Integrating a Computer-Based Flashcard Program into Academic Vocabulary Learning

Cennet Altıner
Uşak University, Uşak, Turkey
Address: İzmir Yolu 8. Km. Atatürk Bulvarı, 64000 Merkez/Uşak Merkez/Uşak Merkez/Uşak
altinercennet@gmail.com

ABSTRACT
The main goal of this study is to investigate the extent to which a computer-based flashcard program, Anki, can help college-level ESL learners improve their vocabulary as well as the learners` perceptions about the program. The vocabulary targeted for the study consisted of Coxhead`s (2000) *Academic Word List*, including the most common words in university textbooks. An academic vocabulary dictionary which encompasses 210 academic words was designed for the study and thirteen students coming from two ESL classes used the Anki dictionary for ten minutes every day during the three week intervention process. Pretest and posttest scores of students were compared to evaluate the effectiveness of the learning process. Learners` perceptions about the training were investigated by means of surveys, interviews and observations. The results present the benefits that might be gained from the integration of flashcard programs into a language classroom, as well as the perceptions of learners about the process.

KEYWORDS: Anki, computer-based flashcard program, ESL learner

INTRODUCTION

Second language (L2) learners are generally conscious of the fact that the limitations in their vocabulary knowledge affect their fluency both in spoken and written language, but they are not sure about how to improve their vocabulary. Language teachers also do not know the best way to incorporate vocabulary learning into their teaching (Read, 2004). Research has suggested that explicit vocabulary teaching should be a part of regular language classrooms and that flashcard learning as an effective way of explicit teaching where learners can memorize many words in a short time (Fitzpatrick, Al-Qarni, & Meara, 2008; Nation, 2001). It was also mentioned in the research that various flashcard programs were gaining popularity for vocabulary learning and they were extensively used around the world (Nakata, 2011). Anki was one of those flashcard programs that had been increasing its users and suggested as a more effective program, providing its users with different possibilities compared with other available flashcard programs (Godwin-Jones, 2010).

The term ‘learning from word cards’ is defined as “the formation of associations between a foreign language word form (written or spoken) and its meaning (often in the form of a first language translation, although it could be a second language definition or a picture or a real object)” (Nation, 2001, p. 296). In the process of learning from word cards, a learner writes a new word on one side of a card and its first language translation on the other side. Then, the learner goes through these cards trying to retrieve the meanings of new words.

Word card strategy, one type of a paired-associate learning, has typically been ignored in the area of vocabulary learning and teaching because it is considered an example of the behaviorist learning model (Hulstijn, 2001). Several studies show that flashcard learning is an important learning activity in terms of helping learners memorize large number of words in a short time (Fitzpatrick, Al-Qarni, & Meara, 2008; Nation, 2001). Some recent studies also demonstrated that learners can transfer flashcard learning to normal language use (Elgort, 2007; Webb, 2002, 2009a). However, Nation (2001) indicated that the extent of learning with flashcards depends upon the way that the word cards are used and suggested some effective strategies for learning with word cards.

According to experimental studies in the area, simultaneous presentation of a word form and its meaning is best for the first encounter, but delayed presentation is more effective later on because there will be a chance for learners to make an effort to recall the new words which will presumably lead to better learning of them (Nation, 2001). In one study, both each foreign word and its English translation were encountered by the learners on the first trial and then, learners were expected to guess the target words to recall them on following trials (Baddeley, 1990). The study showed that the recalling procedure helped learners to acquire more new words. Instead of simply encountering words again and again, retrieving increases the chances that target words will be remembered better later on because it will require much greater effort similar to performance during normal use.

Word cards can be given as a good example of the retrieval process while learners see both the word and its meaning at the same time by using word lists.

Teachers should make learners more aware of the importance of retrieving for their vocabulary learning and encourage them to integrate this repetition technique into their learning activities (Nation, 2001). Retrieval plays an important role in the strategy of using word cards for vocabulary learning and it makes the word cards more favorable for learners compared to other strategies such as notebooks or lists of vocabulary items (Schmitt & Schmitt, 1995; Waring, 2004). Because the target words and their meanings are put on different sides of word cards, retrievals with them will be easier for learners compared with word lists where L2 words and their meanings are presented at the same time.

So, learners using flashcards should be encouraged to retrieve the meaning of the target word from memory, which leads to a more permanent learning (Barcroft, 2007; McNamara & Healy, 1995; Nation, 2001). In addition to the retrieval process, the order of the flashcards is another factor which affects the learning process. According to Baddeley`s (1990) primacy and recency effects, the items at the beginning and the end of a list are memorized better than the words in the middle. Taking into account this finding and also the fact that learners have the freedom to change the order of words if they study with flashcards, learners should put difficult words near the beginning, so these words can get more attention. Nation (2001) also suggests that learners put target vocabulary in a phrase or sentence. Studies looking into the effect of a single sentence on vocabulary learning show that the use of an example sentence in vocabulary learning supports both the learning process and retention in the long run (Baicheng, 2009; Cobb, 1997; Laufer & Shmueli, 1997). Based on the elaboration process, Baicheng (2009) states that sample sentences cause learners to increase their information processing load as they reflect on the syntactic feature of target vocabulary given in an example sentence. This load facilitates the retrieval process later on because learners can find various paths to access new items in their memory.

It is possible to find many different strategies for using flashcards effectively in the literature. However, Mondria and Mondria-de Vries (1994) propose a practical way of using flashcards with spaced repetition which is a 'hand computer' divided into five sections. To be able to use this 'hand computer', words to be learned are written on cards and put into section 1. When a word is known by the learner, it goes into section 2. When section 2 fills up, the words are reviewed again and those that are known are put into section 3 and those not remembered go back to section 1. The same process occurs for section 4 and 5 with words not learned going back to section 1.

Based on memory research and second language vocabulary learning research, Nation (2001) cites several researchers whose results have shown that spaced repetition is much more effective than massed repetition. Massed repetition requires learners to spend a continuous period of time paying attention to a target word. On the other hand, spaced repetition means spreading the repetition sessions across a long period of time. For example, the target vocabulary might be reviewed for three minutes now, another three minutes a few hours later, three minutes a day later, three minutes two days later and finally three minutes a week later instead of reviewing a new word for fifteen minutes a day as in the massed repetition. The total time reviewed is fifteen minutes again, but that time is spread across ten days which ensures a more permanent learning. Nation (2001) explains the general principle behind spaced repetition with these words:

> After a piece of learning, the forgetting is initially very fast and then slows down. On the second repetition, a piece of learning is older than it was on the first repetition and so the forgetting on the second repetition will be slower than it was. On the third repetition the forgetting will be even slower. The right probability of recall level is one where the learner has forgotten enough to feel that repetition is worthwhile attending to and yet not forgotten too much so that there is still a good chance of recalling and thereby strengthening the form-meaning connection. (p. 75)

On the other hand, memory research supports the effectiveness of spaced repetition with physical changes in the brain. Baddeley (1990) stated that spacing repetitions allow time for the regeneration of neuro-chemical substances that make changes in the brain. Massed repetition does not allow enough time for these substances to regenerate and thus they cannot continue to make the physical changes needed for learning.

