Learning Vocabulary With Digital Flashcards

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The importance of developing the L2 lexicon is being increasingly acknowledged as a key component of language learning and proficiency. As a result, vocabulary-building strategies and resources are gradually receiving greater attention from teachers and students alike. Vocabulary flashcards are one such resource, and research suggests that they are an efficient means of acquiring and retaining new words. This paper begins with a brief review of existing research on the use of flashcards for vocabulary learning. The authors then examine the effects of using digital flashcards for vocabulary learning using the Substitution Augmentation Modification Redefinition (SAMR) Model (Puentedura, 2006) to analyse Quizlet (quizlet. com), one of a number of Web 2.0 applications based on the creation and use of digital flashcards. The paper also includes practical guidance for teachers on how to use the Quizlet application.

　近年、第二外国語のボキャブラリーを豊かにすることの重要性が、語学学習やその習熟度を上げるための大切な要素として認識されている。実際、ボキャブラリーの習得方法や手段については、教師のみならず学生たちからも非常に高い注目を集めている。ボキャブラリー・フラッシュカードはその方法の一つであり、過去の調査からもその学習効果が示唆されている。この論文は、フラッシュカードを用いたボキャブラリー習得についての調査結果の簡単なレビューから始まる。著者達はWeb2.0アプリケーションであるクイズレット (quizlet.com) を分析し、SMAR (Puentedura, 2006) を用いたボキャブラリー学習のためのデジタルフラッシュカードの使用効果について調査していく。また、教師のための実用的なクイズレットの使用方法などについても解説する。

The Importance of Vocabulary

In order to be able to comprehend L2 discourse, a language student must typically learn thousands of words. How many thousands depends on the kind of discourse. Research has indicated that an individual must know at least 95% of the words in a given written or spoken text in order to understand it (f Hsueh-Chao & Nation, 2000; Staehr, 2009). Adolphs and Schmitt (2003) found that 3,000 word families covered 95% of the items in the CANCODE (Carter, 1996) spoken corpus and therefore concluded that vocabulary knowledge in the region of 3,000 word families is required to understand spoken discourse. Studies on different kinds of texts, such as television programs, novels, and movies, have resulted in similar results (Nation, 2006; Webb & Rodgers, 2009a, 2009b). Despite the importance of learning words, vocabulary has perhaps not always received sufficient attention. Increasingly, however, researchers recognise that the L2 lexicon represents a vital component of linguistic development (Laufer, 1997; Qian, 1999; Zareva, Schwanenflugel, & Nikolova, 2005) and as such, an area warranting

specific attention. Indeed, Beglar and Hunt (2005) asserted that vocabulary learning is "the central component in successful foreign language acquisition" (p. 7). Perhaps due to this central-ity of vocabulary, Nation (2001) asserted that students need an effective and systematic approach to vocabulary learning in order to avoid frustration and demotivation. Language teachers clearly have a responsibility to provide students with access to and guidance on the most effective vocabulary-learning tools available.

Vocabulary Learning With Traditional Flashcards

In contrast to incidental learning, deliberate language learning involves targeting a particular aspect of language and employ-ing a specific strategy to acquire it. Vocabulary is especially amenable to deliberate learning because unlike grammatical forms, which are thought to be acquired in sequence, words and phrases can be learnt in any order (Lightbown & Spada, 1999). This means that irrespective of their ability level, students can target those words that they perceive to be the most important for their particular needs.

Flashcards are thought to be a particularly effective deliberate learning tool for studying vocabulary. Indeed, flashcards have been shown to be a more efficient means of learning vocabulary than other decontextualized deliberate learning strategies such as word lists or dictionary use (Schmitt & Schmitt, 1995). The apparent effectiveness of flashcards may be attributable to a number of factors. Firstly, using flashcards enables students of all proficiency levels to assume greater responsibility for their own study. Increasing learner autonomy in this way can sig-nificantly increase the rate of lexical acquisition (Nation, 1995, 2003, 2006). Secondly, an advantage of flashcards is that they naturally lend themselves to a metacognitive learning strategy known as spaced learning (Nation, 2003). Periodically revisiting lexical items over an extended period of time provides a more

structured study regime for students, and research confirms that repeated exposure to a word is required in order to learn it (Hulstijn, 2001; Webb, 2007). Thirdly, flashcards are portable and can in theory be studied during almost any free moment. Fourthly, an additional advantage of flashcards is that they can be arranged to create logical groupings of target words (Cohen, 1990). For example, cards can be grouped according to lexical sets, collocation patterns, or simply those items to be learnt in preparation for a test. Finally, using flashcards is thought to have a positive motivational effect on students. The visually stimulating nature of the cards can increase motivation, as can including L1 translations in the definitions, thereby providing a visual link between L1 and the target language (Cross, 1991). It seems clear that a range of benefits make using flashcards an effective way to learn new vocabulary. Although researchers have investigated the effectiveness of paper flashcards (Nation, 2001), comparatively little research has been carried out on the digital variety.

