An investigation into the effectiveness of using ICT vs. Word Cards to study and learn English vocabulary

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Abstract: As ICT (information and communications technology) continues to evolve and develop, changes are also taking place in approaches towards learning and instruction in university classrooms. Such advances offer new opportunities for teachers and students to explore contemporary methods of instruction and study techniques. With this in mind, the current study was conducted with the objective of comparing the effectiveness of ICT -in this case a smart phone application called "Quizlet", that students can access on their smart phones, versus Word Cards, written paper cards held together by a metal ring binder.

A pre-test of fifty English words (vocabulary) was given to all Japanese students in a second year compulsory English class, prior to the commencement of this study. The test was a multiple-choice design, consisting of the word presented in English and four possible answers in Japanese. The student's English scores were in the TOEIC 300-400 range, therefore the vocabulary items chosen were purposely selected to be relatively difficult for the student's level (ranging from 650-850 TOEIC level), with the presumption that students would not already be familiar with the meanings of most words.

Students were then randomly divided into two groups, one using ICT and the other using Word Cards. The teacher then introduced the ten words in both English and Japanese. Students in the ICT group inputted the English and Japanese translation into the Quizlet application, while the second group wrote the English and Japanese translations on their Word Cards. Students were instructed to study the words and were given some time in class to do so. Ten words were introduced each week over a five-week period, fifty words in total. A post- test was then administered, re-testing the student's knowledge of the same pre-tested vocabulary.

Consistent with similar studies, data obtained from this investigation indicated that students using Quizlet scored substantially higher on the Post-test (44/50), than the students using Word Cards (29/50). Results of the study are discussed in this paper, as well as implications for both teachers and students, regarding the use and efficacy of ICT versus traditional study methods, and ways ICT may be implemented in the classroom. Lastly, a recommendation was made for using Quizlet, particularly when short term vocabulary gains are desired, such as in preparation for the TOEIC test.

要旨

ICT が発達するにつれて、大学における教室内の学習や指導へのアプローチに変化が生じてきている。このような進歩により、教師や学生は現在の教授法や学習テクニックをより良いものにすることができる機会が与えられている。本研究では、このことを念頭に置き、ICT、特に Quizlet と呼ばれるスマートフォンのアプリケーションとリングでとじる単語カードを比較し、効果の検証を行うことを目的とする。

事前テストでは 50 の英単語の意味を 4 つの日本語での選択肢から正解を選ぶ形式をとった。出題には、学生のレベル（TOEIC 650-850 点）よりかなり難しく、意味を知らないと思われる英単語を意図的に選んだ。

学生は無作為に 2 つのグループに分けられ、一方のグループは ICT を使用し、もう一方のグループは単語カードを使用した。10 個の英単語と日本語訳を教師が示した後、ICT を使用するグループの学生は英単語とその日本語訳を Quizlet のアプリに入力し、もう一方のグループの学生はカードに書きこんだ。

学生は単語学習を行うように指示され、授業中に学習のための時間も与えられた。毎週 10 単語を 5 週間、合計 50 単語を学習した。事後テストでは、事前テストと同じ単語が出題された。

事後テストの結果から、Quizlet を使用して学習した学生（50 問中平均 44 点）は単語カードを使用して学習した学生（50 問中平均 29 点）よりも点数が高いことが明らかになった。

本論文では、研究結果、及び ICT や単語カードの使用や効果に関する教師と学生への示唆、教室での ICT 利用の方法が述べられる。

Introduction

As ICT (information and communications technology) continues to proliferate, changes are also taking place in approaches to learning and teaching in university classrooms. Such advances offer modernistic opportunities for teachers and students to explore new methods of lesson delivery and study techniques. ICT is a rather broad term that includes "any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems, videoconferencing and distance learning" (Khan, Khan, Din et al, 2015). Additionally, ICT also implies the use of technology which "consists of electronic devices and associated human interactive materials that enable the user to employ them for a wide range of teaching-learning processes in addition to personal use, meeting human needs or purposes including processing and exchanging" cited in Bansal, 2016.

With this in mind, the primary objective of the current investigation was to utilise two different study techniques concurrently (Quizlet vs. Word Cards) amongst two groups studying for a vocabulary test. Then, to compare the results obtained between the groups on a pre-test/post-test of identical vocabulary items to determine which study mode better enhanced students' test performance.

