2.1 Studies related to English Vocabulary

2.2 Studies related to Vocabulary in Other Languages

2.3 Synthesis of the Reviewed Studies
Review of Related Studies

The most important aspect of any research is having sound knowledge in the area where the researcher has to do her own study. Review of related studies helps the investigator to know the past studies, their methods, designs, tools, samples, techniques and other features. Reviewing of related studies adds flavor to her present study and gives a clear picture of what should not be done and what should be developed to the need of the modern organization.

The exercise of review allows understanding the contexts of research, to refine the research further and to see how others have approached the task of empirical investigation in terms of methods used (Burnett, 2009). A good literature review will be looking for a collection of sources and it should be a coherent argument of how to interpret the argument of others. There is an important role in synthesizing different peoples’ work on a particular theme and it adds value to this work.

In the present study the investigator made her target towards the works of researchers which have employed acquisition of vocabulary through computer based instruction. She gave prime importance to the studies which were done in English vocabulary.
The reviewed studies are presented as studies related to English vocabulary and studies related to vocabulary in other languages.

2.1 Studies Related to English Vocabulary

The investigator collected 57 studies related to English language vocabulary conducted for two decades (1994-2014). The investigator selected only studies which have contributed to education for strengthening the vocabulary. All the studies were arranged chronologically in descending order. The reviewed studies were categorized into studies at school level and studies at college level.

2.1.1 Studies at School Level

Thirty one studies at school level reviewed by the investigator are abstracted below.

Bataineh (2014) investigated the effect of using web-site games on the route and the rate of Saudi pupils' reading comprehension, vocabulary acquisition, and motivation quantitatively and qualitatively. The sample of the study consisted of forty male pupils from Madinah Directorate of Education. Anwar AL-Faihaa' School was randomly chosen from the total number of basic schools in that directorate in the first semester of the academic year 2011-2012. In that school, there were two sixth grade classes: Section (A) consisted of 20 students and it was assigned as an experimental group, while the other was decided to be a controlling group. It also consisted of 20 students. Data were collected with twelve weeks via a pre-posttest design for equivalent group. The results of the study indicated that students who were taught using web-site games had better results than those who were taught using the traditional method.

Ghamrawi (2014) examined teachers' use of the Multiple Intelligences Theory on vocabulary acquisition by preschoolers during English as a second language (ESL)
classes in a K-12 school in Lebanon. Eighty kindergartners (KG II, aged 5 years) and eight teachers constituted the sample. The study used mixed methods, including observations of videotaped sessions, teacher surveys, and student interviews. Results indicated that (a) students acquired new vocabulary faster using traditional methods of teaching; however, their retention of such vocabulary was significantly weaker when compared with the vocabulary acquired in Multiple Intelligence (MI) classes; (b) the MI profile of the teachers was correlated with their teaching styles and lesson delivery; and (c) teachers who used MI in their teaching also had lower usage of higher order thinking skills.

Lin (2014) investigated whether computer-assisted collaborative learning is comparable with computer-free and individual learning; the study examined each of their effects on learning English vocabulary, followed by an analysis of their behavior patterns. In a junior high school in northern Taiwan, a normal classroom was first equipped with an interactive whiteboard and seven all-in-one touch screen desktop computers. All participants from three intact classes, 76 students in total, were asked to finish five review activities of the target English vocabulary and assigned to one of the following groups: the learning for the group of computer-supported collaboration took place in the technology-supported classroom whereas that of computer-free collaboration and that of computer-free non-collaboration in a normal classroom. The results of the vocabulary tests showed no significant differences among the three groups; those learning English vocabulary collaboratively in a technology-enhanced environment outperformed the other two groups in vocabulary retention. In addition, analyses of the group's behaviours before the touchscreen desktop computers echoed and explained their better performances than the other two groups.
Al-Sharafat (2012) studied on the effectiveness of using website games for learning vocabulary on fifth grade English as a foreign language (EFL) learners' communication skills (listening, speaking, reading, and writing) development. In addition, the study investigates the effect of website game type (context, word search, compound word, recognition, and synonyms and antonyms) on students' communication skills, and the effectiveness of using website games on students' ability for vocabulary retention. To find the differences that may arise because of the treatment conditions in the study, means, standard deviations, ANOVA analysis, t-test, and Scheffe test were used to test hypotheses about differences between two or more means. The findings of the study revealed that website-based instruction showed more improvement on the achievement test in communication skills than traditional instruction. It was also found that the experimental group significantly outperformed the control group in written skills (reading and writing) while there were no significant differences between them in oral skills (listening and speaking). The findings of the study also indicated that the mean scores on the word search game provide the best indicator to students' later performance on the communication skills test. Another finding indicated higher retention level in favor of the experimental group.

Hashemzadeh (2012) investigated whether the elementary EFL learners’ vocabulary retention of the newly learned words significantly differs by using recognition exercises (fill-in-the-blank, and matching) and production exercises (paraphrasing, and glossing) in immediate and delayed vocabulary tests. The study based on 46 Iranian Elementary learners who were studying English in a language Institute participated. Four texts were selected from Elementary Total English book. Each text contained ten unknown words followed by one exercise type. In each session the learners read a text, and then did the following exercises. The meaning of the words was provided
in a mini dictionary. After doing each exercise, the learners were instructed to provide an English synonym, or an English definition, or translation of the word in L1 for each word. Before the test, mini dictionaries were collected. After a two week interval, the participants' vocabulary learning was tested through the final vocabulary test containing all the words presented in four exercise types. The results of comparing four exercise types revealed that learners recalled more words in fill-in-the-blank exercise than other exercise types both in immediate and delayed tests. Moreover, the results indicated that recognition exercises were more effective than production exercises in EFL vocabulary retention.

Hsu (2012) investigated the effects of different display modes of video captions on mobile devices. The study includes non-caption, full-caption, and target-word modes, on the English comprehension and vocabulary acquisition of fifth graders. During the one-month experiment, the status of the students' English listening comprehension and vocabulary acquisition was evaluated on a weekly basis. From the experimental results, it was found that the learning achievement of the English target-word group was as good as that of the full-caption group in terms of vocabulary acquisition, while both groups outperformed the non-caption group.

Huang et al. (2012) studied English vocabulary learning in ubiquitous learning contexts. The study developed a ubiquitous English vocabulary learning (UEVL) system to assist students in experiencing a systematic vocabulary learning process in which ubiquitous technology is used to develop the system, and video clips are used as the material. Afterward, the technology acceptance model and partial least squares approach are used to explore students’ perspectives on the UEVL system. The results indicate that (i) both the system characteristics and the material characteristics of the UEVL system positively and significantly influence the perspectives of all students on the system;
(ii) the active students are interested in perceived usefulness; and (ii) the passive students are interested in perceived ease of use.