There are various memory schedules applying this basic principle of 'spaced repetition' in the literature. However, the memory schedule that Pimsleur (1967) proposes as a guide for the size of the spaces between the repetitions is the one most commonly cited one in the literature (Nation, 2001; Schmitt, 2000). His schedule uses an exponential scale, so if the first interval between interactions with a new word is five seconds, then the next intervals should be $5^2 = 25$ seconds, then $5^3 = 125$ seconds (about 2 minutes), the next $5^4 = 625$ seconds (about 10

minutes) and so on. Although Pimsleur`s schedule is well-known in the literature, Nation (2001) considers his schedule as a rough guide and says that "there is no particular reason why the spacing between the repetitions should be a matter of precise measurement" (p. 77).

It is true that using word cards gives learners a chance to implement expanded rehearsal more easily, compared with other strategies like word lists. However, learners should be knowledgeable about different strategies to use word cards effectively, such as planning a review schedule and monitoring their learning. If they do not have those skills, word card learning can even cause inefficient learning (Nakata, 2011). On the other hand, a computer program can easily help learners with areas such as planning and monitoring regardless of their abilities (Hulstijn, 2001; Nation, 2001).

There are numerous numbers of flashcard programs available for vocabulary learning in a second language and some of them are widely used around the world. While Nakata (2011) states that 50 universities and hundreds of schools all over the world use *vTrain* (a flashcard program), more than one million people have access to *Quizlet*. It is also reported that Nintendo DS, a flashcard program for English learning, is integrated into English curriculum in all the public junior high schools in Kyoto, Japan (Tamaki, 2007).

Based on the methods and strategies used for word card learning discussed in the previous section, the features of an ideal flashcard program include presentation and retrieval modes, scheduling ability, flexibility about block size and ability to help learners increase retrieval effort (Barcroft, 2004; Nation, 2001; Pyc & Rawson, 2007). Many researchers support the widespread use of flashcard programs and claim that they are more effective than paper-based ones because of the following reasons. The first benefit of a computer-based flashcard program is that it can record a learner`s improvement over a period of time and it can arrange the order of words that can help learners study difficult words more often than easy items (Nakata, 2008; Pyc & Rawson, 2007). Also, computer-based flashcard programs can offer numerous ways for the presentation of new words by means of their multimedia capabilities which can in turn increase learners` motivation and autonomy (Allum, 2004; Hulstijn, 2001; Nakata, 2006; Nation, 2001). With computer programming, retrieval can be practiced more easily by second language learners (Allum, 2004).

The idea behind many current electronic flashcard programs such as *SuperMemo, Anki, StudyProf, Teachmaster* is based on the Leitner system (Godwin-Jones, 2010). In 1940, Sebastian Leitner created a 5-step process by using index cards in a box. This box is divided into five sections and flashcards are moved from the first section to next one on a daily basis if learner can remember them well. If cards are not remembered, they stay in the same section. Each following section has a longer time lag and if words are remembered in the final section after a longer interval, they do not need to stay in the system anymore. At this point, it is assumed that the words are stored in the learner`s long term memory. Today, the electronic systems use a scale system instead of a box, but the action is still designed according to the user`s actions. The user chooses an option from a scale of 0 to 5 according to how well s/he remembers the word. Then, the system arranges a schedule to review this item again based on the score (Nakata, 2008).

In spite of the recent popularity of electronic flashcard program, emprical evidence of the advantages of these programs is quite limited in the second language learning area (Nakata, 2008). Besides, to what extent they are really helpful for the learning process of vocabulary knowledge is still not known by researchers. Recently, some researchers have tried to test their usability and compare them with some traditional vocabulary learning tools such as notebooks, word lists, etc. (Özer & Koçoğlu, 2017; Dizon, 2016; Hirschel & Fritz, 2013). Özer and Koçoğlu (2017) investigated the effectiveness of two vocabulary learning tools (Quizlet and vocabulary notebook) in a vocational high school setting in the Turkish learning context. They study consisted of four classes with total 89 participants. Two classes were utilized as the treatment groups; one class using Quizlet which is an online learning tool that helps learners memorize and recall vocabulary items and one class using the traditional vocabulary notebooks. The remaining two classes were served as control groups without any treatment. The results revealed no significant differences among the tool type groups. On the other hand, significant differences were found between pre-test/post-test and pre-test/delayed post-test results of the Quizlet group. These differences were explained in terms of the effectiveness of using online flashcard program. In a similar vein, Dizon (2016) tested the effectiveness of using Quizlet to improve English vocabulary with 9 Japanese university EFL students. The results of the participants' vocabulary tests after treatment revealed that Quizlet was a useful tool for vocabulary learning. In an educational setting of the United Arab Emirates, Jackson III (2015) compared Quizlet and Educreations, which is a mobile application for sharing educational videos. For vocabulary learning, Quizlet was favored over Educreations due to the availability of L1 translation, the games after sessions and receiving a grade after each session. On the other hand, Hirschel and Fritz (2013) utilized

specially adapted version of Praxised.com (n.d.) which is another Computer Assisted Language Learning (CALL) Program with speaced repetition. They compared this CALL program with traditional vocabulary notebooks through two treatment groups and one control group. Although increases in vocabulary scores for both the CALL and vocabulary notebook groups were similar initially, the vocabulary scores of the CALL group in the delayed post-test were found to be slightly higher in the delayed post-test. As a result, researchers suggest that teachers should prefer CALL programs rather than traditional vocabulary notebooks, but they emphasize that they should take into consideration different factors while choosing these tools.

As can be seen above, the number of the studies in this area is limited and most of these studies tested the effectiveness of the same program "Quizlet" despite many other options such as *SuperMemo, Anki, StudyProf, Teachmaster*. They generally claimed its effectiveness by comparing it with some traditional vocabulary learning tools. Also, they were mostly relied upon quantitative data such as vocabulary test scores which do not provide information about the perceptions or preferences of learners.

In the light of these issues, this study will investigate the effect of another popular electronic flashcard program "Anki" on learners' vocabulary knowledge both quantitatively and qualitatively. With Anki, word cards can be designed in a variety of ways. Different from other flashcard programs, Anki is much more flexible and it provides users with the opportunity to change the directions of the word cards easily and create various kinds of cards. Instead of creating their own cards, users can also import ready-made card decks into their Anki program and start reviewing the cards right away. It is also possible for users to share their own card set with other users. Another good feature of anki is that learners can access their card decks with free online website by using desktop syncing or using it with their mobile phones (Godwin-Jones, 2010).

Thus, the main goal of this study is to gain a deeper knowledge about learners' experiences about using Anki, their perceptions about its effectiveness as well as its effect on learners' vocabulary scores.

Purpose of the Study

The purpose of this study is to describe the effects of using Anki (i.e., spaced repetition software) in ESL classes on students` academic vocabulary knowledge. In general, learners are unaware of vocabulary-learning strategies that play an important role in their language learning. Although they acquire new vocabulary incidentally while engaged in different language learning activities, a more direct and systematic way of learning is also necessary for the improvement of vocabulary (Read, 2004). Hence, the aim of this study is to discover to what extent Anki, which is a spaced repetition tool, impacts students` vocabulary learning and, how it might help them to gain some vocabulary-learning strategies. The goal will be to see if this approach affects their overall language learning as well as learners` perceptions about the learning process.

