Integrating a computer-based flashcard program into academic vocabulary learning

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Integrating a computer-based flashcard program into academic vocabulary learning

by

Cennet Altiner

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

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ABSTRACT

The main goal of this thesis 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.
CHAPTER 1. 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). As a teacher of English, the same situation was also true for me. Since the first day of my teaching, I saw my IEOP (Intensive English and Orientation Program) students trying to improve their vocabulary with different techniques to prepare for the TOEFL (Test of English as a Foreign Language) with the aim of starting their academic study in U.S. universities. I very often heard them complaining about the difficulty of vocabulary learning. Some motivated learners were trying to overcome that difficulty just by memorizing word lists or vocabulary books which include long lists of vocabulary items presented with their first language (L1) meanings. On the other hand, the learners who did not have enough motivation to study vocabulary lists were just ignoring vocabulary learning, which affected their overall language proficiency to a great extent.

Every time I reminded them of the need to focus on vocabulary learning, they were asking me the best way to study vocabulary, but I did not have an alternative to suggest them as an effective way other than the traditional methods which I used for my own vocabulary learning. This problem made me look into the research about vocabulary learning and teaching more closely and try to find an answer to my learners’ question.
Considering the needs of this specific group of learners who wanted to begin their university study soon after passing TOEFL, I was trying to find both an effective and efficient way of learning vocabulary. The second language research indicated that learning new vocabulary through reading could be an important way of acquiring new vocabulary (Day, Omura, & Hiramatsu, 1991; Dupuy & Krashen, 1993). That was the method that I was using in my reading classes, but it was not fast enough to help those learners to get ready for their tests in one semester. On the other hand, Schmitt (2008) and Laufer (2005) support the idea that intentional vocabulary learning with an explicit focus was faster and a more effective way of learning compared with incidental vocabulary learning. Taking into consideration that these learners want to start university as soon as possible by proving that they are proficient in English, I found that explicit vocabulary teaching would help them more, so they would improve their vocabulary in a shorter amount of time.

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). So, I decided to investigate if one of those flashcard programs could help my learners.

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). As a result, I
decided to create an Anki dictionary to be integrated into the classes that I teach by using the principles and findings of the second language vocabulary learning research and check the effect of it on learners` vocabulary development.

Research Questions

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). With this study, I will try 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?

Organization of this study

This thesis uses the traditional format. Chapter 2 provides an overview of the key principles of vocabulary acquisition upon which Anki academic dictionary is founded. Chapter 3 describes the materials and the methods used in the study, including participants, instruments, procedure and the methods for the analysis of the data. Chapter 4 presents the results of the study for each of the research questions and chapter 5 concludes the study with limitations and implications of the study and provides suggestions for further research.
CHAPTER 2. LITERATURE REVIEW

Vocabulary knowledge has a big effect on second language learners’ general language proficiency and it is a prerequisite for mastering a language. Although there are many different methods and techniques available for vocabulary learning in the literature, teachers still have difficulty in choosing an appropriate method according to the needs of their learners (Nation, 2001; Schmitt, 2008). So, the main goal of this literature review is to offer teachers some ideas for effective vocabulary teaching and provide a good rationale for integrating a computer-based flashcard program, Anki, into ESL classrooms.

This review of literature addresses several topics related with second language vocabulary learning. First, the question ‘What vocabulary should college-level ESL learners acquire?’ is answered and effective ways of presenting target vocabulary are dealt with in the second section. The next two sections focus on some basic principles of explicit vocabulary teaching, which include noticing, repetition and retrieval processes, and a strategy combining all these principles, which is word card usage. In the final section, the role of computer-based flashcard programs in vocabulary learning area is explored, since this action research project will investigate the effectiveness of the popular flashcard program called ‘Anki’.

Target Vocabulary for ESL Students

The first concern in direct vocabulary teaching is to determine which words should be studied. The research in vocabulary learning and teaching shows that there are 2000 words that make up the core vocabulary of English (Nation, 2001; Schmitt, 2000). The list that is used to identify these basic words is West’s (1953) classic General Service List (Nation, 2001; Read, 2004). So, Nation (2001) states that the first priority of ESL learners should be
mastery of this list because these 2000 words have been shown to make up 80 percent of English words used in written or spoken text.