Letchumanan et al. (2012) investigated if computer games can expand learners’ vocabulary and improve their writing performance. In testing the research instruments and procedure of a larger project, this pilot study employed only ten Form Four students who had voluntarily taken part in this study and were exposed to two different methods of acquiring vocabulary over a period of fourteen weeks. The study looked at the two methods of vocabulary acquisition through computer games and traditional vocabulary strategies. The first method involved the subjects playing computer vocabulary games from the Internet for seven weeks. In the second method they employed traditional vocabulary strategies such as using a dictionary, contextual clues and semantic mapping for the next seven weeks. The extent of the subjects’ vocabulary acquisition in the two methods was measured by using the pre and post vocabulary tests and two written essays which indicate a significant difference between the pre and post vocabulary tests. However, no significant difference was found between the two essays in terms of vocabulary richness.

Mustafaa (2012) studied vocabulary learning with new words while reading or listening tasks in class. This study investigated whether the technique of using computer as a tool assist the learning of vocabulary among second language learners in a suburban secondary school in Malaysia. The method involved pre-test and post-test for both experimental and control group of second language learners. Findings suggested that the experimental group showed great result in learning vocabulary using computer.

Nakata (2011) conducted a comprehensive investigation of flashcard software for learning vocabulary in a second language. The study has shown that existing flashcard programs have some room for improvement. More specifically, most programs are
limited in their ability to support data entry, increase retrieval effort and promote generative use of target words. When individual programs are compared, flashcard method seems to be the best program among those investigated. It offers the most comprehensive support for data entry automatically generates distracters for multiple-choice exercises and increases retrieval effort by systematically introducing various types of exercises. The variations among the programs in their design suggest that there are no commonly accepted guidelines for how flashcard software should be designed. The Results suggest that in general, most programs have been developed in a way that maximizes vocabulary learning. For instance, seven of the nine programs allow flashcard creation, offer multilingual support and allow learners to add contexts, audios or images to flashcards. Furthermore, eight programs provide various types of exercises, and nine programs support scheduling.

Puhalla (2011) examined the effects of instructional intensity on the acquisition of storybook vocabulary in first graders. The study showed 44 identified as at risk and 22 as average-achieving peers. Students identified as at risk were randomly assigned to either a booster group, where they received explicit instruction of selected storybook vocabulary, or a no booster group, where they received vocabulary instruction in the context of read aloud through an experimental Read Aloud curriculum. A repeated measures design was employed to compare the effects of the intervention. Results indicate that students in the booster group significantly outperformed the students in the no booster and average-achieving peers groups on storybook vocabulary measures.

Taboada (2011) explored the extent to which two instructional frameworks that varied in the explicitness of academic vocabulary instruction. The study highlighted comprehension vocabulary instruction (CVI) framework, four reading comprehension strategies were integrated with two autonomy-supportive (motivation) practices and
implicit instruction of academic science vocabulary. In the intensified vocabulary instruction (IVI) framework, students experienced explicit instruction of academic science vocabulary in relation to reading, without explicit strategy instruction or attention to autonomy supports. Results indicated that the IVI framework increased students' academic vocabulary even 3 weeks after the intervention was over, whereas CVI benefited students' reading comprehension as well as their perceptions of autonomous learning in the classroom.

Matsuoka and Hirsh (2010) studied the vocabulary learning opportunities in an ELT course book designed for upper-intermediate learners. All the words appearing in the 12 chapters of the text were analyzed. The study suggested that the text would provide opportunities to deepen knowledge of the second 1,000 most frequent words in English, and would provide a context for pre-teaching of academic words met in the text for learners on an academic pathway. The results concluded that the text would provide minimal opportunities for learners to develop vocabulary knowledge beyond high frequency and academic words.

Ulanoff (2014) investigated the gains made in second language vocabulary as a direct result of different literacy lessons implementing two bilingual methodologies: concurrent translation and preview-review. Students in the three randomly selected third-grade classes in the Los Angeles area were chosen to serve as the control (no treatment), concurrent translation, and preview-review groups. The children were given a pre-test to assess their knowledge of selected vocabulary items. After the administration of the pre-test students in Group 1 (control) listened to a story in English with no intervention or explanation of the story. Students in Group 2 listened to the same story in English with the reader using the concurrent method (translating the story from one language to the other). Group 3 heard the same story in English after the teacher built background
knowledge by previewing important points and difficult vocabulary in Spanish (preview). They also reviewed the story in Spanish after the reading in order to reinforce important points (review). All three groups were given a post test of the same vocabulary items after the treatment and one week later to examine gains in scores. Results indicate that not only did the students in the preview-review group score significantly higher than the control and concurrent translation groups, but also the concurrent translation group scored the lowest of all three groups and improved slightly one week after treatment. These findings demonstrate positive implications for the use of strategies which build background knowledge as a means of teaching second language vocabulary to English learners.

Verhallen (2010) examined the effects of video storybooks on the receptive and expressive vocabularies of 5-year-old children. Children (N = 92) were exposed repeatedly to the digital storybook. The study was presented with either static or video images. Children in the control condition played with a nonverbal computer game. Children's receptive and expressive book-based vocabularies were assessed. Results reveal that children learned words receptively and expressively; however, the children seldom learned the same words both ways. Both treatments benefited receptive and expressive vocabularies; however, readings with the addition of video were found to be especially effective for expressive L2 vocabulary acquisition.

Acha (2009) investigated the effect of three different presentation modes in children's vocabulary learning with a self-guided multimedia programmes. The study indicated 12 key (previously unknown) words in the story, children received verbal annotations (written translation), visual annotations (picture representing the word), or both. Recall of word translations was better for children who only received verbal annotations than for children who received simultaneously visual and verbal annotations.
or visual annotations only. Results support previous research about cognitive load in e-learning environments, and show that children's learning processes are hindered by limited working memory. This finding implies a challenge for multimedia programmes designed for children and based on self-regulated learning.