The research questions addressed in this study:

1. How does the use of Anki (spaced repetition software) affect the academic vocabulary learning of college-level ESL students?
2. What are the college-level ESL students` perceptions about learning academic vocabulary with Anki?
   a. Do learners find learning academic vocabulary with Anki *useful*?
   b. Do learners find Anki *useable*? Are the content and organization clear?
   c. Do learners find using Anki for academic vocabulary learning *enjoyable*?

METHODOLOGY

Both quantitative and qualitative instruments were used to collect data to address the research questions.

Table 1. Research questions and data collection instruments

Research Questions	Data Collection Instruments
1. How does the use of Anki (spaced repetition software) affect the academic vocabulary learning of college-level ESL students?	Students` pre-test and post-test vocabulary scores
2. What are the college-level ESL students` perceptions about learning academic vocabulary with Anki? a. Usefulness b. Usability c. Enjoyment	Likert-scale survey Interviews Informal observations

Participants

Participants in this study included 13 intermediate-level students in ESL reading and writing classes in the Intensive English and Orientation Program (IEOP) at a Midwestern University who were studying English to pass TOEFL (Test of English as a Foreign Language) or IELTS (International English Language Testing System) to begin their academic classes at different universities in the United States. In addition, most of them had been in the U.S. for less than a year and had been studying English for several years. According to their pre-test vocabulary scores (see table 2), learners were proficient at the 2000 word level which includes the lexical items necessary for basic everyday oral communication. Based on the claims of many researchers indicating that learners need to study subtechnical vocabulary occurring across a wide range of academic texts after mastering the General Service List (GSL) (Coxhead 2000; Nation & Hwang, 1995; Read, 2004), it can be said that the participants in this study were ready to learn academic vocabulary.

Table 2. Test results of learners at 2000 word level part of the Schmitt, Schmitt, and Clapham's (2001) Vocabulary Levels Test, Version 2

Participants	1	2	3	4	5	6	7	8	9	10	11	12	13	Mean
2000 word level test results	23	21	28	25	18	16	25	26	30	22	25	24	*	23.5

* Stands for missing data

According to their responses to pre-project survey (results are summarized in Table 3), learners felt comfortable using computers and internet, and agreed that computers and the internet could help them improve their vocabulary (mean = 4.0, SD = 0.9). They also reported that they were using online sources to improve their English (mean = 4.1, SD = 0.7). Although they all completely agreed that vocabulary is an important part of language learning (mean = 4.8, SD = 0.3), their responses showed that they did not enjoy learning vocabulary (mean = 2.6, SD = 1.3) and they found learning vocabulary difficult (mean = 2.3, SD = 1.2). In addition, they were unsure about how to study vocabulary effectively (mean = 3.3, SD =0.8).

Table 3. Pre-project survey responses

	Mean	**SD**
1. I feel comfortable using computers.	4.4	0.9
2. I feel comfortable using the Internet.	4.5	0.5
3. I often use online resources to improve my English.	4.1	0.7
4. I feel comfortable studying English independently.	3.8	0.9
5. I think vocabulary is an important part of language learning.	4.8	0.3
6. I know how to study vocabulary effectively.	3.3	0.8
7. I enjoy learning vocabulary.	2.6	1.3
8. Learning vocabulary is easy.	2.3	1.2
9. I think computers and the Internet can help me improve my English vocabulary.	4.0	0.9

Instructional Materials

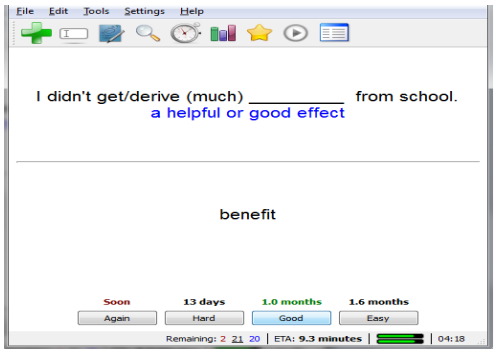

Figure 1. Screen shot of the Anki interface

A spaced repetition program, Anki, was used in two IEOP (Intensive English and Orientation Program) classes to help academically oriented college-level ESL learners improve their academic vocabulary. According to the creator of Anki, Damien Elmes, Anki is a program which makes remembering things easy. He indicates that it is

much more efficient than traditional study methods, so learners can increase the amount that they learn and decrease the time that they generally spend studying to remember things. Users can study with Anki on their own computer, online, on their cell phones or other devices such an iPod touch. It is possible to access to numerous numbers of free flashcards called „decks on different topics and also users can create their own decks on different topics. It`s basically based on a paper flashcard system with the question on one side and the answer on the back. However, the outlook of Anki does not look like the paper flashcards. When you click on "Show Answer" button, the question part is also seen by default (see figure 1).

Anki Academic Dictionary

Considering the empirical studies that state the effectiveness of flashcards for vocabulary learning (Fitzpatrick, Al-Qarni, & Meara, 2008; Nation, 2001), an Anki dictionary which includes only academic words appropriate for the level of students was created for this study. Pre-project test results showed that students in both reading and writing classes mastered GSL (General Service List) and they were ready to learn academic vocabulary which consists of 540 words, so the researcher decided to create an academic vocabulary dictionary for these learners by using Anki. Two hundred words were chosen from Coxhead`s (2000) Academic word list to create a new deck for both classes which also included 30 words that were tested both at the beginning and the end of the study. Researcher chose the target words mainly from list 7, 8, 9 and 10 which includes the most difficult words for learners. When the study started, the researcher had enough knowledge about the proficiency level of the students, so she had the responsibility to choose the necessary vocabulary for them.

Anki provides two formats to prepare flashcards that are "recognition" cards and "recalling" cards. In the recognition card format, learners are given some written part of a language and are tested if they can understand it. In vocabulary learning, a new word is presented to learner and s/he is expected to remember the meaning. It is stated on Anki`s website (http://ankisrs.net/docs/manual.html) that recognition cards are easier to do and more materials can be covered in a short time. However, the drawback of these types of cards is that words may not be included into active vocabulary of learners while they can easily recognize them.

Recalling cards, on the other hand, requires learners to produce an answer in the language they are studying. With this format, the definition of a word or expression of it in the learner`s native language will be given first and s/he will try to find the correct word in the target language. It is stated on the website that recalling cards can be more difficult compared with recognition cards and can take more time to complete, but words that are learned with recalling method will become more memorable in the long term and it is highly possible for learners to use them actively.

Based on the explanation above, the academic dictionary designed for learners adopts recalling card format which will help them to learn new words more effectively and encourage them to use them actively in other contexts instead of just recognizing them. At first, a cloze example sentence and the definition of the word is presented to learners on the front page of the flashcard. The definitions and example sentences are all taken from Cambridge Dictionaries Online (http://dictionary.cambridge.org/).

Only the first definitions of the words were included and the example sentences were chosen according to their easiness to understand for intermediate level learners and to what extent they are explanatory about the use of the target words in a context. As it is stated in the literature, it is very important for learners to see target words in a phrase or sentence (Nation, 2001). First of all, example sentences will help learners to notice the target word, which is the first step of learning vocabulary (Nation, 2001; Ellis, 1991; Schmidt, 1990). Also, they will make the learning process easier for learners and affect the retention process in a positive way (Baicheng, 2009; Laufer & Shmueli, 1997; Cobb, 1997).