Digital Flashcards

A number of Web 2.0 vocabulary learning applications are avail-able that enable users to create and use digital flashcards. These include Anki (ankisrs.net), Quizlet (quizlet.com), and Word Engine (wordengine.jp). Quizlet was chosen as the focus of this study because we have found the interface to be both attractive and intuitive. Also, unlike some of the other systems, Quizlet is completely free. Foster (2009) points out that even those with relatively little knowledge of computer technology can soon begin to interact, work together, and share flashcards. Quizlet provides access to millions of sets of flashcards created by users. Cards can be made from scratch or copied and modified from existing sets. Quizlet, like many of the alternative flashcard sites available, allows users to customize their flashcards and several arrangements are possible, including the use of multiple

languages and images. The Quizlet site also includes a text-to-speech audio function, giving users the option of hearing as well as reading card content. In a recent study, Quizlet was found to be more effective than using paper flashcards at improving vocabulary test scores (Imrie, 2014). By examining Quizlet using The SAMR Model, we aimed to investigate the apparent superiority of Quizlet and digital flashcards in general.

The SAMR Model

Although new technologies like digital flashcards offer attractive features for language learners, teachers need a way to assess the effectiveness of technology as it is used in the classroom. Indeed, there is always the danger that, in adopting new technologies, teachers are simply replacing a perfectly good learning activity with one on a computer or mobile device. In the case of flashcards, teachers need to consider whether a tool like Quizlet can significantly alter the students' learning experience or whether it merely performs the same kind of task as paper flashcards. The Substitution Augmentation Modification Redefinition (SAMR) Model, developed by Puentedura (2006), is a useful way of assessing the integration of technology and its impact on teaching and learning. It divides technological innovation into four stages of progressively greater impact. Figure 1 is a summary of the SAMR Model and is based on the model on the Queensland Government, Department of Education, Training and Employment website (2013).

Substitution	Augmentation	Modification	Redefinition
Technology is used to perform the same kind of task that was done before computers	Although still acting as a substitute, technology offers some functional improvement	Technology facilitates significant task redesign	Technology allows for the creation of tasks that were previously inconceivable
e.g., making basic digital flashcards	e.g., making digital flashcards with images and audio	e.g., generating a test from a set of digital flashcards	e.g., inter-class/inter-school/international digital flashcard learner collaboration

Figure 1. The SAMR Model for technology impact assessment.

The SAMR Model shows a progressive categorisation of how technology in the curriculum can simply enhance the learning experience of students through to how it can radically transform the experience. By examining Quizlet through the lens of the SAMR Model, we assess the potential impact of digital flashcards.

Substitution

This is the first of the four SAMR categories of technology applications. Those activities and applications in which technology acts as only a surrogate for previous methods, with no resulting functional change, are classified as substitution.

Making Flashcards

Once registered, the user is ready to create a set of digital vocabulary cards. New card sets can be given a name along with a brief description if required. Target vocabulary, corresponding definitions, example sentences, translations, or pictures can then be input. Just as with paper flashcards, digital vocabulary

flashcards typically have on one side the target vocabulary in L2 and on the other, the corresponding word in L1 along with a definition in L1 or L2, an example sentence, or both.

Augmentation

This is the next SAMR category of technological application and its impact on teaching and learning. Although the use of technology still substitutes previous methods, augmentation implies that some functional advantage is conferred through technology.

Augmenting Flashcards

While creating flashcards, the Quizlet user can search existing definitions of a term and select one for use if desired. This feature can save time; however, at the time of writing, a definition was often found to be unavailable, particularly for lower frequency vocabulary. In addition, definitions may contain challenging vocabulary and often need to be graded for the students' level. Quizlet also allows the inclusion of pictures made available from Flickr (flickr.com), the image and video hosting website. As previously noted, using images helps to motivate students (Cross, 1991). However, for less common words and phrases, the choice of images was found to be very limited.