Silverman and Rebecca (2009) compared the traditional and multimedia-enhanced read-aloud vocabulary instructions and investigated whether the effects differed for English-language learners (ELLs) and non-English-language learners (non-ELLs). The study indicated that although there was no added benefit of multimedia-enhanced instruction for non-ELLs, there was a positive effect for ELLs on a researcher-designed measure and on a measure of general vocabulary knowledge. Furthermore, for children in the multimedia-enhanced condition, the gap between non-ELLs and ELLs in knowledge of instructional words was closed, and the gap in general vocabulary knowledge was narrowed. The result shows that multimedia support did not negatively impact non-ELLs, indicating the potential of multimedia-enhanced vocabulary instruction for ELLs in inclusive settings.

Avonsa et al. (2008) assessed vocabulary scores, word span, no word repetition, rhyme detection, and articulation rate for a group of 30 preschool children with a mean age of 4-11. It was found that the best predictors of vocabulary were memory span, rhyme detection, and no word repetition, accounting for 19%, 15% and 13% of the variance, respectively. Of these children, 28 were tested again on the same measures 13 months later. At the later stage, memory span and rhyme scores again predicted vocabulary to a significant extent, but no word repetition score did not. Of the measures taken initially, memory span and rhyme detection significantly predicted later vocabulary scores, whereas no word repetition just failed to reach significance. Cross-lagged correlations showed that memory span and rhyme detection on the first test predicted
later vocabulary after partialing out initial vocabulary scores. However, initial vocabulary scores did not predict later memory span (or rhyme detection) after partialing out the initial span (or rhyming) scores. Articulation rate was not significantly related to vocabulary at either age. The results are interpreted as indicating that the phonological store of working memory (required by word span, rhyme detection, and no word repetition, but independent of articulation rates) contributes to vocabulary development.

Farhan (2008) explored whether hypermedia annotation presentation in different locations of the text facilitates EFL vocabulary acquisition and reading comprehension. The study examined participants' preferences for the location of hypermedia-annotated text (at the end of the text, in the margin, at the bottom of the screen, or in a pop-up window). Data were collected from 80 intermediate adult EFL learners who read annotated texts and received support in different conditions of hypermedia annotations. A survey of prior knowledge was carried out, followed by vocabulary and reading comprehension tests, and a questionnaire. Results indicated that students who had access to hypermedia annotations outperformed their peers who used traditional glosses listed at the end of the text. There was also a positive impact for texts with hypermedia annotations located in the margin of the text. Learners also preferred hypermedia annotation presentation in the margin. Finally, no relationship was found between participants' preferences and their level of achievement.

Getty et al. (2008) studied the issue of the optimal on-line glossing format. Two glossing methods were compared. The first method provided readers with sentence-level translation equivalents of the second-language (L2) words. The second method connected the words with their meanings through basic dictionary forms. The study was to determine which of the two glossing formats is more beneficial for text comprehension and vocabulary retention. The results show that retention of lexical items
is better aided by reading the text with dictionary-form equivalents of the L2 words, because it involves a deeper level of cognitive processing.

Kim et al. (2008) investigated the use of multimedia components such as visual text, spoken text, and graphics in a Web-based self-instruction program to increase learners' English vocabulary learning at Myungin Middle School in Seoul, South Korea. The study collected a total of one hundred and seventy two middle school students (14 years of age) in five classes. Each individual was required to complete several testing instruments such as a pretest, post-test, retention test, and attitude inventory. Participants learned better when they received "visual text and added graphics" or "visual text, added spoken text, and added graphics" instruction. Although the added multimedia components required learners to spend more time on the instruction, the extra time was not significant. The results lead one to conclude that an effective way to improve learning of English vocabulary is to offer graphics that illustrate what the vocabulary means.

Lu (2008) examined the effectiveness of SMS vocabulary lessons of limited lexical information on the small screens of mobile phones. The study showed thirty high school students randomly distributed into two groups and given two sets of English words either on paper or through SMS messages during two weeks. Students recognized more vocabulary during the post-test after reading the regular and brief SMS lessons than they did after reading the relatively more detailed print material. Qualitative data from interviews offer information about the learning process as well as the benefits and limitations of m-learning. The Results of the questionnaires show that students in general hold positive attitudes towards learning vocabulary via mobile phone. On the other hand, technological limitations, unfamiliar presentations and learning activities may prevent students from reading SMS lessons.
Min (2008) studied the effectiveness of reading plus vocabulary-enhancement activities. The study highlighted on vocabulary acquisition and retention among EFL secondary school students. Twenty-five third-year male students with intermediate-level English proficiency participated in each instructional treatment 2 hr per week for five weeks. The RV group read selected texts and practised various vocabulary exercises. The NR group read thematically related supplemental materials besides the selected texts. A Chinese version of the modified Vocabulary Knowledge Scale was employed to assess students' knowledge of 50 vocabulary items. The results show that the RV group demonstrated significantly more knowledge about the target vocabulary than the NR group on the acquisition and retention tests. The researcher concludes that reading plus focused vocabulary exercises are more effective and efficient than the narrow reading approach in enhancing target vocabulary acquisition and retention among EFL secondary students.

Nakata (2008) compared vocabulary learning with word lists, word cards, and computers in order to identify which material leads to the most superior spaced learning. The study focused on two hundred and twenty six Japanese high school students who studied ten English words with one of the three learning materials: lists, cards, and computers. One-way analysis of covariance (ANCOVA) showed that although no significant difference existed between the Card group and the other two, the PC group significantly outperformed the List group on the delayed post-test. Item analysis using Chi-squares demonstrated that on the delayed post-test, the List groups successful recall rates for four of the ten items were significantly lower than those of the Card or PC group. Correlation analysis indicated that the time invested in learning and the subsequent post-test scores did not correlate significantly for the List and Card groups. Paradoxically, a negative correlation was observed between the PC group's study time
and their post-test scores. The lack of meaningful relationships between the study time and subsequent retention may be partially due to the limited ability of certain learners to learn effectively while using certain materials. A questionnaire given to the participants found that, in general, computers were evaluated more favorably than lists or cards. At the same time, however, learners exhibited large variations in their evaluation of computers, implying the importance of considering individual differences when introducing CALL to learners. The result demonstrated the superiority of computers over lists, the limited advantage of word cards over lists, and no statistically significant difference between computers and cards. The findings are significant because although the advantages of cards or computers have been advocated, no study has ever tested such claims empirically.