When college-level ESL students master the General Service List (GSL), they need to pay attention to subtechnical words occurring across a wide range of academic texts (Coxhead 2000; Nation & Hwang, 1995; Read, 2004). An important contribution to this approach is Coxhead’s (2000) Academic Word List, which was derived from a corpus of around 3.5 million words from four disciplines: arts, commerce, law, and science. Coxhead (2000) used this corpus to find out the range of occurrence of particular words and came up with a list of 570 word families. Coxhead’s analysis is especially important for academically oriented ESL learners because this list covers 10 percent of the words beyond the 76 percent coverage achieved by the General Service List (Read 2004). Nation (2001) notes the importance of learning Academic Word list because:

With a vocabulary of 2000 words, approximately one word in every five will be unknown. With a vocabulary of 2000 words plus the Academic Word List, approximately one word in every ten will be unknown which is an important change. (p. 17)

As it is stated in the literature, the Academic Word List (AWL) is so important that teachers and learners should spend enough time on it and it should be used to set up goals for courses and included in teaching and learning materials (Coxhead, 2000; Nation & Hwang, 1995). The next section will highlight ways that this list has been integrated into language classroom.
Incidental Vocabulary Acquisition vs. Intentional Vocabulary Learning

The distinction between incidental and intentional learning of vocabulary has been influential in this research area for a long time. The main issue is to what extent learners gain new vocabulary incidentally as a part of their main learning activity than by means of an activity which is designed to enhance vocabulary knowledge.

Second language (L2) research shows that ESL learners may incidentally acquire new vocabulary through reading and this process may play an important role in L2 vocabulary acquisition (Day, Omura, & Hiramatsu, 1991; Dupuy & Krashen, 1993). L2 studies looking into incidental learning have shown that incidental learning is a gradual process in which repeated encounters are needed to learn words (Horst, Cobb, & Meara, 1998; Rott, 1999; Waring & Takaki, 2003).

It has been assumed that in a setting where communicative approach is used for language teaching, learners can gain new vocabulary without any need for pedagogical intervention. However, Read (2004) claims that the research no longer supports this position. Swanborn and de Glopper (2002) showed that the readers’ purpose and level of reading ability influenced the incidental learning of new words. In a research study carried out by Vidal (2003), university students in Spain retained a small number of words one month after viewing videotaped lectures in English. The learners retained only the words that were central to comprehending the lecture topic or the ones that the lecturer explicitly elaborated on. From a psycholinguistic perspective, Hulstijn (2001) indicates that “it is the quality and frequency of the information processing activities (i.e., elaboration on aspects of a word’s form and meaning, plus rehearsal) that determine retention of new information” (p. 275).
Although research demonstrates that learners can gain new vocabulary from incidental exposure to some extent, intentional vocabulary learning with an explicit focus almost always results in greater and faster vocabulary gains as well as a better chance of retention (Schmitt, 2008). In a number of studies reviewed by Laufer (2005), explicit exercises led to 33-86% of the words being learned. In her own studies, Laufer (2005) reported that students learned 70 percent of the new words that were on posttests immediately after explicit vocabulary exercises. Although the percentage decreased to 21-41% on two-week delayed posttests, the results were better than the incidental learning outcomes (Laufer, 2005). Similar to Laufer’s (2005) findings, Smith (2004) indicated that target vocabulary that was emphasized in activities on an internet chat program were remembered well both on posttests and one-week delayed tests.

Considering the results of the studies reported here, one might consider that explicit vocabulary teaching would be an important part of a language classroom. However, the research in this area shows that this is not always the case. As a result of a case study into two Asian contexts, Tang and Nesi (2003) report that explicit vocabulary teaching is not so common in language classrooms. Besides, research shows that teachers do not use many new words in their lessons so that learners with repeated exposure to high-frequency words (Meara, Lightbown & Halter, 1997).

Based on these findings, we can see that language programs should have an explicit vocabulary teaching component which consists of direct vocabulary teaching activities and incidental vocabulary acquisition should be a complementary activity to intentional vocabulary learning (Baicheng, 2009; Nation 2001; Schmitt, 2008).
The following section will explore the necessary steps for vocabulary learning, starting with the role of ‘noticing’.

The Role of Noticing in Vocabulary Learning

Noticing means giving attention to a new word. To acquire new words, learners should be aware of them and understand that they are useful for their language learning (Ellis, 1991; Nation, 2001; Schmidt, 1990). On the other hand, Krashen (1989) strongly contradicts this argument with the Input Hypothesis: “Language is subconsciously acquired-while you are acquiring, you do not know you are acquiring; your conscious focus is on the form, not form” (p. 440). Many language researchers do not think that the Input Hypothesis is appropriately applied to second language vocabulary acquisition (Laufer & Hulstjin, 2001; Pigada & Schmitt, 2006). Schmitt (2000) states that passive language learners who wait patiently for involuntary actions to trigger noticing will be unsuccessful learners because learning will happen very slowly.