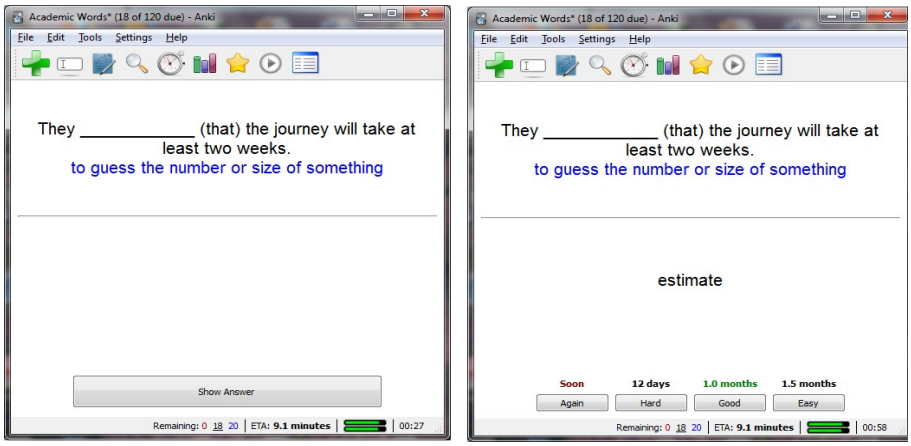

Figure 2. Design of the Anki Academic

By means of example sentences, learner will learn more about the word such as its syntactic feature, which will facilitate the retrieval process later on (Baicheng, 2009). After students look at the cloze example sentence and the definition of a new word, the target word is only presented on the back part of the flashcard when learners click on "Show Answer" button. This ensures that they have enough time to think about the fill-in-the-blank questions and the definitions to find the correct word for each blank.

Data Collection Instruments

Vocabulary Levels Test

Version 2 of the Schmitt, Schmitt, and Clapham's (2001) vocabulary levels test was used for the study, since it was the most widely used vocabulary test in vocabulary learning area and the validity and the reliability of the test was proven in the research.

The Cronbach`s alpha coefficient of the vocabulary levels test was 0.95 which showed that the test had good reliability. Learners` vocabulary size at each four frequency levels of word knowledge and also at academic word level can be learned with this test. For this study, the 2000 level and academic vocabulary parts of the test were used.

As a first step, learners took the 2000 level and academic vocabulary parts of the vocabulary levels test designed by Schmitt, Schmitt & Clapham (2001), considering the fact that academically oriented ESL learners should master the most common 2000 words as a first priority because they include the most of words in the reading texts and then they should start learning academic words, which are supportive of the topics (Coxhead, 2000). So, the 2000 level part of the test helped the researcher see if learners were ready for academic vocabulary learning and the pre-test academic vocabulary test results were used to determine the background academic vocabulary knowledge of the students in both classes. After the intervention, learners took only the academic vocabulary part of the Vocabulary Levels Test again to see the effect of the process on students` academic vocabulary knowledge.

Pre-project questionnaire

Before the project, a pre-project questionnaire was given to all 13 students both in reading and writing classes. The first three questions were designed to gather some demographic data including age, gender, L1. This part also included two questions asking about the participants` length of stay in the United States and the duration of their English learning.

The second part of the questionnaire contained nine Likert-scale items (1 = "strongly disagree", 2 = "disagree", 3 = "not sure", 4 = "agree", 5 = "strongly agree") that measured learners` ability to use computer or internet, their perceptions about vocabulary learning and the role of the technology in this process. Learners` comfort levels of using computer or internet were assessed with two items, "I feel comfortable using computers." and "I feel comfortable using the Internet." Five items were created to evaluate learners` perceptions about vocabulary learning, such as "I think vocabulary is an important part of language learning." and "I know how to study vocabulary effectively." Learners` perceptions about the use of technology for language learning were measured by two items, "I think computers and the Internet can help me improve my English vocabulary." and "I often use online resources to improve my vocabulary."

After the questionnaire was administered the learners in reading and writing class, the results were into the SPSS program and the reliability of the questionnaire was checked with Cronbach`s alpha coefficient which was 0.83.

According to George and Mallery (2003), this value indicated that there was a good internal consistency of items in the survey.

Postproject Survey
Immediately after the end of the project, students completed a survey about the effectiveness of the intervention, which was adapted from Ranalli (2009). The original survey was designed to evaluate the effectiveness of a web-based vocabulary training under three subcategories -- *usefulness, usability and enjoyment* (Ranalli, 2009). The 20 Likert-scale items (1 = "strongly disagree", 2 = "disagree", 3 = "not sure", 4 = "agree", 5 = "strongly agree") for this study were also created according to those three categories to reveal the perceptions of the learners about the learning academic vocabulary with Anki.

The *usefulness* theme of the survey included seven questions evaluating the perceived usefulness of the program, such as "I think Anki can help me improve my vocabulary" and "My academic vocabulary has improved since I started using Anki." Learners` perceptions about the usability of the program were assessed with six items such as "I understood the purpose of Anki clearly." and "The explanations and definitions of words were clear enough for me to understand new words." On the other hand, enjoyment theme encompasses seven items to measure learners` perceptions about the interest found in using the Anki, such as "Using Anki for vocabulary learning is enjoyable" and "I would use Anki again in the future after this class is over."

The postproject survey was administered at the end of the three-week intervention process. The reliability of the postproject survey was checked with Cronbach's alpha coefficient for the survey that was 0.79 showing that the reliability of the survey was good according to George and Mallery (2003).

Interviews
In the following two weeks after the invention, 15-minute interviews were conducted with all 13 students to learn more about their experiences and perceptions about academic vocabulary learning with Anki. The discussions were carried out within a reach of a laptop running the Anki program. Participants were expected to elaborate on what they found useful or least useful with Anki academic dictionary, what they liked or disliked about the program and suggest new ways to improve it, so that it could help them better. Interviews were recorded and transcribed later for analysis process.

Observations
During the intervention process, the researcher, who was also the teacher of both classes, observed the learners using the program at the beginning of each class and took notes on everything that they had done with Anki related to the research question on a daily basis. At some points during observations, participants and the researcher was engaged in dialogues about the use of the program. Observations helped the researcher to understand how the program corresponded to the needs of the different participants.

Research Context
This study was conducted in two same level IEOP (Intensive English and Orientation Program) classes at a large Midwestern university. These classes are designed for international students who want to continue their further education in the US. There are four different skill classes in IEOP which are writing, reading, grammar and listening/speaking. Each skill class meets for 50 minutes every day and the target book for each specific class is followed throughout the classes.

After learners take placement tests for each skill at the beginning of each semester, they are divided into different proficiency levels according to their test scores. Thus, participants in each class are homogenous in terms of their proficiency levels, ages, ranging from 18 to 21, and their native languages, since most of them are from China and are native speakers of Mandarin Chinese. The following section describes how participants were selected for this study.

Data Collection Process
The participants practiced academic vocabulary with Anki every day for 3 weeks. Both the reading class and the writing class meet for 50 minutes every day. At the beginning of each class, learners reviewed 10 words during the first ten minutes of each class. They were also expected to continue reviews on the weekends.