Neri et al. (2008) investigated whether a computer assisted pronunciation training (CAPT) system can help young learners improve word-level pronunciation skills in English. The study looked at the pronunciation improvement of a group of learners of 11 years of age receiving teacher-fronted instruction was compared to that of a group receiving computer assisted pronunciation training by means of a system including an automatic speech recognition component. Results show that 1) pronunciation quality of isolated words improved significantly for both groups of subjects, and 2) both groups significantly improved in pronunciation quality of words that were considered particularly difficult to pronounce and that were likely to have been unknown to them prior to the training. Training with a computer-assisted pronunciation training system with a simple automatic speech recognition component can thus lead to short-term improvements in pronunciation that are comparable to those achieved by means of more traditional, teacher-led pronunciation training.
Musallam et al. (2006) studied the effect of still pictures and animated pictures on the acquisition of vocabulary items. It attempts to find out which mode is more effective in improving vocabulary acquisition and retention. The study highlighted two groups of elementary school girls in Riyadh based on the vocabulary items of a lesson in their textbook. The participants of the study were 42 Saudi female students, aged between 11 – 12 years old. They were divided into two groups. One group, which is the control group, has been taught using the traditional way, i.e. through still pictures, while the experimental group has been taught in a multimedia environment, using animated pictures. A pre-test and a post-test were administered in order to collect the required data. The results of both tests were analyzed using Paired Sample T-test. The researchers hypothesized that use of multimedia enhances the perception and retention of vocabulary items more than still pictures. The findings of the study support the researchers’ hypothesis, that animated pictures are more effective in teaching unknown vocabulary items than still pictures. Recommendations for future research are provided.

Pelletreau and Timothy (2006) analyzed the advantages of explicit and incidental vocabulary learning mechanisms within the field of Second Language Vocabulary Acquisition (SLVA). The study examines the opportunities that intermediate ESL learners had to acquire vocabulary while reading pre-selected texts every week using a computer program known as REAP as part of their coursework in the English Language Institute. Students received an individualized series of documents containing "target" words in a study that was developed as an extension of an earlier study of enhanced learning conditions. The target words consisted of a list of academic words that students did not know. The list was determined by a vocabulary pre-test. Students were told explicitly to try to learn the meanings of their target vocabulary words by clicking on them in order to view online dictionary definitions. Students engaged in explicit learning
of target words, though in doing so, they were given the opportunity to use the same online dictionary to look up other "non-target" words. The learning of non-target words proceeded via incidental learning mechanisms. Data was collected through observations of students, teacher feedback and student-student interviews. The result reveals quantitative and qualitative analyses of variety of student learning outcomes and behaviors. There was no relation between non-target and target vocabulary learning outcomes. Students exhibited one of two distinct vocabulary-learning behaviors. One group of students took notes while reading and focusing more on target words. The other mainly asked their teacher vocabulary questions while reading.

Carlo et al. (2004) studied the gaps in reading performance between Anglo and Latino children to enhance fifth graders' academic vocabulary. The study portrayed the meanings of academically useful words were taught together with strategies for using information from context, from morphology, from knowledge about multiple meanings, and from cognates to infer word meaning. Among the principles underlying the intervention were that new words should be encountered in meaningful text, that native Spanish speakers should have access to the text's meaning through Spanish, that words should be encountered in varying contexts, and that word knowledge involves spelling, pronunciation, morphology, and syntax as well as depth of meaning. Fifth graders in the intervention group showed greater growth than the comparison group on knowledge of the words taught, on depth of vocabulary knowledge, on understanding multiple meanings, and on reading comprehension. The intervention effects were as large for the English-language learners (ELLs) as for the English-only speakers (EOs), though the ELLs scored lower on all pre- and post-test measures. The results show the feasibility of improving comprehension outcomes for students in mixed ELL-EO classes, by teaching word analysis and vocabulary learning strategies.
Brabham et al. (2002) examined the effects of just reading, performance reading, and interactional reading-aloud styles on learning. The study assessed for 117 first graders and 129 third graders. Preserves teachers, trained and guided by scripted procedures, read 2 informational storybooks to students using 1 of the styles. Multivariate analyses of variance and univariate tests showed that reading-aloud styles produced statistically significant effects on vocabulary acquisition and comprehension and similar results at each grade level. Differences in comprehension means for reading style treatments were statistically significant for 1 book only. Vocabulary acquisition was facilitated more by interactional reading than performance reading. Both verbally mediated styles resulted in greater vocabulary learning than just reading. Results extend previous findings on reading-aloud styles and are congruent with sociolinguistic and transactional theories.

Saffarian (2000) studied the role of computer games-based video games on facilitating children's cognitive learning. This study investigated the effect of the varied types of instructional delivery strategies on children’s learning achievement. English has been taught through computer games allow linguistic development. The hypothesized that using computer games may compensate for such shortcomings and computer-based video game playing not only improves participants’ fact/recall processes, but also promotes problem-solving skills by recognizing multiple solutions for problems. The subjects comprised of 418 EFL teachers and learners dealing with EFL in Iranian institute. There are no statistically significant differences in students’ achievement when they receive two different instructional treatments: (1) traditional computer-assisted instruction (CAI) programs; and (2) a computer-based video game. The treatment period was conducted in the spring semester of 2011. Data were statistically analyzed through SPSS 11.5. The results showed that there was a significant difference in both between
those subjects who used computer games and those who did not. The experimental group who used computer games outperformed the control group who did not use it as a teaching aid in foreign language classroom (p<.05). In other words computer games exchanges can play a facilitative role in teaching and learning second language (L2).

Kang (1995) explored the relative effectiveness of four instructional approaches: the paper and pencil, the Computer-based Word-for-word, the Computer-based word-for-word plus Picture, and the Computer-based Context (CC). The study was carried out at an elementary school in Seoul, Korea. English vocabulary was chosen as the target of instruction. The main experiment consisted of five sessions, which was followed by an additional meeting designed to check the long-term treatment effect. Three different types of evaluation tasks were used for both follow-up and retention tests: definition recall, listening comprehension, and knowledge transfer. In the follow-up tests, the CC group tended to perform rather poorly for the first few sessions, but made a gradual improvement in such a way that in the final session it outperformed the other three groups. However, this observed experimental difference was not statistically significant. In the retention test, the CC group showed significantly higher performance than any other group on all the major evaluation tasks. The result suggests that the context-embedded approach to second-language vocabulary learning was most effective in promoting knowledge transfer, listening comprehension, and long-term recall of vocabulary definitions.

2.1.2 Studies at College Level

Twentysix studies reviewed by the investigator at college level are abstracted below.

