

A Comparative Study of Computer-Assisted Vocabulary Acquisition Versus Traditional Methods

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Leveraging technology in the classroom for Second Language Acquisition (SLA) has long been heralded as a powerful addition to the arsenal of effective pedagogical methods (refer to Levy and Hubbard, 2016; Leakey, 2011; Chun, 2016; Stockwell, 2007; Gromik, 2011). This is supported by a wide range of studies that have investigated the effectiveness of Computer-Assisted Language Learning (otherwise known as CALL). It would certainly be an understatement to merely state that research in the field of CALL has a high potential of categorically improving the quality of education received in the SLA classroom. It would, indeed, be far more accurate to describe the pedagogical potential of CALL research as wholly transformative, as the gradual implementation of technology into the curricula of SLA classrooms will fundamentally reshape not only the learning processes but also the hierarchy of interactions between student, teacher, and learning materials (Chun, 2016). In fact, integrating technology into the classroom provides the student with far more agency than ever before, as students are far better able to shape the direction of their learning processes with powerful, computer based learning tools including, but certainly not limited to, electronic dictionaries, automated computer translation, chatbots, social networking services, and smartphone based educational applications. Despite the high level of agency that technology can offer students studying SLA, the mere presence of these powerful educational tools neither ensures success on standardized testing nor guarantees quantitative progress in the target language itself. Indeed, it is now more crucial than ever that SLA instructors effectively design their curricula to not simply accommodate but rather integrate CALL technologies into the learning process.

Computer-assisted Vocabulary Acquisition Technology Employed

The computer-assisted vocabulary acquisition portion of this study will focus

on the independent website and smartphone/tablet application based software known as Quizlet. The software suite Quizlet is an educational platform for students to both passively review material uploaded by teachers through the utilization of electronic flashcard style study and actively interact with said instructional material through a host of educational modalities including recall games, time challenge matching games, input recall mode, audio recall mode, mock test mode, and a social interaction platform by which students can compete with each other in a competition style flashcard review game.

Non-technological Vocabulary Acquisition Method Employed

The "traditional" component of this study refers to a method of vocabulary acquisition that does not employ the required use of technology in the classroom. In particular, the traditional method of vocabulary acquisition used in this study involved simple printouts of target vocabulary, Japanese definitions, English definitions, and example sentences in which the target vocabulary was inserted. No further instructions were given to the students who received the vocabulary printouts described above other than that they were required to memorize the vocabulary for a test one to two weeks after the issuing of the vocabulary printouts. Although no technology was employed to aid in the acquisition of vocabulary, no explicit instruction was given not to use any technological (e.g. electronic dictionaries, internet searches, or additional educational software designed to aid in reviewing academic materials), so this study cannot preclude the use of technological aids used by students who participated in the traditional method study group.

Study Goals

The aim of this study is to examine the importance of the integration (e.g. through lecture review, textbook activities, and/or homework assignments) of vocabulary utilized for standardized comprehension testing into the curricula of SLA classrooms regardless of the pedagogical method used for vocabulary acquisition. With the rise of technology driven study environments, the potential for educational software to positively impact the acquisition rate of second language vocabulary cannot be understated. The plethora of research on CALL integrated into SLA theories such as those identified by Levy and Hubbard point very clearly to the fact that technology will continue to augment and shape the future of SLA research (2016). However, if the educational process of SLA is left

entirely to the interactions between student and software without reinforcing what is being learned with these educational devices in the actual classroom, it is no different than pure self-study and is less effective than study in the classroom environment. Indeed, how well technology is integrated into the curriculum of the SLA classroom is perhaps the better indicator of acquisition rates of second language vocabulary than the simple use of the technology itself. It is the position of this article that despite the high potentiality of computer-assisted language learning to positively affect vocabulary acquisition processes in second language curricula, the learning processes pertaining to vocabulary acquisition are far more effective if integrated into the classroom curriculum and not simply delegated to the interactions between student and technology. The following sections will describe the methods, results, and discuss the implications of the data collected throughout this study.

