involving the exchange of e-messages, 36% in the case of studies targeting non-advanced level students and 37% with AL2 learners. This is consistent with the previously noted lack of focus on developing interpersonal communicative language skills in experimental MALL studies. With non-advanced learners, e-messaging came in third place after the use of games (10%). Game playing was only half as frequent (5%) with AL2 students. Discussions and structured communicative tasks, plus role playing and guided social interaction with non-advanced level students, added another 10% of communicative AL2 MALL activities. So, too, with AL2 students, audience response systems were used 7% of the time, compared to only 1% for non-advanced learners, to promote in-class student interaction. Rote learning was supported by the use of flashcards 3% of the time with non-advanced learners, slightly more often than the 2% encountered with AL2 students. A dozen other activities (e.g., TV watching, oral presentations, written compositions, quizzes, etc.), too infrequent to list separately, accounted for the remaining 12% of AL2 activities and 15% for non-advanced level learners.

In sum, quantitative experimental MALL studies are resolutely concentrated

on tutorial-based exercises and vocabulary acquisition, for AL2 learners no less than non-advanced level students. While communication is supported by activities like discussions, role playing and oral presentations, these are quite different from the kind of interpersonal task-based exchanges that can be mediated via mobile-based messaging. The paucity of such activities is all the more concerning given the critical role that interpersonal task-based learning can play in L2 acquisition.

Research Question 5:

What have been the language learning outcomes of quantitative experimental AL2 MALL studies?

In quantitative MALL studies that focus on language learning outcomes, the ultimate question, of course, is how effective the experimental interventions proved to be. It is noteworthy that every meta-analysis of MALL studies that has addressed this issue has reported very strong positive results. [Burston & Giannakou \(2021\)](#), the most recent and comprehensive analysis of MALL language learning outcomes, calculate a large positive Effect Size of 0.72 for between-group studies (i.e., those with both an experimental and control group). This is the measure of the relative magnitude of observed pre-/post-treatment differences. Studies without control groups manifested an even higher Effect Size of 1.16. As comprehensive as this meta-analysis is, it does not, however, distinguish between learning outcomes based on the language competence level of participants. When this is done, a very different picture of learning outcomes emerges ([Figure 4](#)).

The language learning outcome of quantitative experimental MALL studies can be classified into five categories. In the first, lack of essential data prevents any claimed results to be taken at face value. This happens, for example, in the absence of a pre-test to establish a pre-treatment baseline or when the baseline is simply determined by previous course results. Other times, the statistical analysis of results is defective or missing entirely. In the MALL studies examined here, ten implementations targeting non-advanced level students were excluded from consideration for want of acceptable supporting data. Studies retained for analysis report one of four results: Positive, Mixed, Same, Negative. Positive results

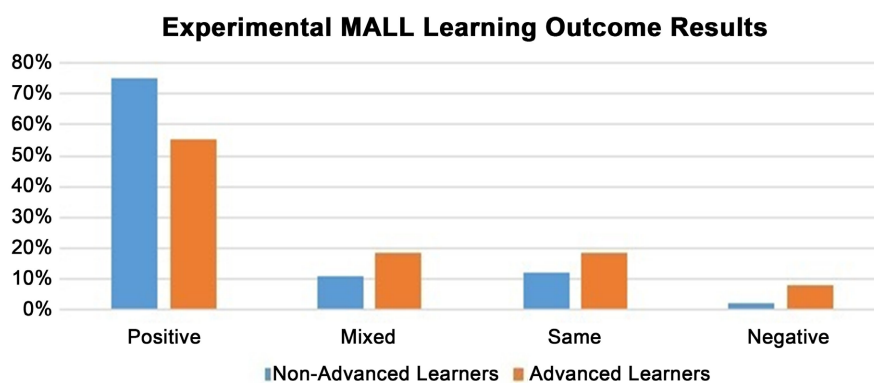


Figure 4. Experimental MALL study learning outcome results.

are those where post-treatment outcomes are superior to the pre-treatment baseline. Mixed outcomes relate to subcategories of outcomes (e.g., word recognition vs word recall, reading speed vs comprehension, etc.), which may be positive for some but equivalent or negative for others. Results identified as the same are those where no significant difference is observed between pre-/post-treatment outcomes. Lastly, Negative results refer to post-treatment outcomes that are below the pre-treatment baseline.

As can be seen in **Figure 4**, AL2 learning outcomes are inferior to those of non-advanced-level studies across the board. While results are still positive in the majority of studies (55%), AL2 MALL is much less effective than what is observed with non-advanced learner groups (75%). Likewise, mixed results are substantially more frequent (18%) in AL2 MALL than in the outcomes of non-advanced groups (11%). So, too, interventions resulting in no significant pre-/post-treatment difference are much more frequent in AL2 MALL (18%) than with other learners (12%). Likewise the proportion of negative outcomes is four times greater in AL2 MALL studies (8%) than in those with non-advanced level learners (2%).

Research Question 6:

What have been the student reactions to experimental AL2 MALL studies?