People in the language learning area generally try to facilitate learners’ noticing by using different techniques such as textual enhancements (Coxhead, 2008). Noticing can happen while learners are reading a text, during a discussion or in situations where learners understand that the new word is filling a gap in their knowledge (Ellis, 1990). Besides, learners can notice new vocabulary while looking up a definition in a dictionary or deliberately studying a word (Nation, 2001).

However, the noticing of unfamiliar words is not enough alone to help learners acquire new vocabulary effectively. The research presents many different factors affecting
vocabulary learning. Repetition is another important aspect associated with vocabulary learning.

**The Role of Repetition for Vocabulary Learning**

*Repetition* is an indispensable part of vocabulary learning. Studies in the psycholinguistic area have also supported the role of repetition in learning vocabulary. De Groot (2006) indicated that Dutch students learned from 43% to 70% of the target words on a one-week delayed test after six 10-second exposures to translation pairs and three receptive tests. Although the duration of those meetings with target words was short, it was obvious that repetition helped learners acquire most of the new words.

However, the number of repetitions that learners need to learn a new word remains controversial. First of all, learners can acquire certain kinds of new words more easily than others such as concrete nouns which require fewer repetitions compared with other abstract nouns. In addition, certain knowledge of a new word is more easily learnable than other aspects of the same words. For example, the form of a new word can be learned through repetition, but learners need to see target words in context to be able to learn the meaning of them (Coxhead, 2008; Horst et al., 1998).

The biggest reason why researchers cannot agree upon an exact number of repetitions learners need to acquire new vocabulary is related with learner-dependent factors. The number of repetitions needed to learn new vocabulary will be different for learners based on their language background and the knowledge base from which they approach the target vocabulary. If a target word is familiar to the learner to some extent, the learning burden will
be quite light. However, if it is too unfamiliar, the learner will spend more time trying to learn the new word. In addition to familiarity, the variation in motivation and language-learning aptitude can also affect the number of repetitions needed for different learners (Nation, 2001).

Considering all the variables discussed, one can understand why the research literature dealing with the issue of how often learners need to encounter new words differs so widely, from 6-20 repetitions (Webb, 2007a). In his brief overview of the related studies, Nation (2001) found that a range of from five to more than 20 repeated meetings were necessary for learners to acquire new words according to different criteria.

Webb (2007a) indicated that at least ten repetitions of target words can produce sizable gains in vocabulary knowledge, although more than ten repetitions many be needed to develop full knowledge of a word (Horst et al., 1998). Horst et al. (1998) found that initial repetitions led to learners` acquisition of a word`s spelling, grammatical function and syntagmatic associates and productive knowledge of its paradigmatic associates. Further repetitions were needed for learners to understand the meaning of the target word. Even after learners grasped the meaning of the target word, repetition led to improvement of learners` receptive and productive knowledge of syntagmatic and paradigmatic associates. Webb`s (2007a) findings support Nation`s (1999) claim that there is no set number of repetitions that will ensure learning.

Although researchers do not agree on an exact number of repetitions for vocabulary learning, they all emphasize the role of the recycling process. Nation (1990) noted that “disregarding the exact number of repetitions required, the important point is that recycling is
necessary and if it is neglected, many partially learned words will be forgotten, wasting all 
the effort already put into learning them” (p. 45).

Schmitt (2008) also claims that recycling should be carefully integrated into 
vocabulary learning programs. He criticizes language teachers showing new lexical items 
one and then forgetting them because he thinks that most of the learners will likely do the 
same thing. Thus, his suggestion for teachers and material writers is to think about 
vocabulary learning in longitudinal terms and recycle new words in an organized way. 
Spaced repetition is one of the ways suggested for organizing vocabulary learning.

Spaced Repetition

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 allows 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).

In addition to the spacing of repetitions, the nature of repetition is another important factor that affects the learning process of target words. The next section will highlight the role of retrieval process in vocabulary learning.

*The Role of Retrieval Process in Vocabulary Learning*

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. The strategy of using word cards for vocabulary learning will be examined in the following section.