Methods

The entirety of this study was carried out over the 2018 spring semester in two English as a Foreign Language (EFL) courses at a Japanese university. Each of these courses have the acquisition of English vocabulary as a component of their curricula, and both courses are tested on their respective vocabulary sets at roughly equal intervals (weekly vs. biweekly) throughout the course of the semester. Furthermore, the format of the vocabulary tests administered to both courses are identical in format, each testing a random sampling of 20 words from their respective vocabulary lists. The vocabulary that each course is tested on is fully integrated into other components of their respective curricula and is regularly reviewed in course lectures or otherwise reinforced through homework assignments and textbook exercises. One of the participant courses utilizes the educational software Quizlet for vocabulary acquisition, the other participant course does not. In order to test the assumption of this research that curriculum integration (e.g. textbook/lecture reinforcement) of vocabulary is the better indicator of vocabulary acquisition rates than the method employed to train said vocabulary (e.g. educational software/printouts), each course received additional vocabulary lists in their respective vocabulary training methods (Quizlet or printouts) from the curriculum of the opposite participant course reviewed in this study but received no additional reinforcement through lecture content, homework

assignments, or textbook exercises. The assumption is that the vocabulary test scores will drop when introduced to the vocabulary set not integrated into each course's respective curriculum regardless of the study method employed.

Course Employing the Quizlet Method

The course utilizing the educational software Quizlet is a first year communicative English course. This communicative English course is tested weekly on sets of fifty words taken from the New General Service List (NGSL), a list of the "most important words for second language learners of English" compiled by Michael West (Browne et al, 2013). This study compiles the test scores of a class size of eight students from a sample of 350 words from the NGSL throughout a series of seven tests. In addition to utilizing Quizlet as a study tool, the students in Communicative English receive in class instruction, review, and integration of the NGSL vocabulary into homework assignments. However, the NGSL vocabulary is not specifically reinforced through the textbook utilized in Communicative English. Although registering for the Quizlet application on the students' individual smartphones/tablets is required in the course, the amount of time students choose to utilize Quizlet as a study resource is not stipulated in the course syllabus. The Quizlet software does however allow the instructor to track students' usage of the application, the qualitative results of which will be discussed in the results section.

Course Employing Traditional Methods

The course not utilizing the educational software Quizlet is a first year English reading and writing class. This English reading and writing course is tested biweekly on sets of 80 selected vocabulary from English language articles featured in the course textbook *Reading Explorer 1* from Cengage Learning and National Geographic Learning (Douglas et al, 2009). This study compiles the test scores of an analogous sample size of eight students from a sample of 240 words from *Reading Explorer 1* throughout a series of three tests. Instead of utilizing Quizlet as a vocabulary acquisition method, all students in English Reading and Writing receive vocabulary printouts two weeks prior to testing of a list of 80 vocabulary words, Japanese definitions, and example English sentences in which the target vocabulary is used. In addition to these printouts, the students in English Reading and Writing receive in-class instruction, review, and integration of the vocabulary from the course textbook *Reading Explorer 1* into homework

assignments. Since the students in English Reading and Writing did not use software which has the ability to track qualitative data on study habits, no data will be presented in the results section regarding how much time students put into studying and what study methods were employed.

Cross Testing

In addition to the vocabulary test data from the two courses described in the previous sections, each course received each other's vocabulary tests in the vocabulary acquisition method originating in their respective curricula. In addition to the seven weekly tests from a list of 350 NGSL vocabulary studied on the educational software Quizlet, the eight students in Communicative English were administered three biweekly tests from a list of 240 selected vocabulary from *Reading Explorer 1* on Quizlet. Likewise, the sample of eight students from English Reading and Writing received their three biweekly tests from the same vocabulary list from *Reading Explorer 1* studied with vocabulary printouts and were additionally administered the seven weekly tests from the 350 word NGSL vocabulary list likewise studied with the same style of vocabulary printouts. Although additional instruction, both in class and out of class, was given on the vocabulary sets originating in each curriculum (local vocabulary sets: Communicative English = NGSL; English Reading and Writing = *Reading Explorer 1*), no additional instruction was given on the cross testing vocabulary sets (cross testing vocabulary sets: Communicative English = *Reading Explorer 1* ; English Reading and Writing = NGSL). Furthermore, the local vocabulary sets for each course were figured into the students' final grades, whereas the cross testing vocabulary sets were not, and the students were informed of these grading procedures before the tests from each vocabulary set were administered. The results from the four vocabulary sets (two local vocabulary sets and two cross testing vocabulary sets) are detailed in the following section.