Literature review

Several studies related to ICT usage and English vocabulary acquisition exist. Studies by Thornton & Houser (2003, 2004, 2005) investigated the effects of mobile phone usage on Japanese university students' vocabulary gains. One particularly pertinent experiment demonstrated that the group studying using mobile phones gained significantly more vocabulary than the group using paper materials (cited in Lu, 2008). In this experiment, two groups of students studied identical materials for two weeks. The first group had messages sent to their mobile

phones, the second group studied via paper materials distributed in class. The investigators concluded from these findings that students who were frequently sent emails were encouraged markedly to study more often than students who were only encouraged to study once a week using paper-based materials, subsequently leading to better learning (Thornton & Houser, 2005).

A study by Lu (2008), of EFL learners in Taiwan found that students using a mobile phone to study English vocabulary had greater vocabulary gains than their paper group counterparts. In this study, 28 target words in English with Chinese translations were provided to students over a two-week period either via SMS messaging twice a day, vs. paper materials given to the second group of students during class. Lu (2008) concluded from this study and subsequent questionnaires that students generally had "positive attitudes towards learning vocabulary via mobile phone, due to its portability, immediacy, novelty and the spacing effect" (learning spread out over time compared to a single session).

Another study by Basoglu and Akdemir (2010) compared the results of undergraduate students' English vocabulary learning using a mobile phone vs. flash cards and found a significant difference between both groups on a multiple choice vocabulary post test, indicating that mobile phones were more effective than vocabulary flashcards for learning vocabulary.

Another recent study which is especially relevant to the current study, is a 2016 study by Barr, in the Japanese university EFL context. Barr's findings also lend support to ICT producing better outcomes than paper based study methods. Barr's study of low-level first year English university students at a university in the Tokyo region consisted of two groups, the first using Quizlet, the second using paper based methods such as a notebook. Barr found that Quizlet users scored higher than non-ICT users on all administered vocabulary post-tests, including both review tests, and tests with new vocabulary content (Barr, 2016).

Taking into account previous research about ICT's apparent effectiveness in memorizing new vocabulary, the current investigation sought to re-examine the efficacy of the Quizlet application compared with a non-ICT related study technique to prepare for a vocabulary test.

Method

This investigation took place over a period of 7 weeks, and involved thirty students in total from one class. There were no absences throughout the duration. In week 1, all students were given a pre-test containing fifty vocabulary items. The test was a multiple-choice design, consisting of one word in English (the key word to be learnt) and four possible answer choices in Japanese. The students English proficiency level was low, based upon university English level placement tests and TOEIC score results. All students had TOEIC scores in the range of 300-400, with no student scoring over 400. Taking this into account, the vocabulary items chosen for the test were purposely selected to be relatively difficult for the student's level (ranging 650-850 TOEIC level), with the presumption that students would likely not already be familiar with the translations of many of the words presented. Students were given 20 minutes to complete the test, and then tests were submitted and graded by the instructor. Neither the answers, nor the students' scores, were divulged to the students.

Students were then divided into two groups. The first group were requested to purchase Word Cards (see Appendix A) from the university bookstore for homework, and bring them to class the following week. The second group were given information by the instructor on how to install and register an application called "Quizlet" on their mobile phones in class. These procedures were completed to ensure minimal complications the following week, when the respective groups commenced learning and studying the target vocabulary using their designated study method.

In week two, the class was divided into the same two groups, the first, the Word Cards group, the second being the Quizlet group. The instructor introduced ten words in English, with corresponding Japanese translations, displayed at the front of the room via a projector. Both groups were required to note down the words. In the case of the first group, students wrote the word first in English, then on the flip side of the word card in Japanese. In the case of the Quizlet students, they were required to login, and then input the words in English and Japanese into the Quizlet template (See Appendix B). Both groups were instructed to read the words from the projected image, write them down (or input them into their smart phones), and finally repeat the words out aloud to themselves. Students were then given several minutes to review and study the vocabulary.

The same procedure was repeated in weeks 3-6, with the instructor introducing ten words and the students taking note of, and then studying the vocabulary using their prescribed study method. At the end of week 6, students had amassed a vocabulary bank of 50 words. These 50 vocabulary items introduced over five weeks were identical to words used during the pre-test. In week 7, the final week of this investigation, all students sat a post-test, re-testing the student's learning of the 50 vocabulary items given in the pre-test. This was done expressly for comparing the post test results between groups, to discover which study method contributed to higher test scores.