Learning from Word Cards as a Vocabulary Learning Strategy

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.
As mentioned earlier, the retrieval process is an indispensable part of flashcard learning. 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.

It is true that using word cards give 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). The following section will explore the possibility of using computer-based flashcard programs for vocabulary learning.

*Computer-based Flashcard Programs*

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 leaners’ 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).
There are so many electronic flashcard programs designed following the rules of this system. Although *SuperMemo* is one of the most well-known flashcard programs, it is criticized in the literature because of the difficulty to customize it. A program becoming more popular is *Anki* (Godwin-Jones, 2010).

With *Anki*, word cards can be designed in a variety of ways and different options such as pictures, graphics, and pronunciation of words can be added to them. 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).

**Summary**

Vocabulary knowledge forms the basis of second language learners’ general language proficiency. When learners master the General Service List which includes the most common 2,000 words in English, academically oriented ESL learners need to work on the Academic Word List. Although these facts are well-known by teachers, leaners, researchers and material developers, it is unclear the best way to achieve success with these word lists (Schmitt, 2008). Studies on both incidental and intentional learning of vocabulary still continue.
The research shows that incidental learning can help language learners to some extent (Day, Omura, & Hiramatsu, 1991; Dupuy & Krashen, 1993), but if it is not supported with other direct teaching materials, it will not be helpful enough to help learners master necessary vocabulary. Current studies suggest that teachers should pay attention to explicit vocabulary teaching which can encourage learners to acquire a lot of new words in a short time (Tang & Nesi, 2003).

Language teachers should be aware of different components of intentional vocabulary learning process for effectively integrating of explicit vocabulary teaching into classrooms. As a first step, teachers should help learners notice the target vocabulary and understand the importance. Then, repetitions of target words should be organized carefully. Instead of massed repetition and word lists, learners should be encouraged to use spaced repetition and word cards, so they can go through retrieval process which guarantees a better learning (Nation, 2001).

However, if learners are not aware of effective strategies to implement spaced repetition with word cards, they may not be successful. The solution to this problem can be using a computer-based flashcard program. Flashcard programs can offer many advantages for learners that paper-based programs cannot (Nakata, 2008; Pyc & Rawson, 2007). Considering the empirical studies that states the effectiveness and efficiency of using flashcards for vocabulary learning (Fitzpatrick, Al-Qarni, & Meara, 2008; Nation, 2001), it seems worthwhile to investigate using computer-based programs for this purpose. The following chapter will explain the methodology used for this study and how Anki, a spaced
repetition, can be integrated into language classrooms to help learners with their academic vocabulary learning.
CHAPTER 3. METHODOLOGY

In Chapter 3, the data collection methods and materials used in this study are described. First, participants and their perceptions about vocabulary learning in general are described. Second, the materials and procedures used in the data collection are presented. Then, the chapter concludes with the data analysis methods used for each research question.

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 before the beginning of the every 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.
Participants

Participants in this study included 13 intermediate-level students in my ESL reading and writing classes in the Intensive English and Orientation Program (IEOP) at Iowa State 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 3.1), 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 3.1 Test results of learners at 2000 word level part of the Schmitt, Schmitt, and Clapham’s (2001) Vocabulary Levels Test, Version 2

<table>
<thead>
<tr>
<th>Participants</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 word level test results</td>
<td>23</td>
<td>21</td>
<td>28</td>
<td>25</td>
<td>18</td>
<td>16</td>
<td>25</td>
<td>26</td>
<td>30</td>
<td>22</td>
<td>25</td>
<td>24</td>
<td>*</td>
<td>23.5</td>
</tr>
</tbody>
</table>

* Stands for missing data
According to their responses to pre-project survey (results are summarized in Table 3.2), 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 3.2 Pre-project survey responses

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

Materials

*Description of the spaced repetition program (Anki)*

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 as 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 3.1).

![Figure 3.1 Screen shot of the Anki interface](image-url)
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, require 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 my 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). 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.