As previously indicated, experimental AL2 MALL studies assess student reactions to treatments within two parameters, attitudinal and behavioral. All but three (93%) fall into the first category, which evaluates participant perceptions of aspects of the MALL implementation. The three behavioral assessments targeted motivation, learning strategies and critical thinking. The proportion of attitudinal treatment assessments is about the same as in experimental MALL studies that target non-advanced learners (95%), learning motivation was the most frequently assessed behavioral outcome.

Whatever the competence level of participants, satisfaction with L2 MALL language learning interventions is overwhelmingly high, with an 88% positive response rate for AL2 groups, higher even than the 86% for non-advanced ones. Mixed (some positive, some not) or neutral responses make up the remainder (12%) of AL2 MALL reactions to MALL treatments, with virtually the same result in non-advanced-level groups (11%). Purely negative evaluations of MALL implementations are non-existent in experimental AL2 MALL studies compared to 3% of student reactions in non-advanced groups.

5. Summary

Consistent with the marginal status of advanced-level language learning in classroom practice, AL2 has very much been on the fringes of experimental MALL studies, only appearing for the first time several years after publications began in this domain. Moreover, it is also a very recent phenomenon, with the majority of such MALL studies published in the past seven years. While experimental MALL studies have been undertaken worldwide, AL2 MALL implemen-

tations are only attested in little over a quarter of the countries that have authored experimental MALL studies, primarily in Gulf states, Asia and the USA. Moreover, the scope of experimental AL2 MALL has been severely restricted, with English being virtually the only language targeted and the near totality of learners being late adolescent/adult university/college or language institute students. So, too, aside from a limited interest in social constructivism, experimental AL2 MALL studies are very little concerned with learning theory.

As with experimental MALL studies in general, quantitative experimental AL2 MALL studies are characterized by their small sample sizes and short treatment durations. More than a quarter of AL2 MALL studies fail to meet a minimum requirement of 15 participants per treatment group. This is nearly double the non-compliance rate of MALL studies targeting non-advanced level learners. Nearly half of the AL2 MALL studies that meet the minimal sample size requirement involve less than 30 participants. Again, this is greater than the corresponding proportion of non-advanced groups with less than 30 students. Experimental AL2 MALL studies fare even less well with regard to treatment durations, with only slightly more than half meeting the recommended eight-week minimum. To their credit though, among those that do, a substantial proportion last at least a semester.

Regarding language learning focus and treatment activities, quantitative experimental AL2 MALL studies are noteworthy for their concentration on tutorial exercises and vocabulary acquisition. As far as language learning outcomes are concerned, overall, experimental AL2 MALL studies result in fewer unequivocally positive results than do MALL studies that do not target advanced-level learners. Whatever the shortcomings of experimental MALL treatments, student attitudes towards them are exceptionally positive, for AL2 groups no less so than non-advanced-level ones. Totally negative perceptions of experimental MALL implementations are non-existent with AL2 students and very rare with non-advanced level learners. Rare, too, are assessments of behavioral changes resulting from experimental MALL implementations at any L2 competence level.

6. Discussion

Overall, the foregoing meta-analysis does not paint a very inspiring picture of experimental AL2 MALL. Of particular concern is the extent to which experimental AL2 MALL studies are even more afflicted than non-advanced language level studies by the same research design shortcomings of small sample sizes and short treatment durations. So, too, despite the very positive perceptions of students, experimental AL2 MALL implementations fail to exploit mobile technologies much beyond tutorial exercises and vocabulary acquisition. Advanced-level learners have had many opportunities to practice discrete linguistic skill-based learning and, in accordance with both ACTFL and CEFR proficiency descriptors, need to work on discourse-pragmatic competence and actively enhance their intercultural/sociolinguistic awareness.

Likewise, while vocabulary acquisition is unquestionably important, this cannot simply be a matter of increasing students' lexical inventory. Rich, complex, semantic networks must also be developed that take into account connotations, register, and other socio-cultural factors. This is not to say that AL2 learners do not benefit from tutorial exercises or explicit vocabulary learning. Rather, the high proportion of tutorial AL2 MALL compared to more communicative and performance-based activities is a cause for concern and reflects the lost learning opportunities represented by the low frequency of such activities. Obviously, given the well-established effectiveness of interactive communicative task-based learning, advanced-level learners could have profited as much, if not more so than non-advanced learners, from engaging in such activities. AL2 MALL is much the poorer for their absence.

Lastly, on a more positive note, the demonstrated shortcomings of experimental AL2 MALL studies in fact provide a useful roadmap of the directions in which future research needs to head. Colleagues interested in taking up this challenge also now have in the attached Appendix a comprehensive AL2 MALL reference bibliography to guide them. Going forward, it is to be hoped that the numerous anywhere/anytime communicative affordances of modern mobile devices, most especially smartphones, will realize their potential to support the kinds of interactive task-based, problem solving, activities that are so critical to advanced-level language learning. Needless to say, these kinds of activities can be equally instrumental in getting lower-level language learners on the path to AL2.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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