Results

Table 1

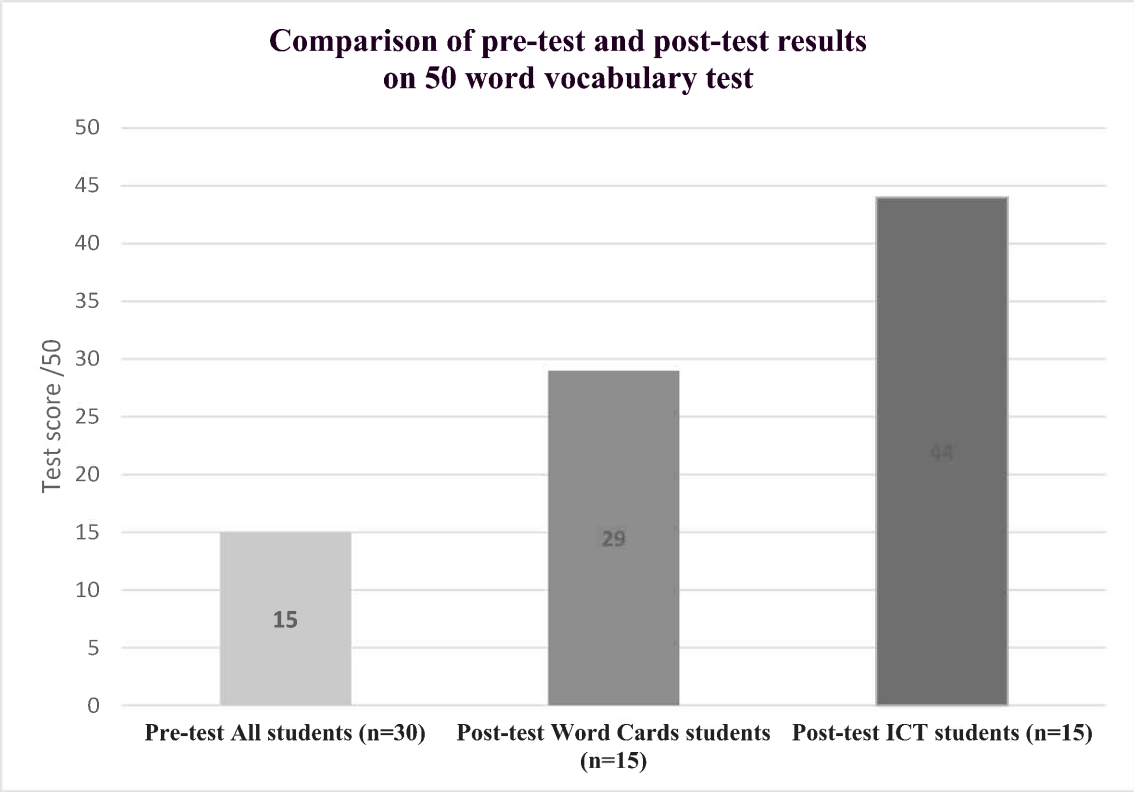


Table 1 illustrates the difference in test scores between groups. In column 1, in the pre-test the mean score of all students was 15 out of 50. In the post test, the students were split into two groups, one group using Word Cards, the other using the ICT application, "Quizlet". Column 2 shows that students using Word Cards scored a mean score of 29, whereas Column 3 indicates that students using Quizlet achieved a mean score of 44 out of 50.

Discussion

The data illustrates that students using Quizlet scored considerably higher on the Post-test (44), than the students using Word Cards (29). One possible reason for this outcome is anecdotally students using Quizlet appeared quite interested and engaged with the functionality and style of the application itself. I observed some students smiling and shouting comments such as "fun!" "yes, 100%!", "I did it!" "this is cool!". Quizlet has several different ways to learn and study the inputted vocabulary, such as flash cards, spell check, multiple choice quizzes and games (see Appendix B). Therefore, student motivation and interaction with the learning delivery method may have contributed to increased usage and enjoyment, subsequently aiding the students learning and retention of the target vocabulary. This "novelty" effect was also observed by Lu's (2008) investigation of English learners in Taiwan. Similarly Barr (2016) noted that students "were visibly engaged by Quizlet in the classroom". In contrast, students using the Word Cards were relatively silent, although admittedly concentration and attention to the task itself appeared focussed.