Chen (2013) studied current knowledge by exploring the effect of different annotation formats, namely in-text annotation, glossary annotation, and pop-up
annotation, on hypertext reading comprehension in a foreign language and vocabulary acquisition across student proficiencies. The data were collected from 83 non-English-majored university students in Taiwan in a 4-week period. Each week participants read three passages, each with different annotation formats as a treatment condition and one passage without annotation as a control condition. Posttests of reading comprehension and vocabulary recognition followed each passage. The results indicate that, for reading comprehension, the in-text format led to the lowest performance among all types of annotation, including the control condition. The best performance was observed in the condition where annotations were presented in the pop-up format. No interaction effect between format and proficiency was detected. For vocabulary acquisition, reading passages with hypermedia annotations significantly benefit vocabulary learning for participants of medium and high proficiencies compared with the control condition. No significant differences were found among the 3 formats. The beneficial effect, however, did not extend to low-proficiency participants. Participant feedback revealed a positive attitude toward annotations. Among the 3 annotation formats, the glossary type was considered the least preferred type by participants.

Orawiwatnakul (2013) examined the effects of crossword puzzles on vocabulary acquisition. Sixty-eight students enrolled in a fundamental English course participated in the study. The instruments were pre-and post-vocabulary tests and a questionnaire surveying the students' attitudes toward learning. Results: The findings revealed that the students' overall post-test score was higher than their pre-test score at a significance level of 0.05. When classifying students into three groups based on their vocabulary proficiency, it was found that students in all groups could improve their vocabulary knowledge at a significance level of 0.05. The results from Repeated Measures Analysis of Variance test showed that significant differences existed in the scores of the three tests
which students gained from the tests and the final exam. The results of the questionnaire also illustrated their very favorable attitudes toward learning vocabulary through crosswords as a whole.

Reynolds (2013) studied the effect of freedom of reader choice on the incidental acquisition of vocabulary. This study aims to address this issue by exploring two research questions: (i) Is incidental vocabulary acquisition affected by whether reading material is selected by the learner or assigned by a computer system; and (ii) Is incidental vocabulary acquisition related to the learner’s level of interest in the reading materials? Results suggest that the influence of reader choice on students' L2 is worthy of teachers' attention, as is the influence of autonomy on students' L2 vocabulary acquisition. Moreover, this investigation shows the benefit of using computers to provide students with the freedom to choose the articles they read.

Shao (2012) studied the effects of the multimedia application on foreign language vocabulary acquisition in recent years. The study provides an overview the computer-assisted language learning (CALL) and detailed a developing result of CALL-multimedia. It presents a case study that uses survey method to explore the interest level of Chinese college students with the multimedia software they worked with and their attitudes towards multimedia application. Another purpose of the study is to examine the effectiveness of multimedia application among Chinese EFL learners. The result states that with the application of constructivism theory, the research explores the use of multimedia software to vocabulary acquisition.

Yanguas (2012) studied vocabulary acquisition through a within groups experimental design. The study uses Skype as a way of learner-to-learner interaction and investigates whether traditional face-to-face interaction and oral CMC (computer mediated communication- audio and video) interaction will lead to differences in
learners’ development of vocabulary knowledge. The study is based on The Amazing Race, which is a reality television game show. As for assessment tasks, 16 target words were presented in the jigsaw task to check the participants’ development in recognition, production and listening abilities. If briefly stated, Yanguas’ findings show that there are no statistically significant differences considering production and recognition abilities among the three groups: participants completing the tasks through video CMC (VidCMC), through audio CMC (AudCMC), and through face-to-face interaction in class. As the post-test which was conducted after two weeks indicate, all the groups were able to recognize the target words, with no significant difference. However, an interesting finding was found regarding aural comprehension development. The participants who interacted through audio CMC group outperformed the other two groups, which were accounted for the fact that they did not focus on visual cues. The results also showed that there were no significant differences among the groups in their development of production or written recognition, which need pivotal care. Considering the participants’ attitudes, most of the participants highly valued CMC modes and provided positive feedback.

Chun and Plass (2011) investigated how reading comprehension can be facilitated with a multimedia application for language learning. On the macro level, the effect of a dynamic visual advance organizer is investigated. The study highlighted on the micro level, the effects of multimedia annotations for single vocabulary items are studied. In addition, the relationship between vocabulary acquisition and reading comprehension is examined. To test our hypotheses three studies with a total of 160 students were conducted using the multimedia application CyberBuch. The results indicate that a dynamic visual advance organizer does aid in overall comprehension and that annotations of individual vocabulary items consisting of both visual and verbal
information help more than verbal information only. Also, a moderate correlation between vocabulary knowledge and reading comprehension was found.

Esit (2011) investigated the effectiveness of an intelligent computer-assisted language learning (ICALL) program on Turkish learners' vocabulary learning. The study shows an ICALL application with a morphological analyser (Your Verbal Zone, YVZ) was developed and used in an English language preparatory class to measure its effects on students' achievement in vocabulary acquisition as well as their attitudes towards such an ICALL environment. The study employed a pre-test–post-test control group design. The sample consisted of 42 low intermediate learners who were assigned to experimental and control groups. The independent samples t test was used to study the differences in continuous variables between the experiment and the control groups. The improvement in the vocabulary knowledge of the participants was measured as to two different aspects, i.e. morphological knowledge and the knowledge of words' definitions and usage. The results indicate that reading activities with YVZ have proved to have positive effects on both learners' vocabulary learning and their attitudes towards the use of an intelligent computer-assisted language learning application in the classroom.

Yun (2011) examined the effects of hypertext gloss use on L2 vocabulary acquisition in computerized reading contexts. The study aims to synthesize characteristics of technology use, and research methods from empirical research studies for a comprehensible and insightful review of the effect of hypertext glosses on L2 vocabulary acquisition. Meta-analysis was conducted to synthesize overall findings of empirical studies by calculating a standardized mean difference effect size. On the basis of 35 weighted mean effect sizes, the magnitude of text + visual (multiple) hypertext gloss combination was moderately effective on L2 vocabulary acquisition when L2 learners were given two conditions: text-only and text + visual hypertext glosses. The
results revealed that studies with large samples (Mes = 0.43) provided a bigger effect size. In addition, the variable of learner proficiency was found statistically significant. The impact of multiple hypertext glosses was likely more on L2 vocabulary acquisition of beginning learners. Test type formats were also found as a significant factor across the studies.

Frederick (2010) developed a blended learning design to integrate instructional design and blending design practices to support and improve learning for vocabulary acquisition of developmental readers. The study designed, developed, implemented, and evaluated the blending of computer-based games with traditional classroom instruction to provide the repetition and active processing required for students to acquire new vocabulary. Results confirmed that students found digital games a motivating instructional method; however, no advantage in improving achievement was found using text-based or video-style games over the traditional paper-based worksheets method. A description of the analysis, design, development, implementation, and evaluation of digital games blended with traditional classroom instruction is provided to assist those interested in pursuing digital game-based learning with post-secondary developmental populations. Recommendations are also provided for future research and educational game development.