Results

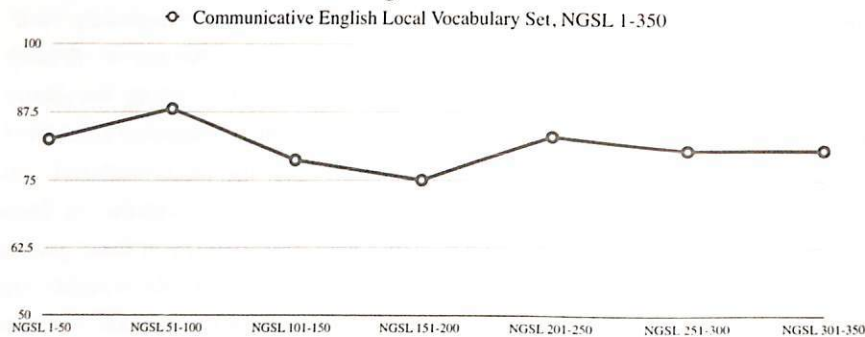
Local Vocabulary Sets

The following sections will delineate the results from the local vocabulary sets in both the communicative English course and in the English reading and writing course. The local vocabulary set for Communicative English shows data collected from a series of seven weekly vocabulary tests of 50 words each from

the NGSL vocabulary list using Quizlet as a study medium. The local vocabulary set for English Reading and Writing shows data collected from a series of three biweekly vocabulary tests of 80 words each from the course textbook *Reading Explorer 1* using vocabulary printouts as a study medium. Each local vocabulary set is fully integrated into the course's respective curriculum and pedagogically reinforced through lecture content and homework assignments.

Communicative English (Local). The test results from the NGSL 1-350 local vocabulary set are shown in Figure 1. The eight students in the course averaged a score of 81.25% throughout a series of seven weekly tests. Although the students in Communicative English showed no quantitative improvement on whole throughout the semester in their overall test scores, the increasing difficulty of the NGSL vocabulary lists could be partially responsible for the decline in overall performance midway through the semester, the highest average score being on the second test, NGSL 51-100. The qualitative data provided by the Quizlet software, however, can provide further insight into the lack of average test score improvement throughout the semester.

Figure 1

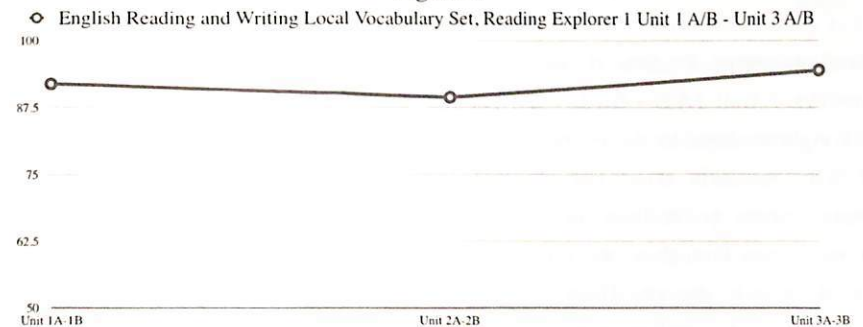


The qualitative data illustrating student study habits provided by the Quizlet software mirror the test results shown in Figure 1 nicely. The students in Communicative English averaged 27.3 minutes of study time per session with no statistically significant changes to this time throughout the semester. Furthermore, the students' preferred study mode, the simple flashcard interface, remained constant throughout the semester with the rest of the suite of study interfaces (e.g. games, pronunciation, social competitions) remaining, more or less, untested. The

qualitative data collected by the Quizlet software supports the test results by reflecting no major changes in the students' study habits, thus eliciting no major improvements in test scores in the local NGSL vocabulary set.

English Reading and Writing (Local). The test results from the 240 selected vocabulary from Units 1A/B - 3A/B in *Reading Explorer 1* comprising the local vocabulary set for English Reading and Writing are shown in Figure 2. The sample of eight students in the course averaged a score of 91.87 throughout a series of three biweekly tests. The student sample from English Reading and Writing did show a slight quantitative improvement on whole throughout the semester in their overall test scores with a 2.5% increase from the first test to the last test. However, the data set of only three biweekly tests does not indicate as clear a trend as the local vocabulary data set from the seven weekly tests in Communicative English does, so a certain degree of sobriety is needed in generalizing how much the students managed to improve in their vocabulary study habits. Furthermore, the vocabulary from *Reading Explorer 1* is not only reinforced directly by textbook activities (in contrast to Communicative English whose local vocabulary set is not reinforced by direct references in the textbook employed), but the selected vocabulary from *Reading Explorer 1* does not increase in difficulty (in contrast to the NGSL vocabulary). Furthermore, the slight drop in test scores in the Unit 2A-2B test does little to provide convincing evidence that the students are showing increasing improvement in vocabulary acquisition. Finally, due to the fact that the students were given vocabulary printouts as study guides for each test, there is no qualitative data to support a line of evidence suggesting that students' study habits evolved throughout the semester.