On the first day of the intervention, the pre-project questionnaire and vocabulary test were administrated. Then, the importance of academic vocabulary learning was discussed in both classes by the teacher, who was also the researcher. Coxhead`s (2000) academic vocabulary list was introduced to them and explained how the list was

created to help academically oriented ESL learners. Also, the teacher briefly introduced learners to 'Anki' as a tool that could help them learn academic words that Coxhead`s (2000) list includes, and announced that they were using Anki in the class during the semester. It was explained that Anki could be used on a laptop as well as on other mobile devices such as cellphones, iPods or iPads. Because each class has only one lab day, students were asked to bring either their laptops or any of those mobile devices to class every day.

In the following class, a detailed presentation was given to students about how to use the tool and different features of it. Then, students downloaded 'Anki' to their own devices and imported the academic words dictionary that the researcher prepared for them to their Anki. Except for one student who decided to use his iPad, all students in the reading class decided to use their laptops. On the other hand, the situation in the writing class was different. While three students were using their laptops, the other four was using their cellphones. After downloading the dictionary, they were ready for the reviewing process. The students were told to review at least 10 new words each day for ten minutes at the beginning of each class. They got used to that idea very soon and then the reviewing process continued for another two weeks. Each reading and writing class started with 10-minute reviewing session for three weeks. During those three weeks, the researcher took notes of her observations as well as the reflections on them.

After a three-week learning process, the academic vocabulary part of the vocabulary levels test designed by Schmitt, Schmitt & Clapham (2001) was given to learners again to be able to evaluate the effect of intervention on students` academic vocabulary knowledge. In addition, the participants completed the Likert-scale survey about the usefulness and usability of the tool and, the enjoyment of the process. During the week following the intervention, 15-minute interviews were conducted with students and they shared their experiences of learning academic vocabulary with Anki. The data from the survey and interviews were triangulated with the data from observations to check the accuracy of instruments and to prepare more accurate and reliable answers for research questions.

Analysis of the Data

To answer the first research question, the study made use of the quantitative data from the vocabulary level test that was given before the study and at the end of the study. A paired samples t-test was conducted using the SPSS computer analysis program to examine the differences in means that may be present between pre-test and post-test scores.

To address the second research question about learners` perceptions about the usefulness, usability and enjoyment of the program, data were compiled from the post-project survey, interviews and observations. Survey results were entered into SPSS program and descriptive statistics were used for the analysis of each Likert-scale item. Mean scores and standard deviation of each survey item were used to answer the research question investigating the learners` perceptions.

The data obtained from interviews and observations were analyzed by means of a coding scheme, namely the data providing similar types of information were grouped together (Parson & Brown, 2002). The research suggests that as the researcher read through transcripts or other documents, s/he notices narrative categories under some common themes. The researcher should make note of each category and code the narrative data according to these categories which is specifically carried out by searching for words or phrases that begin to repeat themselves (Mills, 2003; Parsons & Brown, 2002). Hence, the researcher in this study searched for utterances that revealed learners` perceptions about the learning process with Anki as she read through the interview transcripts and observation notes, and highlighted words or phrases related to the perception of usefulness, usability and enjoyment with different colors as it was suggested by Schwalbach (2003), who indicates that it is important for researchers to find some mechanism for coding that works for them. After coloring the narrative data according to these three themes, the data with the same color were grouped together under the subheadings of usefulness, usability and enjoyment, and used as a supportive evidence for survey results.

RESULTS

This section deals with the issue of the extent to which Anki academic dictionary used in the study has affected learners` academic vocabulary and learners` perceptions about academic vocabulary learning process with Anki.

Research Question 1: How does the use of Anki (spaced repetition software) affect the academic vocabulary learning of college-level ESL students?

In order to examine if there were significant improvements in the participants` academic vocabulary knowledge after the intervention process, the academic vocabulary part of the vocabulary test developed by Schmitt, Schmitt and Clapham (2001) was administrated both before the training and at the end of the study. The general aim of

the vocabulary level test used for the study is to get an accurate record of what learners know, including both completely mastered words and words they have partially mastered. Learners` scores at the academic word level represent the proportion of all the words known at that level. So, if a learner scores 15 out of 30 on the academic word level, it can be said that 50% or 285 out of 570 words are known at that level.

Although there were 13 participants in the study, 12 participants` vocabulary test results were analyzed because one of the participants did not take the pre-test (see table 1). While the mean of the pre-test was 19.3 (SD = 6.8), it increased to 23. 6 on the post-test (SD = 5.3). Five participants` pre-test scores out of 12 showed that they did not know more than half of the academic word list which consists of 570 word families because their scores were below 15 out of 30 questions. After the intervention process, all of the learners scored at least 15 out of 30 which indicated that almost all of the learners became proficient in at least 50% percent of the *Academic Word List.* Although all learners increased their scores compared with the pretest scores, only two learners (10 and 12) showed a much better improvement compared with the other learners. The motivation of those learners could be the reason for this great increase in their test results. During class hours, learners 10 and 12 was sitting together and always in the first row.

Table 4. Pre-test and Post-test Scores

Participant	Academic word level pre-test scores	Academic word level post-test scores
1	13	19
2	14	15
3	28	30
4	22	26
5	12	16
6	12	18
7	26	28
8	23	26
9	29	30
10	10	24
11	23	24
12	20	28
Mean	19.3	23.6
Standard deviation	6.8	5.3

Due to the small sample size, the Wilcoxon signed rank test was conducted on data obtained from pretest and posttest results. As a non-parametric test, the Wilcoxon converts scores to ranks and compares them at Time 1 and Time 2 instead of comparing means (Pallant, 2007). A Wilcoxon Signed Rank Test revealed a statistically significant increase in academic vocabulary knowledge of college-level ESL learners following the three-week training with Anki, z = -3.068, p= 0.002. Table 5 indicates that the median score of the vocabulary level test increased from pre-test (Md = 21) to post-test (Md = 25). The results implied that learning academic vocabulary with Anki facilitated an increase in academic vocabulary knowledge of college-level ESL learners.

Table 5. Descriptive Statistics of Pre-test and Post-test

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
pretest	12	19.33	6.81	10.00	29.00	12.25	21.00	25.25
posttest	12	23.66	5.36	15.00	30.00	18.25	25.00	28.00

Research Question 2: What are the college-level ESL students` perceptions about learning academic vocabulary with Anki?

a- Do learners find learning academic vocabulary with Anki useful?

The question asking whether participants found learning academic vocabulary with Anki useful was answered mainly from data gathered from participants` responses on the survey given at the end of the study and interviews. Participants indicated that they found the learning experience with Anki useful for their academic vocabulary learning.

On a Likert-scale of 1 to 5, with 1 showing 'strongly disagree' and 5 showing 'strongly agree', they showed a clear agreement that their academic vocabulary has improved since they started using Anki (mean = 3.9, SD = 0.7) and Anki can help them to improve their academic vocabulary knowledge (mean = 4.0, SD = 0.8). Although they showed less than complete agreement, the participants also reported that Anki could help other language learners to learn new words easily (mean = 3.6, SD = 0.7). The relatively weak agreement (mean= 3.6, SD = 0.7) that participants indicated about their familiarity with vocabulary learning strategies before studying with Anki implied that Anki could be a helpful tool for learners by presenting them a new strategy to acquire vocabulary.