_How to Use Anki Dictionary_

The main purpose of the Anki dictionary is to help learners to organize their academic vocabulary learning by using spaced repetition. The research both in memory and second language learning area shows that spaced repetition is more effective than massed repetition and it ensures more permanent learning (Nation, 2001). According to the spaced repetition learning system, most of the forgetting will happen immediately after the first encounter of a new word. The next time, the target word can be remembered for a day or two. However, the time after that, the learner will probably remember it for a longer time. Thus, the main role of Anki is to schedule review times for learners just before the learner is expected to forget the target word by using a spaced repetition learning system. It is an important opportunity for learners compared with other traditional flashcard systems in which learners decide when to practice cards.
After a learner looks at the vocabulary question on a flashcard, s/he thinks about the answer for a while to recall the correct answer. The suggested time frame to answer a question is 10 seconds. When the learner is ready, ‘Show Answer’ option should be chosen and the following options on the flashcard will show up (See figure 3.2)

Now, learners need to choose one option according to how well they remembered the target item. Although learners perform the same action for each question, labels on the four options will change according to how well the learner got the card right last time

Figure 3.2 the Design of the Anki Academic

Figure 3.3 Different labels for questions
The meanings of labels are explained on the website as in the following part

(http://ankisrs.net/docs/manual.html):

1. **Again**
   The card will be shown again shortly - within 10 minutes with the default settings.
   You can use this button if you’ve forgotten the answer, and you can also use it if you remembered, but felt it was too difficult and want to practice again.

2. **Good / Hard**
   Wait a little bit longer before showing the card next time, and tell Anki to be more conservative in the future. Best used when you are able to answer correctly but not with speed/confidence.

3. **Easy / Good**
   Wait a fair bit longer before showing the card next time, and tell Anki the last interval was about right.

4. **Very Easy / Easy**
   Wait a lot longer before showing the card next time, and tell Anki to be less conservative in the future.

Every time the learner remembers a word correctly, s/he will see the same word again after a longer time period. For example, if the card is too difficult, the learner can choose the option ‘Again’ which means that the word is not remembered well, so this card is shown to learner again just before the end of the reviewing session. This time learner clicks on ‘Good’ to see the same word the next day again. On the other hand, another learner can already know the answer for the card, so s/he can choose ‘easy option’ which means that this card will be shown again in 3-5 days. Each time the learners answer the card correctly, the times will grow according to the chosen options.
How to Choose New Cards

By default, 20 new words are introduced to learners every day. However, they have the option to choose how many cards they want to review each day. For this study, learners are told to review at least 10 words a day, but they have the chance to increase this number according to their own pace. Anki is based on the spaced repetition learning system, which aims at helping learners to review target words for a short period of time every day. However, if they cannot do it at some point, they can set ‘New Cards/Day’ part as 0 when they open it next time which will prevent any new cards from being shown, so learners will not have too many new items to review a day.

Display Order

By using the box under the ‘Display Order’, learners can choose how to see new cards every day. New cards can be seen in the order they were added, in reverse order, or in random order. Also, the second box allows them to choose whether new cards should be shown before review, after review, or in a mixed order. Seeing new cards before the review
session of old ones is not suggested on the website because it can cause learners to become too much overwhelmed at the beginning.

Considering these points, all participants in the study were told to choose ‘show new cards in order added’ for the first box to have consistency among all students and ‘show new cards after review’ for the second box, so they all reviewed previous items first and then started learning new cards later on.

*How to arrange review options*

![Review options](image)

*Max Failed Cards*

By default, Anki stops showing reviews or new cards when the failed cards count reaches 20. Users can also change this option by increasing or decreasing the number. Participants in this study used this part as the default.

*Display Order*

The order of the cards due for review is controlled by the first option and the options in the first box are explained in the user manual ([http://ankisrs.net/docs/manual.html](http://ankisrs.net/docs/manual.html)). Participants in this study used the first display order as ‘review cards from largest interval’, which means that cards learners know well and haven’t seen for a long time are shown first,
so a review session starts on a more positive note. The second box, on the other hand, controls the delay after pressing the "Again" answer button. “Show failed cards soon” option was used for the second box, so participants were able to see the failed cards at the end of 10 minutes again.

Arrange session limit

![Figure 3.6 Screenhot of ‘timeboxing’ option](image)

With the ‘timeboxing’ option, learners can arrange their study sessions according to their preference. For this study, 10 minutes of each class is given to learners, so they were asked to set ‘Session limit’ box to 10.

Data Collection Instruments

Both quantitative and qualitative instruments were used to collect data to address the research questions.
Table 3.3 Research questions and data collection instruments

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

**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. Some examples of the test questions can be seen in figure 3.7.

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 (see Appendix B).