Studying in Flashcards Mode

In order to study using Quizlet, the user first selects a flashcard set from those available. Once working within a set of flashcards, there is a choice of six study options or modes. These are *Flashcards, Learn, Speller, Test, Scatter* and *Space Race*. In *Flashcards* mode, cards are displayed one at a time and by default with the *term* side first. Clicking on the card reveals the other side of the card—revealing the definition of the term, for example. It is possible to adjust the settings to show the definition before the

term. The audio option provides students with a useful model of pronunciation. Audio can be slowed down, which may help some students to notice the correct pronunciation of new items. Another useful feature is that if example sentences containing the target vocabulary have been included on the definition side of a card using an underscore in place of the target item, Quizlet reads aloud the sentence inserting the word *blank* for the missing item. The same activity with conventional cards would require at least two students working together.

Studying in Learn Mode

The *Learn* study option prompts the user with the written and spoken form of one side of a card, one at a time from the card set. The student must then recall the item and type it. Throughout the activity, the site records answers and gives a final score when the set is complete. For registered users, the site maintains detailed records of all *Study* activities, allowing individuals to monitor their own progress. This immediate feedback should help to motivate students and improve their performance.

Studying in Speller Mode

In the *Speller* study option, the user listens to the terms one at a time from the card set. They must then type in the word or phrase they hear, using the correct spelling. The definition side of the card is also shown as an additional prompt. If a word is spelt incorrectly, it is then spelt out aurally and on screen. The student is then asked to retype the word. Once all items have been attempted, a progress summary appears. This feedback includes the number of items that have been learned (at least two correct attempts), partially learned (one correct attempt), and yet to be learned (no correct attempts), providing immediate feedback on those items requiring more work and a sense of progress for the user.

Using the Game Modes

The two game activities on Quizlet are called *Scatter* and *Space Race*. In *Scatter*, a number of terms and their corresponding definitions are distributed randomly over the screen. The player must click and drag matching terms and definitions together, thus making them disappear. Upon matching all terms and definitions correctly, the task is complete and the time taken to finish is shown. Users are then challenged to try to beat their time by playing again. In *Space Race*, a definition moves across the screen. The player must type the correct term before the definition reaches the far right of the screen and in doing so "kill" the definition. If the user fails to do this, the game stops and the player is given the answer and required to type it in before the game restarts. The game is over when an item reaches the right side of the screen for the third time. The player's score is based on the number of successful kills. As more points accumulate during the game, the challenge is gradually increased, with definitions moving more quickly across the screen. By introducing rules, goal-setting, challenge, and reward, the gamification of vocabulary study afforded by these activities should help to further engage and motivate students.

Mobile Quizlet

Many university students carry a smartphone, and the Quizlet application for iOS and Android systems is freely available to download. Once the application is installed, students can download sets of cards to their smartphone, which means they can study away from a computer or without an Internet connection. As with paper flashcards, the associated transfer of autonomy and responsibility for learning from teacher to student, along with the increased capacity for spaced learning, should help vocabulary acquisition (Hulstijn, 2001; Nation, 1995, 2003, 2006; Webb, 2007). Studying with Quizlet on a mobile device means that students can study vocabulary anywhere and at any time.

Providing students with a QR code allows them to download a set of flashcards to their mobile devices quickly and easily. Students simply scan the code with their phones and are taken directly to the flashcards on their device without having to register with the Quizlet site. Teachers can make a QR code while in study mode by clicking on *Share*. A URL code for that card set will then appear. A free online QR code generator (for example, www.the-qrcode-generator.com) can then be used to generate a QR code jpeg image. The QR code is then inserted into a word document and distributed to students, or teachers can project the QR code onto a screen and have students scan it directly into their phones from there.

Printing

Quizlet offers a number of printing options. Achievement tests (discussed in the next section) are printable, and may therefore be administered and collected in class. We have found that these in-class tests have a desirable backwash effect, helping to ensure that students complete Quizlet study assignments set as homework. It is also possible to make paper handouts using the print function in a variety of formats including a table, glossary, and flashcards in three different sizes. These can be put to various uses. For example, the smallest versions of the flashcards can be used to manage classroom dynamics, while simultaneously reviewing vocabulary. The teacher distributes words and definitions randomly to students and then has them find and sit next to the student with the card matching their own.