Regarding the questions evaluating the usefulness of different components of the Anki academic dictionary, the results showed that participants found the example sentences useful (mean = 3.8, SD = 0.8) and they indicated that example sentences facilitated the learning process (mean = 3.7, SD= 5.9). Compared with the usefulness of example sentences, there was a slightly less agreement with the ratings about the usefulness of the definitions for their academic vocabulary learning (mean = 3.6, SD = 0.8).

Table 6. Perceptions of Usefulness

Survey Items	Mean	SD
5. Example sentences were useful for me to remember new words.	3.8	0.8
8. I learned many new words by looking at the explanations of words.	3.6	0.8
9. I learned many new words by using example sentences.	3.7	0.5
14. I have already known how to arrange my vocabulary study.	3.6	0.7
15. I think Anki can help me improve my vocabulary.	4.0	0.8
17. Anki can help language students learn new words easily.	3.6	0.6
18. My academic vocabulary has improved since I started using Anki.	3.9	0.7

These results were also in tune with the data from interviews. In general, the positive comments about the usefulness of the program were mentioned throughout the interviews. Some of them indicated that they learned new vocabulary that they had never seen before and they understood academic texts more easily since they started learning academic vocabulary with Anki.

> Oh, yeah…it was useful. Maybe, for the first three or four times I was not clear about words and their meanings. Later on, I found that I learned many words and are familiar with many words. As soon as I saw the definition, I was able to find the word. (S1)
>
> Yeah. I think it is useful because some academic words are on the Anki. Maybe, before I was not sure about the English definition, but I used Anki and learned English definition better. (S5)

During the interviews, participants elaborated on the usefulness of the Anki by indicating the different aspects of Anki they found most useful. Generally, they stated that the repeating option, which made them see the same words again and again, was very helpful for them to remember those words later on which shows that they were clear about the purpose of the program.

Their responses about the improvement of their academic vocabulary were also very positive, similar to survey results. They stated that reviewing sessions helped them to remember more academic words in a short time.

> Yes, I improved a lot. Before I learned Anki, I read some passages like academic reading. Sometimes, I cannot really understand it. But after I learned Anki, I did it again and found it very helpful. (S1)
>
> The first time I saw the word, I didn`t know the word. Later on, I realized that I learned more words as I reviewed them again and again. (S10)

In terms of usefulness of example sentences or explanations, interview data also showed that learners generally found them useful. Some of the participants indicated that they used both example sentences and definitions of words to learn new words. While explanation of a new word gave them the first idea about the word, they learned how to use words in their language by means of example sentences.

> I used both because sometimes if you just read definition, you may not know like what is the word. With the example sentence, it is easier to remember words. (S6)
> When I used Anki, I used both sides. First I saw the definition and then example sentence. I learned how to use the word by looking at the example sentence. (S8)

The learners who stated that they used both example sentences and definitions of words also indicated that their dictionaries helped them a lot at points where they did not understand the exact meaning of the words.
During my classroom observations, I also saw that some of learners were regularly using their electronic dictionaries to check the meanings of the words in their native language. While some of the learners indicated during interview sessions that seeing the words in their native language helped them to learn and recall new words more easily, others said that they used their dictionaries because definitions and example sentences had some unknown words.

> Sometimes, example sentences and sometimes, definitions because there are some new words in definitions for me. So, I need to search for the dictionary. When I use Anki, if there is a new word in the example sentence or definition, I looked up the Chinese meaning. I think Chinese meaning is helpful, but it is not easy job for you to add Chinese meaning because there are other students from different countries. (S10)
> Yeah, I used both definitions and example sentences. Sometimes, I was not sure about the definition and I used my dictionary to find the word. Yes, I checked them because I learn better if I see the meaning in my native language. (S9)

However, interview data also noted that there could be some individual differences regarding their perceptions about the usefulness of example sentences and definitions. Some of the participants emphasized the importance of knowing how to explain words in English and they indicated that they often used definitions to remember words instead of example sentences.

> Definition part helped better. I really think if you know a word, you need to know how to explain it to somebody else. I think it is very important. Not just remembering. If you have somebody who does not know this vocabulary, you really need to know how to explain it. (S6)
> Actually, I didn`t use example sentences to learn words. I just checked their meanings and tried to remember. (S1)

On the other hand, some learners indicated how important to see new words in example sentences and different advantages to learn words with example sentences such as

> Sometimes, the definitions are not very clear and I got confused. Example sentence is very important. It helped me to learn the how to use the word. Also, if it is a noun or a verb. (S7)

In sum, participants found the academic learning process with Anki useful and indicated that their academic vocabulary improved since they started using Anki which also supported the findings of the first research question. However, not all of the participants used the Anki academic dictionary in the same way. Some of them preferred to use only explanations to learn new words, while some of them emphasized the importance of example sentences for vocabulary learning. Explanations of the words were criticized by some learners because they were not clear enough. The next section will focus on more issues about the usability.

b- Do learners find Anki useable? Were the content and organization clear?

To answer this question, the data obtained from the survey about learners` perceptions, interviews and observations were analyzed. In general, their answers indicated that they found the Anki usable and easy to navigate although some parts of the program were criticized by the participants.

Table 7. Perceptions of Usability

Survey Items	Mean	SD
2. It was easy to use Anki.	4.6	0.5
3. I understood the purpose of Anki clearly.	4.3	0.5
4. The explanations and definitions of words were clear enough for me to understand new words.	3.6	0.7

6. I used 'again', 'hard', 'good' and 'easy' options of Anki to arrange my vocabulary study.	4.4	0.5
7. I have not experienced any technical difficulty with Anki.	3.7	0.8
16. I think using Anki on the internet is helpful.	3.8	0.8

Results showed that participants were all in clear agreement that Anki was easy to use (mean = 4.6, SD = 0.5) and the purpose of it was clear (mean = 4.3, SD = 0.5). Most of them did not experience any technical difficulty (mean = 3.7, SD= 0.8). They indicated that they used the review options of Anki to arrange their vocabulary review (mean = 4.6, SD = 0.5) and the accessibility of Anki dictionary on the internet was helpful (mean = 3.8, SD = 0.8). However, there was less than a complete agreement about the clarity of the definitions and example sentences given in their Anki academic dictionary (mean = 3.6, SD = 0.5).

The observational data also supported these findings, indicating that most of the learners understood the purpose of Anki easily and felt very comfortable using the Anki dictionary. After the researcher showed learners how to download the program to their laptops or use it on their cellphone, most of the learners easily downloaded it and set it up. Because the researcher wanted to make all learners use the same dictionary, she exported the dictionary prepared for this study and sent it to participants as an e-mail attachment. Learners had a little difficulty only during the process of importing this dictionary to their own Anki programs because it required them to follow many steps. However, special help was given to each learner by the researcher and they were able to open the academic dictionary file on their programs. During the rest of the study, they started and used the program very easily.