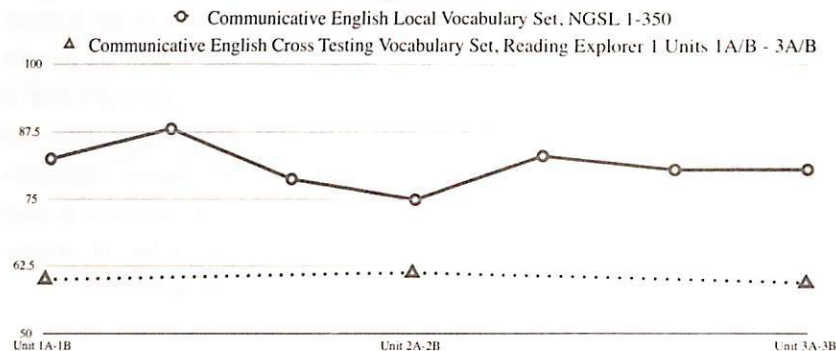
Figure 2



Cross Testing Vocabulary Sets

The following sections will delineate the results from the cross testing vocabulary sets overlaid on the data presented in the local vocabulary sets in both the communicative English course and in the English reading and writing course. The cross testing vocabulary set for Communicative English shows data collected from the same series of three biweekly tests from the local vocabulary set administered to English Reading and Writing (*Reading Explorer 1* Unit 1A/B - 3A/B). The cross testing vocabulary set for English Reading and Writing shows data collected from the same series of seven weekly tests from the local vocabulary set administered to Communicative English (NGSL 1-350). Each cross testing vocabulary set is unintegrated into each course's respective curriculum, and the students were given the cross testing vocabulary set to study with the vocabulary acquisition method respective to each course's curriculum (Communicative English = Quizlet; English Reading and Writing = vocabulary printouts).

Figure 3



Communicative English (Cross Testing). The test results from the *Reading Explorer 1* Unit 1A/B - 3A/B cross testing vocabulary set are shown in Figure 3. The eight students in the course averaged a score of 60.21% throughout a series of three biweekly tests. The students again showed no statistically significant improvements or declines in performance throughout the semester, with the average score throughout the series of three tests remaining within two percentage points of one another. There is, however, a significant drop in cross testing vocabulary set performance when compared to the local vocabulary set

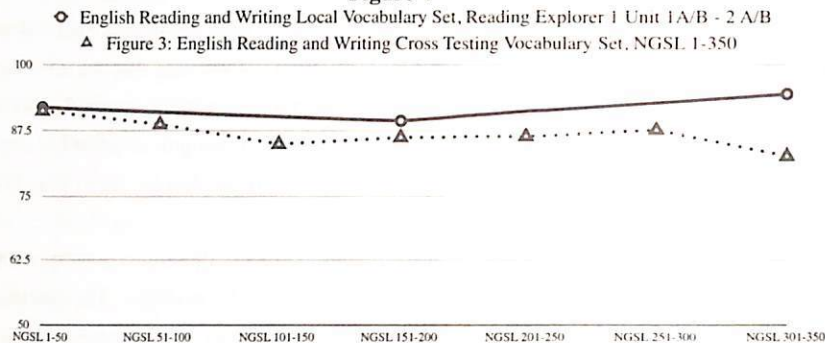
performance with a 21.04% difference in average test scores between both vocabulary sets. This decline in average test scores is seen despite students using the same vocabulary acquisition method (Quizlet). These results would seem to point to the integration of the local vocabulary set into the Communicative English curriculum as the reason for the higher test scores, whereby the vocabulary acquisition method is secondary, if not independent, of the method of vocabulary instruction both in class and out of class. However, due to the fact that the students in Communicative English used Quizlet as their method of vocabulary acquisition, qualitative data may provide further insight as to why their scores in the cross testing vocabulary set are so much lower than the test averages from the local vocabulary set.