Secondly, another implication of using a mobile phone to study vocabulary is that mobile phones, unlike Word Cards are used every day by Japanese students, and are an indispensable part of their daily life and routine. Mobile phone ownership and usage is ubiquitous in Japan, no more so amongst teenagers and young adults. Japanese university students are perpetually engaged with their phones for a variety of purposes including playing games such as Pokémon Go! social media networking via Facebook, Instagram and Twitter, & chatting via applications such as LINE, to name a few. Consequently, the improvements in test performance identified in this study, and indeed other studies such as those by Thornton (2005) Lu (2008) and Barr (2016), perhaps rather than reflecting the superiority of the study method itself (ICT), may simply reflect this younger generations' propensity to engage with their mobile devices with higher levels of affection and engrossment, than more traditional paper based methods.

Implications for TESOL professionals

The use of ICT in the EFL classroom has several advantages. Japanese EFL students are often passive and reluctant to contribute to the class. As such the emphasis is regularly placed on lesson content, and the learning environment is inclined to be teacher centred. "Students are often regarded as having knowledge holes that need to be filled with information, emphasis is placed on lesson content and delivery, and knowledge is mastered through drill and practice" (Novak, 1988; Johnson & Johnson, 1991 cited in Fortunasari, 2016). However, when ICT is used to support learning, the environment becomes more student centred. Students can work independently at their own pace, and make their own decisions about the study method itself (in this case undertaking quizzes, playing games, flash card activities and so on). The use of ICT "promotes the student's ability to think critically, to make decisions, and to plan actions in authentic and real word contexts" (cited in Fortunasari, 2016). Furthermore, because ICT is student centred rather than teacher centred, the use of ICT on mobile devices may be "more closely related to individual's specific contextual needs" (Hwang, Huang, Shadiev, Wu, and Chen, 2014).

Second, another advantage of ICT as a learning tool is its mobility and convenience. Although this too may be said for the use of Word Cards in this instance, one of the advantages of ICT is that students can study anytime and anywhere. The potential of mobile technology to assist language learning has been discussed in various studies, "aiding both formal learning in traditional classrooms and informal settings outside classes, thus increasing access to learning activities and engagement in learning tasks in and outside the classroom" (Chen, Hsieh & Kinshuk (2008), and Huang & Chiu (2014), cited in Hwang et al, 2014.

Third, is the issue of teacher training and competence in using ICT in their classrooms. In this investigation, the application Quizlet was chosen because it was free, easy to navigate and allowed inputting of multiple languages. With a little time to explore and navigate around the interface, TESOL professionals who are interested in using ICT in the classroom, can self-teach relatively easily. The Quizlet site is extremely user friendly with a very comprehensive help section. Additionally, registering for an account for students was quite simple. In this investigation 100% of student surveyed owned a smart phone. Smart phone ownership is extremely high in Japan, particularly among university students. For TESOL professionals wishing to use this application in class, it is important to confirm that the students have the means to access it, whether that be via smart phone, tablet, laptop or

another device. The Quizlet application is also available via personal computer in a desktop version, so accessibility via multiple devices is also possible.

Fourth, is consideration of the so-called spacing effect. The spacing effect posits that "learning and/or memory is enhanced when information is distributed over time when compared with the same amount of information massed together in time" (Sisti et al, 2007). To maximise the potential benefits of the spacing effect, ten new vocabulary items were introduced over a five-week period, with approximately ten minutes' study/review time given in class.

Fifth, Quizlet allows students to compete with each other via various activities such as timed matching or racing games, whereby teachers can give students points or some type of reward or incentive based on speed or accurate completion of the task. See Appendix C. In this study the free version of Quizlet was used, so students and the teacher did not have full access to all of the features available. However, the paid version, which is available to teachers and administrators, purportedly offers 10 different gaming and study modes. Additionally, teachers can monitor student progress easily, and tailor lesson content towards individual student's strengths and weakness.

Finally, one suggestion is offered, given the evidence concerning the effectiveness of using ICT to study vocabulary. Applications such as Quizlet may be particularly useful in instances whereby short term vocabulary gains for a specific purpose are required, such as preparing for the TOEIC test. Indeed vocabulary is "probably the single most important factor influencing success on the TOEIC test, as it requires an extensive range of vocabulary and knowledge of how these words change and are organised grammatically" (Trew, 2007). At the university at which this study was conducted for example, sitting the TOEIC test is mandatory every year for all students, and test results are utilised for things like class level placements, and eligibility for higher- level English courses and study abroad programs. Additionally many Japanese companies use the TOEIC test to set targets with required minimum proficiency levels when hiring new employees, considering transfers or promotions to managerial positions. Needless to say, given the TOEIC test's widespread use in Japan, chosen study methods are vital, and those offering the greatest vocabulary gains should be adopted by students wherever possible.