Haan et al. (2010) investigated to what degree, if at all, video game interactivity would help or hinder the noticing and recall of second language vocabulary. The study showed eighty randomly-selected Japanese university undergraduates were paired based on similar English language and game proficiencies. One subject played an English-language music video game for 20 minutes while the paired subject watched the game simultaneously on another monitor. Following game play, a vocabulary recall test, a cognitive load measure, an experience questionnaire, and a two-week delayed
vocabulary recall test were administered. Results were analyzed using paired samples t-tests and various analyses of variance. Both the players and the watchers of the video game recalled vocabulary from the game, but the players recalled significantly less vocabulary than the watchers.

Lin et al. (2010) investigated the effects of video-based computer assisted language learning (VBCALL) program on English learners' incidental vocabulary acquisition. The study based on the results of an English proficiency test, three English proficiency groups were set up: (1) 44 participants with high reading and high listening English proficiency (the RHLH group), (2) 20 participants with high reading and low listening English proficiency the RHLL group), and (3) 18 participants with low reading and high listening English proficiency (the RLLH group). All participants completed five practice sessions, five vocabulary follow-up tests, and vocabulary pre- and post-tests. Quantitative analysis was conducted in terms of three proficiency groups. The results demonstrated that RHLH, RHLL, and RLLH groups' vocabulary post-tests were both higher than those of their pre-tests. Paired t-test results show that RHLH and RHLL groups respectively performed significantly better in the vocabulary posttest. One-way ANOVA results demonstrate that in the vocabulary follow-up tests, the total scores revealed significant differences between the RHLH and RLLH groups. The qualitative interpretation was presented in terms of the participants' one-on-one interview response.

Scott (2010) presented a model of lexical proficiency based on lexical indices related to vocabulary size, depth of lexical knowledge, and accessibility to core lexical items. The lexical indices used in this study come from the computational tool Coh-Metrix and includes word length scores, lexical diversity values, word frequency counts, hyponymy values, polysemy values, semantic co-referentiality, word meaningfulness, word concreteness, word imagability, and word familiarity. Human
raters evaluated a corpus of two hundred and forty written texts using a standardized rubric of lexical proficiency. The study ensures a variety of text levels; the corpus comprised sixty texts each from beginning, intermediate, and advanced second language (L2) adult English learners. The L2 texts were collected longitudinally from 10 English learners. In addition, sixty texts from native English speakers were collected. The holistic scores from the trained human raters were then correlated to a variety of lexical indices. The study also found that lexical diversity, word hyponymy values and content word frequency explain 44% of the variance of the human evaluations of lexical proficiency in the examined writing samples. The findings represent an important step in the development of a model of lexical proficiency that incorporates both vocabulary size and depth of lexical knowledge features.

Tozcu and Coaldy (2010) investigated the effect of direct vocabulary learning using Computer Assisted Language Learning (CALL) on vocabulary knowledge, reading comprehension, and speed of word recognition. The study focused on the students who use Tutorial CALL to learn highly frequent vocabulary did learn a significantly larger number of words than those in a control group. Reaction time was decreased for frequent word recognition as compared to the control group and exhibited significantly better reading comprehension than a control group. The students in the treatment group studied approximately 2,000 of the highly frequent words in English on the computer for 3 hr per week for 8 weeks whereas the students in the control group spent the same amount of time reading texts and doing reading comprehension exercises. The result indicated although both groups showed increases in vocabulary gain, and reading comprehension, and a decrease in reaction time for frequent word recognition, the treatment students showed significantly greater gains than the control students.
Lee (2009) investigated the differential effects of CMC interaction (both text-chat and voice-chat) and face-to-face interactions on university level of ESL students' vocabulary acquisition. The participants consisted of 12 (6 male, 6 female) international students and visiting scholars at Iowa state university. The study design included a pre-test, a treatment activity, an immediate post-test, and a one week delayed post-test. The pre-test containing 24 vocabulary whose referents were auto parts items was given to choose the target lexical items. The type of treatment activity used in this study was an information-gap activity in which the students were required to request and obtain information from each other to complete the task. Two post-tests (immediate and delayed) were administered to assess the acquisition of new lexical items. The immediate and delayed post-tests were offered to students on the treatment day and one week after the initial treatment. Finally, a follow-up survey from each participant in CMC interaction group was also used to determine the strengths and weaknesses of computer-assisted language learning (CALL) task and the drawbacks or advantages of using such activities for language learning. The results showed that all ESL learners in both CMC and face-to-face interaction negotiated to complete their tasks, and all of the twelve target lexical items prompted negotiation for all of the dyads. Moreover, the results revealed that the students in all three groups recalled more than half of the previously unknown target lexical items in the immediate post-test and delayed post-test. For both productive oral and written acquisition, the results revealed that all three conditions seem to facilitate the acquisition of L2 words, as well as to ensure a good level of retention. However, there were no statistically significant differences between groups and post tests. Thus, meaning negotiation during computer-mediated and face-to-face interaction seems to promote both oral and written acquisition of L2 vocabulary. In addition, the results indicated that students tended to acquire new lexical items when they had some
background knowledge about the target words or they were negotiating both form and meaning with their partners.

Yanguas and Kilickay (2009) investigated the effects of different types of multimedia glosses, namely textual, pictorial, and textual + pictorial, have on text comprehension and vocabulary learning. The study is based on the theoretical framework of attention, which maintains that attention is critical in the acquisition process of an L2 (Robinson, 1995; Schmidt, 1995, 2001; Tomlin and Villa, 1994). Ninety-four participants read a text under one of four gloss conditions while asked to think aloud. The study also investigated whether any of the conditions promoted noticing and whether this noticing led to better comprehension of the text and learning of the target vocabulary words. Reading comprehension, recognition, and production measures were utilized in a pre-post test design. Results of quantitative and qualitative analyses of the data gathered showed first that all multimedia gloss groups noticed and recognized significantly more of the target words than the control group. Second, no significant differences were found among any of the groups in production of the target vocabulary items. Finally, regarding comprehension, results showed that the combination gloss group significantly outperformed all other groups. These results confirm that the multimedia glosses under investigation have a different effect on comprehension and vocabulary learning.