<table>
<thead>
<tr>
<th>2,000 Word Level</th>
<th>Academic Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 copy</td>
<td>1 area</td>
</tr>
<tr>
<td>2 event</td>
<td>2 contract</td>
</tr>
<tr>
<td>3 motor</td>
<td>3 definition</td>
</tr>
<tr>
<td>4 pity</td>
<td>4 evidence</td>
</tr>
<tr>
<td>5 profit</td>
<td>5 method</td>
</tr>
<tr>
<td>6 tip</td>
<td>6 role</td>
</tr>
</tbody>
</table>

Figure 3.7 The first 6 of 30 questions for the 2000 and Academic Vocabulary lists from Schmitt, Schmitt, and Clapham’s (2001) Vocabulary Levels Test, Version 2
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.” (see Appendix C).

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 completed survey is presented in the Appendix D.

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 related with 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.

The list of interview questions is presented in the Appendix E. Some of these questions:

1) Do you think Anki helped you increase your academic vocabulary?
2) What did you enjoy the most about using Anki for academic vocabulary learning?
3) What did you enjoy the least?
4) Would you prefer to use Anki for your future vocabulary learning?
5) How do you think Anki academic dictionary could be made more useful for your vocabulary learning?

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.
An example observation note written immediately after the classes

March 22, Tuesday

Reading Class: Students were all very silent during review session and seemed to focus on new words. John was again writing the new words, he believed that he would learn better if he could write the new words somewhere. Steve was reviewing words faster than other. It seemed to me like he was not paying enough attention to words. After the class, John told me that he is reviewing 200 words from a book every day to be able to pass the TOEFL. I suggested him to use Anki instead of a book and tried to explain he will remember new words for a long period of time if he reviews vocabulary with Anki. He told me that he was used to more traditional methods.

Writing Class: Sally decided to use her cellphones instead of her laptop today because she told me that she still could not open Anki on her computer. She tried to delete and downloaded the program again and again but Anki still cannot open on her laptop. So, she decided to use her cellphone instead of laptop. I think she did not like Anki because she indicated that anki could be a good tool but she liked memorizing words from a book at the end of the class. Vicky asked me how to enter her vocabulary into Anki. It seems like she enjoyed learning vocabulary with Anki and wanted to create her own dictionary. I showed her how to do it. She found it very easy but I don’t know if she will do it or not. I need to ask her.

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.
CHAPTER 4. RESULTS AND FINDINGS

Chapter 4 presents the findings of the data analysis to address the two research questions given in Chapter 1. In particular, this chapter 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 4.1 Paired Samples Statistics

<table>
<thead>
<tr>
<th>Participant</th>
<th>Academic word level pre-test scores</th>
<th>Academic word level post-test scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13</td>
<td>19</td>
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<tr>
<td>2</td>
<td>14</td>
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<tr>
<td>12</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Mean</td>
<td>19.3</td>
<td>23.6</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>6.8</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Measures of central tendency (means and standard deviations) of these two tests were compared and the paired samples t-test was conducted on data obtained from pretest and posttest results. Table 4.2 indicates the results obtained. The asterisk * in the last column

Table 4.2 Paired Samples Test

<table>
<thead>
<tr>
<th>pretest - posttest</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-4.3</td>
<td>3.7</td>
<td>1.0</td>
<td>-3.9</td>
<td>11</td>
<td>.002*</td>
</tr>
</tbody>
</table>

Table 4.2 Paired Samples Test
indicates that the difference between the pre-tests and post-test results was statistically significant at the p<.05 level, which highlighted that there was a knowledge gain during the three-week training. The results implied that learning academic vocabulary with Anki facilitated an increase in academic vocabulary knowledge of college-level ESL learners.

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

- **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 4.3 Perceptions of Usefulness

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

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 4.4 Perceptions of Usability

<table>
<thead>
<tr>
<th>Survey Items</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. It was easy to use Anki.</td>
<td>4.6</td>
<td>0.5</td>
</tr>
<tr>
<td>3. I understood the purpose of Anki clearly.</td>
<td>4.3</td>
<td>0.5</td>
</tr>
<tr>
<td>4. The explanations and definitions of words were clear enough for me to</td>
<td>3.6</td>
<td>0.7</td>
</tr>
<tr>
<td>understand new words.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I used ‘again’, ‘hard’, ‘good’ and ‘easy’ options of Anki to arrange my</td>
<td>4.4</td>
<td>0.5</td>
</tr>
<tr>
<td>vocabulary study.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I have not experienced any technical difficulty with Anki.</td>
<td>3.7</td>
<td>0.8</td>
</tr>
<tr>
<td>16. I think using Anki on the internet is helpful.</td>
<td>3.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

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 4.5 Perceptions of Enjoyment

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

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.
CHAPTER 5. CONCLUSION

This chapter presents the discussion of the findings, describes limitations of the study, and concludes with recommendations for future research about the use of flashcard programs for vocabulary learning.