Modification

Modification is the third SAMR category and the point at which technology can be seen transforming the classroom rather than just enhancing traditional practice.

Modifying Flashcards

Rather than creating flashcards from scratch, Quizlet allows users to import the data necessary to create a flashcard set from another source. For example, if users already have words and definitions in a digital format such as a word list in an MS Word or EXCEL file, a useful way to save time is to import vocabulary data by clicking on the *Import Data* button. A window will appear into which the user can paste the data. The words and definitions can be checked before finally clicking *Import*. Quizlet will then use this data to generate a vocabulary flashcard set.

Using the Test Mode

Test making can be a time-consuming activity for teachers but the *Test* mode in Quizlet has the facility to randomly generate an achievement test using a previously made flashcard set. The test can be configured to include different question types, including written answer, multiple choice, matching, and true/false questions. After generating and taking a test, students immediately receive their score as a percentage, along with a letter grade ranging from A+ to F. In addition, items answered incorrectly are highlighted in red and the correct response is displayed. Students can also save the test as a pdf file and email it to their teacher.

Share Embedded Sets Via a Website

Teachers can embed any of the Quizlet study activities, such as the *Speller* mode or one of the game modes, into a website such as a class blog or Moodle site. The effect is both a professional look for the teacher's website and the advantage of not having to open a new browser tab to visit the Quizlet site directly. To embed a Quizlet activity in a website, the user selects the drop-down menu entitled *More Tools* in the *Study* mode and selects embed. A pop-up window with six strings of HTML code will then appear (each string is for a different study activity). Users simply copy and paste the code corresponding to the study option that they wish to embed in a website.

Creating a Class and Monitoring Progress

Unlike paper flashcards, which learners tend to study by themselves, Quizlet enables teachers to create a virtual class on the Quizlet website, enabling a degree of cooperation and collaboration between students. A teacher can set up a Quizlet class, give the class an appropriate name and then invite registered members to join that class. One benefit is that, once students join a class, they can compare their progress with their classmates. For example, after playing *Scatter* or *Space Race*, students are presented with a leaderboard showing the top 10 performers. A student can also see which of their classmates have completed the *Learn* and *Speller* activities. A further advantage of having students register and join a Quizlet class is that teachers can monitor their students' progress, albeit in a limited fashion. For instance, teachers have access to a chronological list of recent activity for each student detailing when a particular set was last used. In short, having students register with Quizlet and join a class can help motivate them by giving them a sense of progress and by stimulating friendly competition with their peers.

Redefinition

This is the fourth and final SAMR category of technology integration. Essentially, redefinition stands for the creation of learning tasks that would otherwise be impossible without the use of computer technology.

Studying Together and Sharing Resources

Creating a Quizlet class enables students not only to study together but also to collaborate and generate their own resources. For example, a TOEFL class teacher can have his or her students work together to generate the hundreds of flashcards needed for a semester's work. The job can be divided up between all students in the class by having each student create just some of the total number of flashcards required. Once all the flashcards are combined through a Quizlet class, the students in that class will have access to all the flashcards for an entire course of study. Moreover, collaboration need not be limited to students within the same class. Students from different classes, different universities or even different countries can work together through Quizlet to generate digital flashcards for a test or project. Put simply, a project of this kind would not be possible without the kind of technology offered by Quizlet.

Summary and Conclusion

In this paper we have described Quizlet, a free online learning tool, and suggested several ways that it can be used to transform the teaching and learning of vocabulary. More specifically, we have used the SAMR Model for technology impact assessment to examine the benefits to language students of using Quizlet to study vocabulary. Rather than simply substituting paper flashcards for digital ones, it seems that Quizlet can offer the opportunity to redefine the vocabulary learning experience. The application allows learners to share resources and interact in ways unthinkable with paper resources. Indeed, it is apparent that the range of additional functionality offered by the digitalization of flashcards, combined with the smooth integration of these features, has resulted in a comprehensive platform for vocabulary study with many advantages. These benefits may help to explain the positive results of existing preliminary research into the effects of using digital flashcards on vocabulary-learning outcomes. An experimental investigation measuring vocabulary gains using Quizlet compared to traditional paper flashcards represents a relevant and useful avenue for future research.

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