Limitations

One of the limitations of these findings is the potential advantage that ICT students had over the Words Cards students, due to the nature of their respective study technique. Typically, EFL instructors try to incorporate all four of the basic language skills into their English classes, with emphasis sometimes given to certain skills depending upon the objectives of the class. These four basic language skills are widely known among TESOL professionals, and are summarized in Table 2 below.

Table 2

Four basic language skills (SIL, 1999)

	Oral	Written
Receptive	Listening	Reading
Productive	Speaking	Writing

Students in the Word Cards group read the words from the projected image, wrote down the words, and most also repeated the words out aloud to themselves, thus utilizing three of these language skills, reading, writing and speaking. Students in the ICT group too, read the words from the projected image, input the word into their smart phones and repeated the words out aloud to themselves similarly utilizing the same three of these language skills, reading, writing and speaking. However, students in the ICT group also had the opportunity to access the receptive input of the fourth skill, listening. The Quizlet application has a function whereby users can listen to an audio file of the pronunciation of all words entered in both English and Japanese (see Appendix B). Consequently, it could be argued that students in the ICT groups study techniques were augmented by this fourth input skill of listening, which may have had a positive impact or advantage on their studies and subsequent test scores.

Second, because the pre-test and post tests were identical, it is possible that students absorbed knowledge just from taking the test itself, or that they may have remembered their answers from the pre-test. Attempts were made to mitigate these possibilities in two ways. Firstly, the time between the pre-and post-tests was approximately five weeks duration so that students sitting the post test would hopefully not be able to simply remember test items from the pre-test. Secondly, neither the correct answers nor student scores were given to the students upon completion of the pre-test. Furthermore, the scores between the two groups (Word Cards vs. ICT) were substantially different in the post-test 29 out of 50 versus 44 out of 50 respectively, which certainly seems to suggest that the ICT study method was more effective in aiding higher test scores. Nevertheless, improvements in performance attributed to the study method itself, must be made with caution. Other factors unrelated to the study method itself such as students own motivation, and time spent studying/reviewing would also likely positively affect test scores.

Finally, the sample size was a relatively small sample size of 30 students undertaking an English language course at a private Japanese university. As such generalisations to wider populations of students at other universities should be made with caution.

Conclusion

As technology continues to evolve, opportunities for its use in education arise for both teachers and students alike. In this investigation, not only did ICT students perform noticeably better on the vocabulary post test, but also appeared to enjoy and engage well with the Quizlet application, suggesting an appropriate fit. It was also argued that the Quizlet application may be particularly beneficial in certain situations, such as when short term vocabulary

gains are desired, for example when preparing for the TOEIC test. It is increasingly important for TESOL professionals to be cognizant and receptive to emerging study methodologies. Furthermore, it is also vital to align such methodologies with both student needs and interests, and to their overall study objectives.

References

Bansal, E.S. (2016). Impact of Information and Communication Technology (ICT) on Secondary School Level. *International Journal of Information and Communication Technology Research*. Volume 6 (No.4), 1-5.

Barr, B. (2016). Checking the effectiveness of Quizlet® as a tool for vocabulary learning. *The Center for ELF Journal*. Volume 2(1), 36-48. doi: http://libds.tamagawa.ac.jp/dspace/handle/11078/359

Basoglu, E.B., & Akdemir, O. (2010). A comparison of undergraduate students English vocabulary learning: Using mobile phones and flash cards. *The Turkish Online Journal of Educational Technology* , July 2010, Volume 9, Issue 3.

Fortunasari (2016). The use of information and communication technologies (ICTs) in English as foreign language learning: A review of recent practices in Indonesia. *The Asian EFL Journal Professional Teaching Articles*, May 2016, Issue 92, 4-21.

Hwang,W.Y., Huang, Y.M., Shadliev, R., Wu, S.Y., & Chen. S.L. (2014). Effects of using mobile devices on English listening diversity and speaking for EFL elementary students. *Australasian Journal of Educational Technology*, 30(5), 503-516.

Khan, M.S., Irfanullah, K., Din, S., Ismail, H.M., Khattak, R., Jan, R. (2015). The impacts of ICT on the students' Performance: A Review of Access to Information. *Research on Humanities and Social Sciences*. Vol.5, No.1, 85-94.