Discussion

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 described in this thesis 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.
Recommendations

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.
Appendix A. Research Approval Form From IRB

Date: 4/6/2011
To: Cennet Altiner
831-24th Street, #45
Ames, Iowa 50010
CC: Dr. Ann Thompson
N108 Lagomarcino

From: Office for Responsible Research

Title: Expanding Academic Vocabulary with a Spaced Repetition Software
IRB Num: 11-101
Submission Type: New
Exemption Date: 4/6/2011

The project referenced above has undergone review by the Institutional Review Board (IRB) and has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

- You do not need to submit an application for annual continuing review.
- You must carry out the research as proposed in the IRB application, including obtaining and documenting informed consent if you have stated in your application that you will do so or if required by the IRB.
- Any modification of this research should be submitted to the IRB on a Continuing Review and/or Modification form, prior to making any changes, to determine if the project still meets the federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Please be sure to use only the approved study materials in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.

Please note that you must submit all research involving human participants for review by the IRB. Only the IRB may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.
### Version 2 The 2,000 word level

<table>
<thead>
<tr>
<th>1 copy</th>
<th>1 admire</th>
<th>make wider or longer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 event</td>
<td>2 complain</td>
<td>bring in for the first time</td>
</tr>
<tr>
<td>3 motor</td>
<td>3 fix</td>
<td>have a high opinion of</td>
</tr>
<tr>
<td>4 pity</td>
<td>4 hire</td>
<td>someone</td>
</tr>
<tr>
<td>5 profit</td>
<td>5 introduce</td>
<td></td>
</tr>
<tr>
<td>6 tip</td>
<td>6 stretch</td>
<td></td>
</tr>
</tbody>
</table>

| 1 accident | 1 arrange | grow |
| 2 debt | 2 develop | put in order |
| 3 fortune | 3 lean | like more than something |
| 4 pride | 4 owe | else |
| 5 roar | 5 prefer | |
| 6 thread | 6 seize | |

| 1 coffee | 1 blame | make |
| 2 disease | 2 elect | choose by voting |
| 3 justice | 3 jump | become like water |
| 4 skirt | 4 manufacture | |
| 5 stage | 5 melt | |
| 6 wage | 6 threaten | |

| 1 clerk | 1 ancient | not easy |
| 2 frame | 2 curious | very old |
| 3 noise | 3 difficult | related to God |
| 4 respect | 4 entire | |
| 5 theater | 5 holy | |
| 6 wine | 6 social | |

| 1 dozen | 1 bitter | beautiful |
| 2 empire | 2 independent | |
| 3 gift | 3 lovely | small |
| 4 opportunity | 4 merry | liked by many people |
| 5 relief | 5 popular | |
| 6 tax | 6 slight | |
## Version 2  Academic Vocabulary