Although most of them did not have any technical difficulty during the rest of the study, a couple of issues arose as some of the learners mentioned in the interviews. A couple of learners complained that starting Anki took a lot of time for them every class which diminished the time for them to review new vocabulary. One learner commented, "Every time I turn on my laptop, I clicked on Anki and I had to wait for a long time. It was really slow" (S6). Another learner mentioned that she did not start Anki every day because it was opening very slowly (S8).

In addition to some technical problems, interviews shed light on some of the problems about the definitions of the words. Although participants did not state any issue about example sentences, they indicated that some definitions were unclear and confusing at some points.

> I didn`t understand the meanings. Meanings were unclear. Example sentences were OK. Most of them were clear, but not all of them. (S2)
> Meaning are not clear enough. You also need to include more details. For example, when I look at a dictionary, definition is very specific. Definitions in Anki are not very specific. (S7)

These data correspond with the researchers` observations during the class hours. It was difficult for some learners to understand the meaning of a new word by looking at the English definitions. Some of learners were regularly checking their electronic or online dictionaries to see the meaning of the words in their native language. During interviews, they indicated that they used dictionaries because the definitions given on Anki were not clear and explanatory enough for them. They also mentioned that they wanted to see more meanings of a new word, but Anki was showing them only one definition, which also caused some confusion for the learners who know another meaning of the same word.

> Sometimes, definitions were confusing because I checked some words in the dictionary and found that it had many more meanings, but I saw only one meaning on Anki. (S9)
> If there is no new word for me, they are clear. However, I generally searched for Chinese meanings of words. Definitions were not clear sometimes. (S12)

While survey results show that learners feel comfortable using the Anki, the interviews and the observation data indicate some problems regarding the usability of different components of the dictionary, such as slow openings and the clarity of definitions.

c- Do learners find using Anki for academic vocabulary learning enjoyable?

Responses to the questions related with the 'enjoyment' of the site showed that participants generally found using Anki for vocabulary learning enjoyable (mean = 3.6, SD = 0.9). However, the lowest mean scores of the

questions 10 and 11 (mean = 3.3, SD = 0.9; mean = 3.4, SD = 0.7) indicated that learners were not sure if Anki was interesting or motivating for vocabulary learning.

Table 8. Perceptions of Enjoyment

	Mean	SD
1. Using Anki for vocabulary learning is enjoyable.	3.6	0.9
10. Learning vocabulary with Anki is interesting.	3.3	0.9
11. It is motivating to use Anki to learn new words.	3.4	0.7
12. I liked seeing example sentence and definition first.	3.8	1.0
13. I liked the fill-in-the-blanks exercises for vocabulary learning.	3.6	0.8
19. I would use Anki again in the future after this class is over.	3.7	0.9
20. This kind of tools should be included in language courses.	3.7	1.0

My observations also coincide with these findings. Trying a new way of learning words caught learners` attention from the first day. Most of them got used to the idea of reviewing vocabulary with Anki very soon and they were very careful about bringing their laptops or cellphone to classes. In the interviews, several participants expressed how they felt about using Anki for their vocabulary learning. Some of them indicated that they liked it because it was a new way of learning and they used it for a limited time every time. Although they stated that the Anki is not interesting or motivating during the interviews, they enjoyed trying a different way of learning new words and seeing that they were really improving their vocabulary.

Sometimes, I felt bored, but it is OK. Learning is boring, so that`s fine. Sometimes, I found it enjoyable. When I saw that I was learning, I found it very enjoyable. (S3)

Learning vocabulary is not interesting. Process is boring, but when you see that you have learned something, then it is very interesting. (S7)

In addition to the general enjoyment of the Anki dictionary, survey results also indicated that learners liked the design of flashcards (mean = 3.8, SD = 1. 06) and the fill-in-the-blanks strategy used to present new words on the first sides of flashcards (mean = 3.6, SD = 0.8). However, they provided some suggestions to make Anki academic dictionary more interesting and effective for their learning. They stated that it would have been better if the dictionary were enriched with more information, such as pronunciations of new words, the meanings of words in learners` native language or pictures.

> I think there are many things that can help to improve Anki. Sometimes, you know I ask you the pronunciations of words. That should be on that. If you add pronunciation, it can be more interesting. If I don`t know the pronunciation, I cannot spell the word. Also, definitions can be clearer and more meanings can be added. (S2)
> I think you can show some pictures to explain definition. You know, some people remember the words by imagining them and also you can also add some pronunciation about the word. So, some people can read it and speak it. Just know the definition, they cannot speak. (S6)

Some of the participants indicated that Anki could have helped them better if it had a ‘typing’ feature. They said that they did not find any chance to practice the spelling of the works and just reading the flashcards could not help them.

> We should type it. If I type the word, I can learn it better. If I type ‘indicate’ without ‘i’, it should show answer ‘indicate’ so that I can learn spelling. (S4)
> But I prefer to write down the word, I used to write down. It`s my personal problem. Sometimes, I try to write essays in my laptop, but I cannot write. If I have a pen and paper, I can write down, but I cannot write by using laptop. It`s my problem. At first, I need to write down and then type it. (S8)

Although there were some suggestions given by learners to make the Anki dictionary more effective, the participants indicated that they would use Anki again in the future for their vocabulary learning (mean = 3.7, SD = 0.9) and they were positive about the integration of this type of tool into language classrooms (mean = 3.7, SD = 1.09). The observational data also supported these findings. Although it was obvious to me that participants were not using the Anki academic dictionary outside of the class, they were careful about bringing their laptops to classrooms and reviewing vocabulary regularly in the classroom. Learners did not have enough motivation to use Anki on their own, but they were trying to keep up with reviewing during the class hours. When they were asked whether they would Anki in the future, their responses were;

> I think I will use it if I have examples like this. If the teacher gives us the example dictionary, because I am lazy. If I need to type everything, I will be too difficult for me. (S1)
> Actually, it depends. If there is a word list suitable, I can do that. But I think……Because you know, I cannot find the right word list for me. I do not know which word list I need to study. Also, I am a little bit lazy, so probably I will not do because it will take a lot of time to put words into Anki. If teacher prepares a dictionary, I can study it (S4)

Most of the learners stated that they would think about using other Anki dictionaries in the future if they were prepared by teachers. However, learners indicated that preparing their own dictionary by using Anki would take a lot of time and they were not knowledgeable enough to decide which words to study. So, most of them were hesitant to give a positive answer when they were asked whether they would prefer to create their own dictionary. One of the learners stated that he was not interested in creating his own dictionary because it was very complex for him (S4), while another student said, "If I read the word like the definition and example sentence, I think it is fine but if I put definitions and example sentences by myself, it is hard. It needs to take long time" (S7).

To sum up, learners found learning academic vocabulary with Anki enjoyable and liked trying a new learning strategy. They want to use it again in the future if they can find some good dictionaries prepared by others, but they are not willing to prepare their own dictionaries. So, they are positive about integration of the tool into language classrooms if the teacher prepares the dictionary for them. Although they indicated that Anki academic dictionary was not interesting enough for them, they liked the design of the dictionary. They suggested that it could be improved with different options such as a pronunciation option, pictures and more detailed information about new words.