Lu, M. (2008). Effectiveness of vocabulary learning via mobile phone. *Journal of Computer Assisted Learning,* 24, 515-525. doi:10.1111/j.1365-2729.2008.00289.x

Sisti, H.M., Glass, A.L., & Shors, T.J. (2007). Neurogenesis and the spacing effect: Learning over time enhances memory and the survival of new neurons. *Learning Memory*. v.14(5), 2007 May. doi: 10.1101/lm.488707

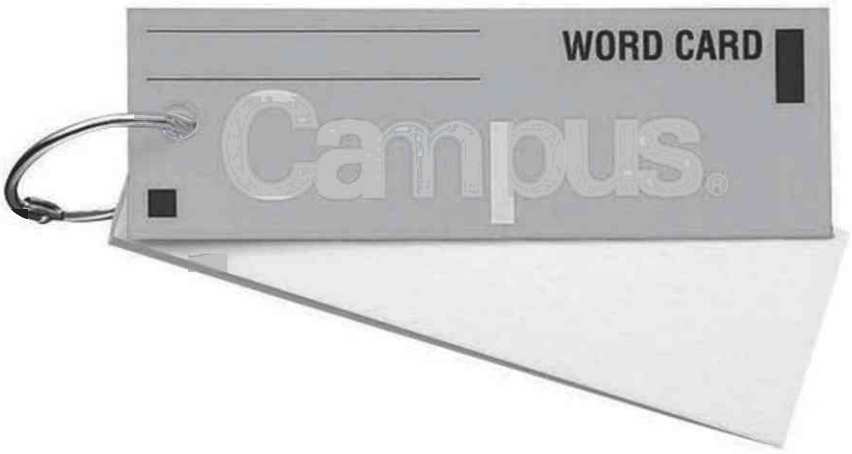
SIL International. (1999). Four basic language skills. Retrieved September 7, 2016, from http:// www-01.sil.org/lingualinks/languagelearning/otherresources/gudlnsfralnggandcltrlrnngprgrm/FourBasicLanguageSkills.htm

Thornton, P. & Houser, C. (2015). Using mobile phones in English education in Japan. *Journal of Computer Assisted Learning*, 21, 217-228.

Trew, G. (2007). A Teacher's Guide to TOEIC Listening and Reading Test Preparing Your Students for Success. Oxford University Press. Retrieved from https://elt.oup.com/elt/students/exams/pdf/elt/toeic_teachers_guide_international.pdf