<table>
<thead>
<tr>
<th>1. area</th>
<th>1. alter</th>
<th>___________ change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. contract</td>
<td>2. coincide</td>
<td>___________ say something is not true</td>
</tr>
<tr>
<td>3. definition</td>
<td>3. deny</td>
<td>___________ describe clearly and exactly</td>
</tr>
<tr>
<td>4. evidence</td>
<td>4. devote</td>
<td></td>
</tr>
<tr>
<td>5. method</td>
<td>5. release</td>
<td></td>
</tr>
<tr>
<td>6. role</td>
<td>6. specify</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1. debate</th>
<th>1. correspond</th>
<th>___________ keep</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. exposure</td>
<td>2. diminish</td>
<td>___________ match or be in agreement</td>
</tr>
<tr>
<td>3. integration</td>
<td>3. emerge</td>
<td>with</td>
</tr>
<tr>
<td>4. option</td>
<td>4. highlight</td>
<td>___________ give special attention</td>
</tr>
<tr>
<td>5. scheme</td>
<td>5. invoke</td>
<td>to something</td>
</tr>
<tr>
<td>6. stability</td>
<td>6. retain</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1. access</th>
<th>1. bond</th>
<th>___________ make smaller</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. gender</td>
<td>2. channel</td>
<td>___________ guess the number or size</td>
</tr>
<tr>
<td>3. implementation</td>
<td>3. estimate</td>
<td>of something</td>
</tr>
<tr>
<td>4. license</td>
<td>4. identify</td>
<td></td>
</tr>
<tr>
<td>5. orientation</td>
<td>5. mediate</td>
<td>___________ recognizing and naming</td>
</tr>
<tr>
<td>6. psychology</td>
<td>6. minimize</td>
<td>a person or thing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1. accumulation</th>
<th>1. explicit</th>
<th>___________ last</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. edition</td>
<td>2. final</td>
<td>___________ stiff</td>
</tr>
<tr>
<td>3. guarantee</td>
<td>3. negative</td>
<td>___________ meaning &quot;no&quot; or &quot;not&quot;</td>
</tr>
<tr>
<td>4. media</td>
<td>4. professional</td>
<td></td>
</tr>
<tr>
<td>5. motivation</td>
<td>5. rigid</td>
<td></td>
</tr>
<tr>
<td>6. phenomenon</td>
<td>6. sole</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1. adult</th>
<th>1. abstract</th>
<th>___________ next to</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. exploitation</td>
<td>2. adjacent</td>
<td></td>
</tr>
<tr>
<td>3. infrastructure</td>
<td>3. controversial</td>
<td>___________ added to</td>
</tr>
<tr>
<td>4. schedule</td>
<td>4. global</td>
<td>concerning the whole world</td>
</tr>
<tr>
<td>5. termination</td>
<td>5. neutral</td>
<td></td>
</tr>
<tr>
<td>6. vehicle</td>
<td>6. supplementary</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C. Preproject Questionnaire

Name: .................................................................

Gender: M or F

Age: .........................

Native Language: .............................

How many years have you studied English at school? ......................

How many months have you been in the U.S.? ..............................

For the questions 1-9, indicate your answer by circling the appropriate number to match your opinion.

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>No opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel comfortable using computers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I feel comfortable using the Internet.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. I often use online resources to improve my English.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I feel comfortable studying English independently.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I think vocabulary is an important part of language learning.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. I know how to study vocabulary effectively.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I enjoy learning vocabulary.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Learning vocabulary is easy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I think computers and the Internet can help me improve my English vocabulary.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix D. Postproject Survey

Participant Name: _____________________________________

For the items 1-20, please circle the number that most closely matches your response to each statement.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Using Anki for vocabulary learning is enjoyable.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>It was easy to use Anki.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>I understood the purpose of Anki clearly.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>The explanations of words were clear enough for me to understand new words.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>Example sentences were useful for me to remember new words.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>I used ‘again’, ‘hard’, ‘good’ and ‘easy’ options of Anki to arrange my vocabulary study.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>I have not experienced any technical difficulty with Anki.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>I learned many new words by looking at the explanations of words.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>I learned many new words by using example sentences.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10.</td>
<td>Learning vocabulary with Anki is interesting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11.</td>
<td>It is motivating to use Anki to learn new words.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12.</td>
<td>I liked seeing example sentence and definition first.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13.</td>
<td>I liked the fill-in-the-blanks exercises for vocabulary learning.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14.</td>
<td>I have already known how to arrange my vocabulary study.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15.</td>
<td>I think Anki can help me improve my vocabulary.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16.</td>
<td>I think using Anki on the internet is helpful.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17.</td>
<td>Anki can help language students learn new words easily.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18.</td>
<td>My academic vocabulary has improved since I started using Anki.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19.</td>
<td>I would use Anki again in the future after this class is over.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20.</td>
<td>This kind of tools should be included in language courses.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Appendix E. Interview Questions

The following questions will be asked during the interview:

- Do you think Anki helped you increase your academic vocabulary?
- Did you find Anki useful for your vocabulary learning?
- Which aspects of it did you find most useful? Which aspects did you find least useful?
- What did you enjoy the most about using Anki for academic vocabulary learning?
- What did you enjoy the least?
- Do you think you improved your academic vocabulary with Anki? If yes, how? If no, what are the reasons? Give specific reasons.
- How did you find the organization of the dictionary used in the classroom? Are example sentences and explanations are clear enough?
- How do you think Anki could be used differently so that it can help you learn words better?
- If you create your own dictionary by using Anki, how would you design the cards different from the cards used in the classroom? What kind of information do you want to add more?
- Did you use Anki outside of the classroom?
- Would you prefer to use Anki for your future vocabulary learning?


Learning and memory of knowledge and skills: Durability and specificity (pp. 132-169). CA: Sage.