Song (2008) investigated the undergraduate students' dictionary and other uses of Personal Digital Assistants (PDAs) to enhance their incidental vocabulary learning in English as a Medium of Instruction. The research findings show: (a) the students made various uses of the PDA to improve their vocabulary learning, namely, referential, situated, constructive, reflective, explorative and conversing uses, (b) the students adopted integrated uses of the tools on the PDA and the computer for their incidental
vocabulary learning, and (c) the integrated use of the PDA and the computer shaped the vocabulary learning activities and vice versa. The results indicate that PDAs can be used in more flexible, novel and extended ways for English as a Foreign Language (EFL) vocabulary teaching and learning in higher education, taking student needs and contexts into consideration.

Akbulut (2007) investigated factors predicting vocabulary learning and reading comprehension of advanced language learners of English in a linear multimedia text. The study looked at sixty nine undergraduates enrolled at the foreign language teaching department of a Turkish university. Participants were randomly assigned to three different forms of an authentic electronic text, which differed from each other based on the type of multimedia: (a) definition of words, (b) definitions coupled with pictures, and (c) definitions coupled with short movies. The participants were given the text to read for general comprehension and were given an unannounced vocabulary test along with a reading comprehension test. Multiple regression analyses with vocabulary scores and reading scores as the criterion variables and the independent variables as the predictors served to reveal whether a relationship existed between the independent and dependent variables. Findings suggest that annotation type, reading ability and prior topical knowledge are important variables contributing to vocabulary learning whilst reading ability and learning styles (visual score) are important variables contributing to reading comprehension in a hypermedia environment.

Al-Jarf (2007) investigated online learning in EFL vocabulary instruction from home, as a supplement to classroom instruction. The study compared the pre- and post-test mean scores of 53 freshman students showed significant differences indicating that online instruction had an effect on vocabulary development. The posttest scores also correlated with the frequency of using the online course. Active participants made higher
gains than inactive participants. The result showed that in learning environments where technology is unavailable to EFL students and instructors, use of technology from home and even as a supplement to traditional classroom techniques helps motivate and enhance EFL students' learning and acquisition of English vocabulary.

Christensen et al. (2007) compared the impact of a computer-based diglot reader with that of a sophisticated, computer-based, drill and practice program on second language acquisition. The effective benefits as well as depth and breadth of vocabulary development were examined. The study highlighted on the diglot method, originally conceived by Burling, introduces second language vocabulary within the context of a familiar first language text, thus allowing the reader to acquire the second language incidentally while lowering the affective barrier to language acquisition. The result reaffirmed the positive affective benefit of the diglot method and showed that the diglot reader was equally as effective as the drill and practice program in facilitating vocabulary acquisition.

Folse (2006) examined the effect of the type of written exercise on L2 vocabulary retention. The study focused on an unannounced post test using a modified version of the vocabulary knowledge scale tested the meaning of the word (L1 translation or L2 synonym) and usage of the word in a student-written sentence. A repeated measure ANOVA revealed that mean scores for the three exercise types were significantly different from each other, with words practiced under the three fill-in-the-blank exercises condition retained much better than those practiced under either of the other two exercise conditions. The findings suggest the important feature of a given L2 vocabulary exercise is not depth of word processing but number of word retrievals required. The result has implications for language teachers, curriculum designers, and, in particular, materials writers of traditional workbooks and CALL materials.
Yoshii (2006) examined the effectiveness of L1 and L2 glosses on incidental vocabulary learning in a multimedia environment. The investigation included the effects of additional pictorial cues in L1 and L2 glosses, and how these additions affect vocabulary learning. Analysis of variance indicated no significant differences between L1 and L2 glosses for definition-supply and recognition tasks and showed significant differences between picture (text-plus-picture) and no-picture (text-only) glosses for definition-supply test only. The results also revealed significant interaction effects between languages and tests indicating that L1 and L2 groups showed different patterns of vocabulary retention over time. Findings suggest that both L1 and L2 glosses are effective for incidental vocabulary learning, but long-term retention may differ between the two types; and that the effect of additional visual cues on vocabulary learning may rely on the nature of the tasks given.

Song and Fox (2005) explored the role of mobile technology (m-technology) in English as second language (ESL) vocabulary learning for working adult learners. The study shows the use of short message service (SMS), m-technology was integrated into Web-based vocabulary learning for working adult learners. The study also examined learner experiences of m-technology used in the workplace in Hong Kong. Ten learners were involved in the study. Both quantitative and qualitative methods were adopted through assessments using an online test system and an open-ended questionnaire sent by email to collect data. The findings show significant improvements in the learner performance and in their attitudes towards using m-technology in their learning.

May (2003) conducted a project concerning the learning of English vocabulary by Cantonese speakers. The aims of the study were threefold: (a) to find out the vocabulary size of the tertiary students and whether they need help with academic vocabulary, (b) to identify the strategies that are conducive to learning vocabulary in
general and the strategies that are especially useful for learning high- and low-frequency words in particular, and (c) to look at the discrepancies among the frequency of use, the perceived usefulness, and the actual usefulness of vocabulary strategies. The participants in the study included one thousand and sixty seven students who had recently been offered places by the seven local institutions of higher education. A vocabulary test and a vocabulary learning strategy questionnaire were used for data collection. ANOVA and multiple regressions were employed for data analysis. The results of the study shed light not only on the strategy profile of the Hong Kong learners in general but also on the complexity involved in strategy use. Strategies relevant to the learning of L2 vocabulary as well as high- and low-frequency words were identified.

Yeh and Wang (2003) investigated the effectiveness of three types of vocabulary annotations on vocabulary learning for EFL college students in Taiwan. The study was to determine whether learners with certain perceptual learning styles benefited more from a particular type of vocabulary annotations. The perceptual learning styles investigated were auditory, visual-verbal (with text), visual-nonverbal (with pictures), and mixed preferences. The results of the study showed that the version with text plus picture was the most effective type of vocabulary annotation. Perceptual learning styles did not seem to have a significant influence on the effectiveness of vocabulary annotations.

Qian (2002) investigated 2000 researches to conceptually validate the roles of breadth and depth of vocabulary knowledge in reading comprehension in academic settings and empirically evaluated a test measuring three elements of the depth dimension of vocabulary knowledge, namely, synonymy, polysemy, and collocation. A vocabulary size measure and a TOEFL vocabulary measure were also tested. The study found that the dimension of vocabulary depth is as important as that of vocabulary size in predicting performance on academic reading and that scores on the three
vocabulary measures tested are similarly useful in predicting performance on the reading comprehension measure used as the criterion.