Appendices and Supplemental Materials

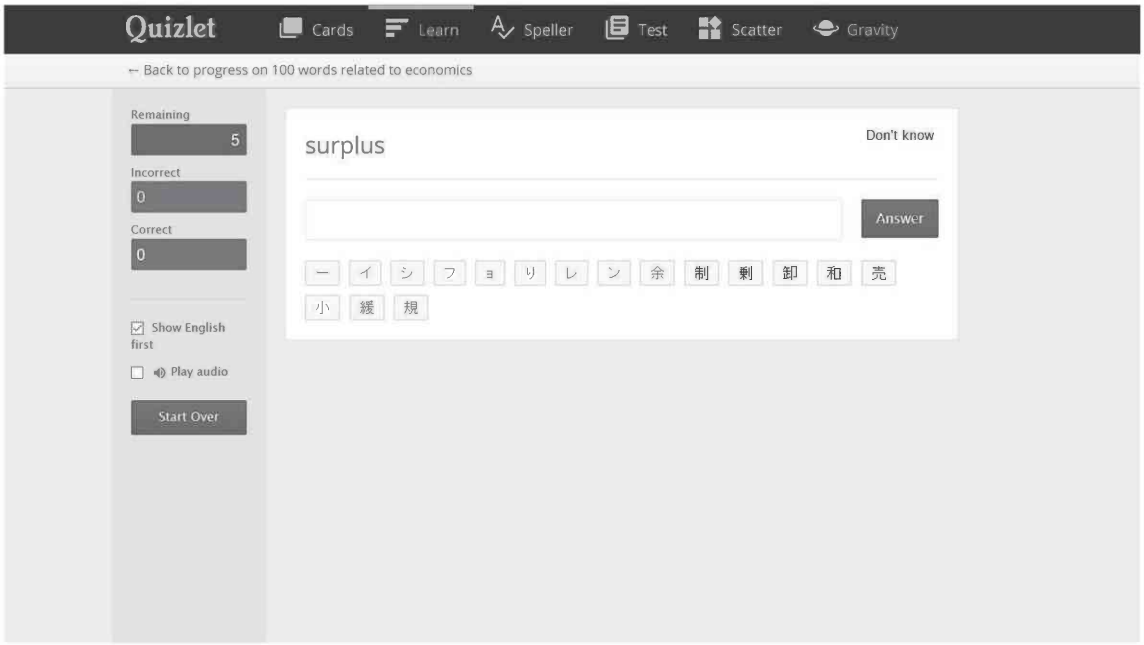
Appendix A



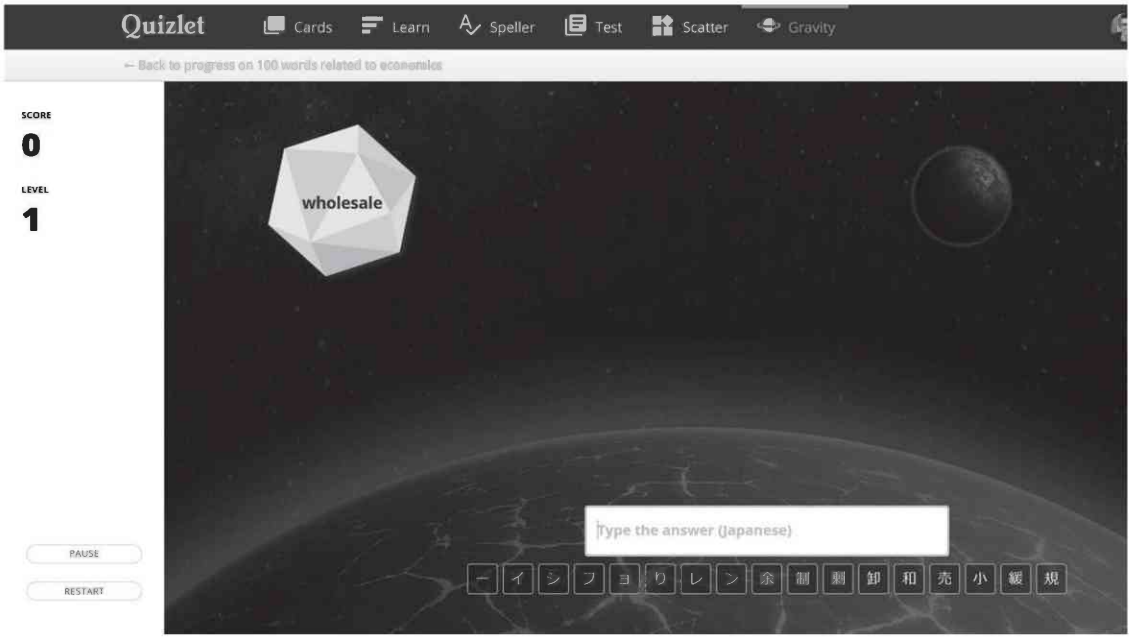
Appendix B

First screen after log in where students enter the English terms and Japanese definitions.

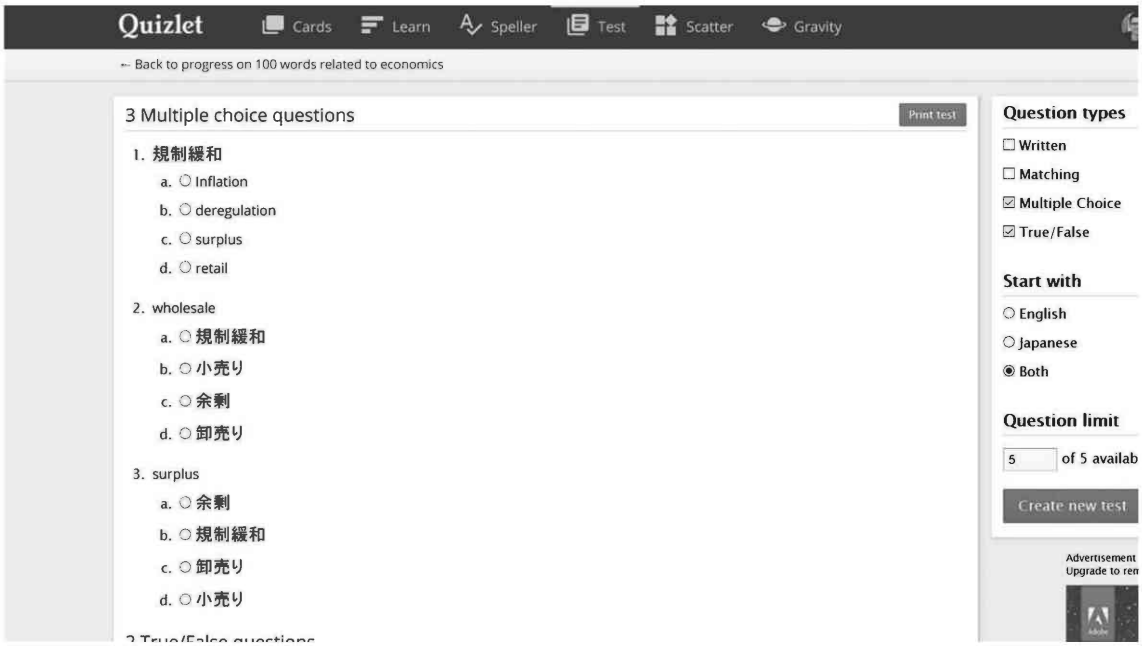
Students can listen to both English and Japanese word pronunciation.