The qualitative data provided by the Quizlet software illustrates a very clear reason for the drop in test scores: average length of study sessions. The average length for each study session for the cross testing vocabulary set was 8.9 minutes, a difference of 18.4 minutes from the local vocabulary set (=27.3 minutes). Furthermore, the students in Communicative English showed the same tendencies to utilize the same study mode on Quizlet throughout the semester (simple flashcard interface). One potential reason for the drop in study time that is reflected in the qualitative data provided by Quizlet of student study habits could lie in the fact that the cross testing vocabulary sets did not figure into the students' final grades, thus eliminating the threat of a low test score pulling their overall course grade down.

English Reading and Writing (Cross Testing). The test results from the NGSL 1-350 cross testing vocabulary set are shown in Figure 4. The sample of eight students from English Reading and Writing averaged a score of 86.79% throughout the series of seven tests. Just as the results from the NGSL local vocabulary set in Communicative English demonstrate, there is a slight declining trend from the first test to the last throughout the semester. This downward trend could be the result of the increasing difficulty level built into the NGSL vocabulary set. The difference in the average test scores, a meager 5.09%, between the local vocabulary set and the cross testing vocabulary set in English Reading and Writing is significantly smaller than that seen in Communicative English, although the average score from the local vocabulary set remained higher suggesting still that integration of tested vocabulary into the curriculum is still the

better indicator of vocabulary acquisition as can be quantitatively demonstrated via vocabulary testing. Due to the fact that the vocabulary acquisition method used in English Reading and Writing utilizes vocabulary printouts instead of the Quizlet software, no qualitative data were collected on the students' study habits.

Figure 4



Discussion

The assumption made at the onset of this study, namely that integration through lecture content, textbook exercises, and homework assignments of tested vocabulary in the SLA classroom is more effective at producing quantitatively higher test scores independent of the method used for vocabulary acquisition, is positively correlated in the data collected in both participant courses through the spring semester of 2018. Indeed, should computer-assisted vocabulary acquisition software such as Quizlet be fundamentally more effective than traditional methods in vocabulary acquisition processes, then one would expect to observe scores that outperform traditional acquisition methods, such as printouts, and that are independent of in-class instruction. In this particular study however, the opposite was seen; the cross testing vocabulary set in the vocabulary printout group outperformed the cross testing vocabulary set in the Quizlet group. These results are in no way a call to eliminate technology from the SLA classroom. These results are much more a reminder to SLA instructors that it is not the pedagogical method used that drives favorable results, but rather how the method is integrated into curricula. The following sections will discuss some of the observed advantages and disadvantages to each method of vocabulary acquisition used in this study.

Advantages

Computer-assisted Vocabulary Acquisition Method (Quizlet). The specific advantages of the Quizlet software utilized by Communicative English in this study primarily involve the technological tools afforded to both students and instructors alike. For students, the Quizlet software not only offers a multitude of options of studying modalities (as discussed in previous sections), but it also provides students with the opportunity to study anywhere they are (assuming that students have their smartphones with them). For instructors, Quizlet not only offers the ability to automatically collect valuable qualitative data on students' usage and studying habits, but it also provides the instructor with numerous opportunities to automatically integrate the vocabulary into lessons. Of particular use in classroom integration is the Quizlet Live function, which allows students to conveniently and instantly compete against each other in review style games. The Quizlet software also generates vocabulary tests to specific parameters set by the instructor and significantly cuts down on activity and homework planning.

Traditional Vocabulary Acquisition Method (Vocabulary Printout). The specific advantages of the vocabulary printouts utilized by English Reading and Writing in this study are somewhat more difficult to analyze. The difficulty in analysis is only exacerbated by the lack of qualitative data gathered on how students study once the printouts are distributed amongst the student sample population. One of the clear advantages of the traditional method of vocabulary printouts utilized in this study was that this method outperformed the Quizlet method in both the local vocabulary set and in the cross testing vocabulary set. Although there may be any number of factors involved in these data results (such as the difference in overall English ability between each class), the qualitative data gathered from Quizlet may once again provide us with insight into analyzing how effectively the students are studying for vocabulary tests. In particular, the Quizlet group showed reluctance to utilize the multitude of study modes made available to them by the software, favoring by far the simple flashcard interface. Despite there being a very distinct possibility that some of the other study modalities offered by Quizlet are more conducive to an individual's learning pattern, the students very rarely explored the other study interfaces. In contrast, the vocabulary printout is completely devoid of study interfaces, and students are left to their own resources about how best to go about studying for the

vocabulary tests. In this circumstance, the students in English Reading and Writing were able to conjure up more effective studying methods for themselves than the one studying method too often preferred by the students in Communicative English. There are numerous other factors to consider as well, such as student motivation to study, which are difficult to analyze without specific qualitative data to support such claims.