CONCLUSION

There were two research questions in this study. The second research question was investigated under three subcategories. So, findings are discussed in four sections. The first research question was "How does the use of Anki (spaced repetition software) affect the academic vocabulary learning of college-level ESL students?" The vocabulary levels test results showed that the process of learning academic vocabulary with Anki helped college-level ESL students to improve their academic vocabulary. This finding corresponds with the claims of Laufer (2005) and Schmitt (2008), who indicate that explicit vocabulary learning helps learners to gain greater amount of vocabulary in a short period of time in addition to a better chance of retention. Learners practiced about two hundred academic words in three weeks and their scores increased significantly. Although the intervention process affected each learner`s success at different rates, all learners scored at least 15 out of 30 which means that they become proficient in almost half of the *Academic Word List.*

The second research question was "What are the college-level ESL students` perceptions about learning academic vocabulary with Anki?" Learners` perceptions about use of the flashcard program for vocabulary learning were categorized under three subheadings: *usefulness, usability, and enjoyment.*

Regarding the learners` perceptions about the usefulness and usability of the program, the results suggested that learners found learning academic vocabulary with Anki useful and they found the program useable. These findings support many researchers` claims about the usefulness of such flashcard programs in terms of keeping the record of learners` improvement for a certain amount of time and arranging the order of words which enable learners to see and practice difficult words more often (Nakata, 2008; Pyc & Rawson, 2007). By using Anki, learners did not spend time arranging review schedules. Anki organized the reviewing process and presented the words in a planned manner according to the review options chosen by each learner.

In addition, learners also found different components of the Anki dictionary useful, such as example sentences and definitions of the words. The findings showing that example sentences facilitated the learning process coincides with other researchers` findings indicating that example sentence in vocabulary learning supports both

the learning process and retention in the long run (Baicheng, 2009; Laufer & Shmueli, 1997; Cobb, 1997). These results were also in line with the findings of the preproject questionnaire. Before the intervention, there was a clear agreement among learners with the notion that computers and internet could help them improve their vocabulary. At the end of the project, learners also reported that they found Anki useful and they had improved their academic vocabulary since they started using Anki.

Although learners reported that example sentences and definitions were useable in general, interview data shed light on some possible problems regarding the usability of definitions. Some of the learners complained that the definitions were long and the unknown words made the understanding difficult for them. So, some of the learners were checking their bilingual dictionaries during review sessions which decreased the number of words seen by them every class. This finding implies that special attention should be given to the clarity of the definitions and they should be checked with learners not clear what you mean here before they start reviewing.
In general, learners agreed that Anki was easy to use and they did not report that they had serious technical problems. However, observations and interview data showed that a few of the learners had to wait for a long time to start Anki, which made them review fewer words than other. So, the reasons for this problem should be investigated to provide learners with equal time to review.

Regarding learners` perceptions of enjoyment, learners indicated that they enjoyed learning academic vocabulary with Anki. The findings showed that the intervention process affected learners` enjoyment of learning vocabulary in a positive way, because they were very sure of the fact that they did not enjoy vocabulary learning before the project as it was shown by the preproject questionnaire (See table 3.2). Integration of a computer-based flashcard program into the academic vocabulary learning process changed learners` attitudes toward vocabulary learning to a great extent. Hence, language teachers should be aware of the fact that ESL learners think that learning vocabulary is both a difficult and boring process, but they can change their learners` negative perceptions about vocabulary learning by adopting new strategies, such as technology integration into learning and teaching as in this study. This finding is also supported by other researchers who indicate that students love to use different technologies and technology use can create positive attitudes in learners (Oblinger, 2005).

Even though technology integration into vocabulary learning changed learners` perceptions and helped them to enjoy learning, survey results showed that they were not so sure about whether learning vocabulary with Anki is interesting or motivating. This may result from the limitations of the Anki academic dictionary that the researcher created according to the needs of this specific group of learners. The research suggests that computer-based flashcard programs can increase learners` motivation to a great extent by presenting various multimedia possibilities (Nakata, 2006; Allum, 2004; Hulstijn, 2001; Nation, 2001). However, this study focused on the spaced repetition aspect of the flashcard program and the flashcards used in this study did not integrate multimedia capabilities. The participants also indicated this deficiency stating that program could be more interesting for them if the pronunciations of words were provided in addition to the definitions of the words and example sentences. This finding implies that flashcard programs to be used in language classrooms can be made more interesting and motivating for learners if multimedia options of them are adapted according to the needs of learners. Language teachers can integrate audio files for pronunciation or pictures into flashcards according to the proficiency level of their learners.

Overall, this study found out that flashcard programs are promising for vocabulary learning in terms of giving ESL learners a chance to organize their vocabulary learning based on the spaced repetition (Baddeley, 1999; Nation, 2001). Language teachers can integrate a recycling process into vocabulary learning by means of Anki, based on Schmitt`s (2008) suggestion that language teachers and material writers think about vocabulary learning in longitudinal terms and recycle new words in an organized way. The spaced repetition tool used for this study, Anki, helped academically oriented college-level ESL students improve their academic vocabulary and changed their negative perceptions about vocabulary learning. Learners found Anki useful, usable and enjoyable. However, learners prefer to use it with the guidance of a teacher instead of creating their dictionaries for their future study. As a result, language teachers should be aware of the potential of these programs and have their students notice that these kinds of tools are available for their vocabulary learning.

LIMITATIONS OF THE STUDY

The study has limitations related to the design of the study. First of all, only one-group pretest/post-test scores were compared. Even though test results indicated that the learning process with Anki improved learners` academic vocabulary knowledge, it is not possible to say that Anki was the only reason why learners` test results increased considering that these learners attended four different language classes every day to prepare them for their future academic study and they lived in a community where English is spoken. So, there is a high possibility that these other factors might also have affected the overall post-test scores.

Also, a convenience sample which came from the researcher`s own classes was used and there was a limited number of participants, which lead to use of descriptive statistics instead of inferential statistics. As a result, it is difficult to generalize the findings to a broader population.

SUGGESTIONS FOR FURTHER RESEARCH

Based on the results of this study, several suggestions for future research arise. First of all, as only receptive vocabulary knowledge of learners was measured in this study, further research is needed to investigate the effect of the intervention on learners` productive vocabulary knowledge. For this purpose, other assessment instruments need to be included in the study, where learners can use the words for productive purposes. Second, since the findings of the study suggested that the integration of different multimedia options into the Anki dictionary could change learner`s perceptions, it is important to investigate the possible effects of these options on learners` overall success and perceptions. Thus, a new Anki dictionary should be designed based on the recommendations of the learners and it should be tested with another group of participants.

Third, the effect of learning vocabulary with Anki on learners` language proficiency in different language skills such as speaking or reading should be evaluated. For example, the pronunciation of words can be recorded and incorporated into the dictionary by using the audio feature of Anki and its effect on learners` speaking ability can be assessed with various speaking activities.

In addition, the effectiveness of the flashcard program can be investigated in a study in which learners design their own Anki dictionaries by using different options and then review their dictionaries instead of the one created by the teacher. As some learners indicated that they could learn better if they typed the words themselves, this type of a study can make learners explore the tool better and prepare them for autonomous learning process.

All in all, although the data revealed that flashcard programs are effective for vocabulary learning, necessary changes to the design of the dictionary should be made and further research is recommended to be carried out with a larger sample size so that the findings can be generalized to the population.

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