In this game students need to enter the correct Japanese translation on this screen.



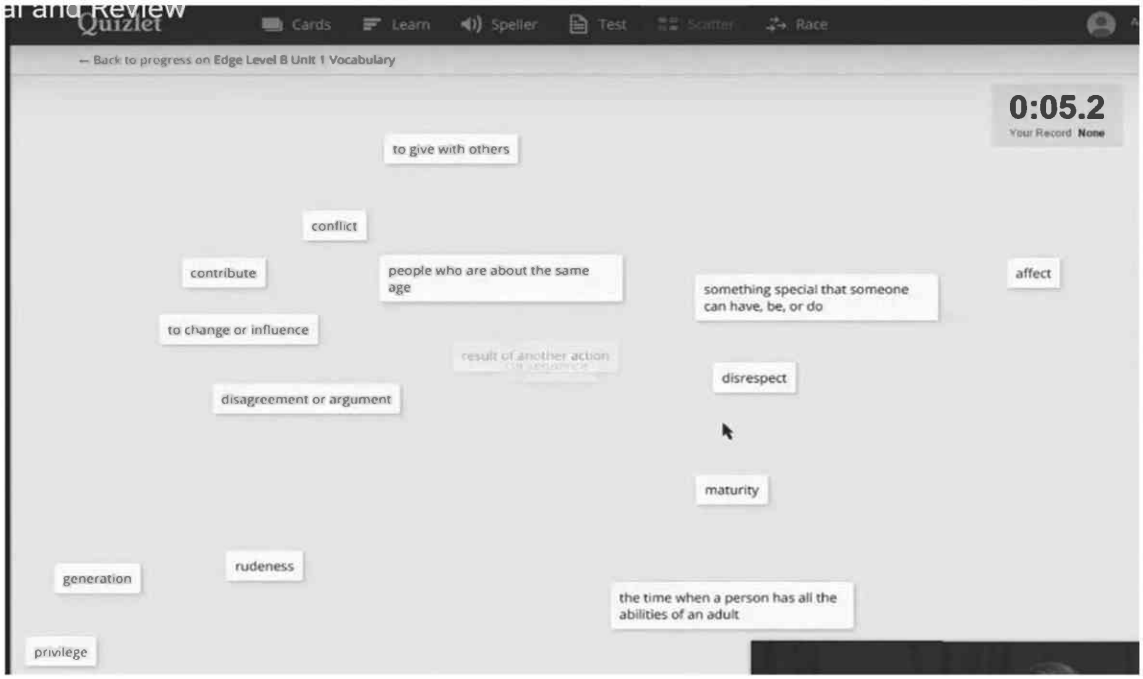
A practice test



Appendix C

Matching game

In this game students need to match both key words and definitions as quickly as they can.



Racing game

In this game, students need to type the word as the definition scrolls from left to right of the screen, before the definition leaves the screen.

Author Bio note

Ben Humphreys was born in Melbourne, Australia and now resides in Osaka, Japan. His specialties include: oral communication, TOEIC preparation, teaching English vocabulary and common expressions via various modalities including music, sitcoms, movies, TV commercials & extensive reading. He currently teaches English at Otemae University, Kindai University and Mukogawa Women's University. He can be reached at:benwilliamhumphreys@gmail.com