Disadvantages

Computer-assisted Vocabulary Acquisition Method (Quizlet). The disadvantages of Quizlet observed in this study, although quite small compared to the long list of advantages presented in the previous section, mostly involve students being unfamiliar or otherwise unaccustomed to the user interface and with the practice of studying with language software. There were a number of small issues getting all of the students in Communicative English registered for Quizlet. Additionally, certain students throughout the semester complained of not knowing how to use the software. The difficulties faced by certain students with the user interface of Quizlet could indeed have played a large part in the trend of students primarily using the flashcard study interface instead of the other studying modalities with which they were not yet accustomed.

Traditional Vocabulary Acquisition Method (Vocabulary Printout). The disadvantages to using the vocabulary printout vocabulary acquisition method as observed in this study are twofold: the lack of automatic qualitative data collection and the lack of data control over how the students are studying with the vocabulary printouts after they have been distributed. Firstly, traditional methods for vocabulary acquisition, such as simple printouts, that do not employ educational software with built in data collection such as Quizlet require extra foresight and preparation on part of the instructor to fill in the gap of qualitative data assessment. Secondly, due to the lack of qualitative data, it remains outside the scope of this study to assess exactly how the students were studying the vocabulary after the printouts were distributed. Indeed, some of the students may very well have fed the vocabulary back into study-aid software, which would ultimately compromise the validity of the data presented in this study.

Future Considerations

Ultimately, the presumption upon which this research was founded at the start of data collection seems probable when considering the results of both local

vocabulary sets and cross testing vocabulary sets. This study may serve as a reminder to SLA instructors that it is not enough to rely on technology alone for vocabulary acquisition, and that no matter the method used (computer-assisted or traditional), specific attention must be made to not only integrate the vocabulary into the SLA curriculum, but also to address the potential disadvantages presented with both methodologies relating to SLA vocabulary acquisition. To address the disadvantages relating to computer-assisted vocabulary acquisition methods as observed in this study, class time must be set aside to not only solve user interface issues that may arise throughout the semester, but also to teach students about the multitude of studying modalities that technological innovation offers. To address the disadvantages relating to traditional vocabulary methods such as vocabulary printouts as observed in this study, qualitative data should be collected to help assess the effectiveness of the method employed. A wealth of CALL protocols utilized in SLA have proven qualitative data collection to be beneficial in constructing more effective language learning environments (Levy, 2015). This suggests that efforts should be made to recreate these qualitative data collections even in SLA classrooms that do not employ CALL, either by technology or by hand. With the continuing advance of CALL into the SLA classroom and the continuing advance of technological innovation of both hardware and software, the point may come when technology is so perfectly integrated into the classroom that the instructor need not bother making adjustments to improve the effectiveness of the studying methods for which it is employed. However, that time has not come yet, and the success of the student is still very much so dependent on the effectiveness of human instruction.

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Abstract

The level of student agency, classroom efficiency, and amount of qualitative data collection provided by CALL technologies beg the question of where such technology belongs in the classroom, how it should be integrated into SLA curricula, and whether the more traditional, non-technological tools of SLA instruction should be replaced altogether, or simply augmented by such educational technology. Of particular interest is the effectiveness of CALL technologies in specific areas of SLA compared to traditional methods, and the specific circumstances in which such technologies are more or less effective than traditional methods. This study examines the effectiveness of the educational software Quizlet versus vocabulary printouts for vocabulary acquisition in two stages: vocabulary lists integrated into the course curriculum (local vocabulary sets), and vocabulary lists studied independently by students outside of the class (cross testing vocabulary sets). The results of this study suggest that the method of vocabulary acquisition (CALL or traditional) is less effective at predicting higher vocabulary test scores than the local vocabulary sets integrated into the course curriculum.