Al-Seghayer (2001) examined which of the image modalities dynamic video or still picture is more effective in aiding vocabulary acquisition. The participants, 30 ESL students, were introduced to a hypermedia-learning program, designed by the researcher for reading comprehension. The study provides users reading a narrative English text with a variety of glosses or annotations for words in the form of printed text, graphics, video, and sound, all of which are intended to aid in the understanding and learning of unknown words. A within-subject design was used in this study with 30 participants being measured under three conditions: printed text definition alone, printed text definition coupled with still pictures, and printed text definition coupled with video clips. In order to assess the efficacy of each mode, a vocabulary test was designed and administered to participants after they had read the English narrative. Two types of tests were administered: recognition and production. In addition, a face-to-face interview was conducted, and questionnaires were distributed. Results of the both tests were analyzed using analysis of variance procedures. The investigation has yielded the conclusion that a video clip is more effective in teaching unknown vocabulary words than a still picture. Among the suggested factors that explain such a result are that video better builds a mental image, better creates curiosity leading to increased concentration, and embodies an advantageous combination of modalities (vivid or dynamic image, sound, and printed text).

2.2 Studies Related to Vocabulary in Other Languages

The investigator located 14 studies related to other language vocabularies from (1997 - 2013). The method of instruction employed in these reviewed studies was based on
computer. All these studies were arranged chronologically in descending order and categorized into studies at school level and studies at college level.

2.2.1. Studies at School Level

Eight studies at school level reviewed by the investigator are abstracted below.

Liu (2013) explored the associations of two aspects of morphological awareness in Chinese homophone awareness and lexical compounding awareness to Chinese word reading and vocabulary knowledge. The primary focus of the present study was among 154 9-year-old Hong Kong Chinese children, both lexical compounding and homophone awareness were significantly associated with word reading and vocabulary knowledge. However, with autoregressors additionally statistically controlled, homophone awareness remained uniquely associated with vocabulary but not word reading; lexical compounding was uniquely associated with both word reading and vocabulary. The result shows, homophone awareness is more centrally associated with vocabulary knowledge because it taps specific, existing morpheme knowledge. In contrast, lexical compounding requires structural understanding of one's language, which seems to be helpful for both learning to read and vocabulary acquisition in Chinese.

Ouellecta (2013) studied the influence of alphabetic knowledge and vocabulary on phonemic awareness. The study evaluated possible sources of individual differences in early explicit, smaller segment phonological awareness. In particular, the unique contributions of oral vocabulary and alphabetic knowledge to phonemic awareness acquisition were examined across the first year of school. A total of 57 participants were tested in kindergarten (mean age 5 years, 8 months) and again one year later midway through Grade 1. Results revealed that oral vocabulary and alphabetic knowledge were correlated with concurrent larger segment phonological awareness and phonemic
blending in kindergarten whereas oral vocabulary was the only measure that predicted unique variance in phonemic awareness into Grade

Zhou et al. (2012) studied the comparison of phonological awareness, lexical compounding, and homophone training for Chinese word reading in Hong Kong kindergartners. In this study, 88 kindergartners received special training in lexical compounding, homophone awareness or phonological awareness or were assigned to a control condition over a period of approximately two months, with 20-min lessons administered twice per week. Chinese word reading improved significantly more in the lexical compounding group as compared to the other groups. Vocabulary knowledge also showed a trend toward improvement in this group (p less than 0.08) and improved significantly in the homophone group. Although phonological awareness improved most in the phonological awareness training group, this group showed no reading or vocabulary improvements relative to the other groups. Practice or Policy: The results underscore the importance of morphological awareness training for both word reading and vocabulary knowledge in young Chinese children.

Liu (2010) studied tapping lexical compounding awareness in Chinese third graders. One hundred twenty-one third-grade Chinese children were assessed with a new morphological awareness task involving open-ended lexical compounding, in addition to completing other measures. The study focused on children's age, nonverbal intelligence, phonological awareness, and previously established measures of morphological awareness statistically controlled; this compounding production task significantly explained unique variance in both Chinese character reading and vocabulary knowledge. Within this new task, subordinate and coordinative structures were significantly easier to compound than were subject-predicate and verb-object structures. Moreover, novel compounds that made use of verb morphemes were more difficult to manipulate than
were those that did not contain verbs. This newly developed task of compounding production may be optimal for tapping older children's morphological awareness in the form of lexical compounding, in both Chinese and possibly other languages. The results demonstrate that linguistic manipulations within tasks of morphological awareness can influence their difficulty levels.

Meli (2009) examined the impact of multimedia as a delivery tool for enhancing vocabulary in second-language classrooms. The study comprised of 93 students enrolled in beginning levels of Spanish was divided into multimedia intervention and existing curriculum control groups who completed vocabulary tests, the Survey of Multimedia Uses and Perceptions (SMUP), and participated in focus groups. The results of this study contribute to positive social change by informing practices that align to student preferences when integrating new technologies into second language instruction.

Uzun and Levent (2009) studied a vocabulary learning game which can be used as supplementary material in CALL and/or traditional language classes in any language, and to compare it with two other widely used games in FLT. A criteria checklist for CALL systems and more specifically for vocabulary learning software is offered and applied to the evaluation of one game, namely VocaWord. The study showed that the weakness of the game is half as much, and the strengths might be twice as much compared to Scrabble and Taboo, which is a commercially oriented game widely, used by teachers and foreign language learners. These results suggest that Voca Word is a promising game that has the potential to be quite effective. The study underlines the necessity to develop more educational games that can be used in CALL.

Rispens (2008) studied the morphological awareness and advanced word recognition and spelling in Dutch. The study investigated the relations of three aspects of morphological awareness to word recognition and spelling skills of Dutch speaking
children. Tasks of inflectional and derivational morphology and lexical compounding, as well as measures of phonological awareness, vocabulary and mathematics were administered to 104 first graders (mean age 6 years, 11 months) and 112 sixth graders (mean age 12 years, 1 month). For the first grade children, awareness of noun morphology uniquely contributed to word reading, and none of the morphological tasks were uniquely associated with spelling. In grade 6, derivational morphology contributed both to reading and spelling achievement, whereas awareness of verb inflection uniquely explained spelling only. Lexical compounding did not uniquely contribute to literacy skills in either grade. These findings suggest that awareness of both inflectional and derivational morphology may be independently useful for learning to read and spell Dutch.

Schmitt (2008) examined how two types of word knowledge, word associations and grammatical suffix knowledge, change over time both receptively and productively. The study focused on ninety-five secondary and postsecondary Japanese students who were tested on three word associations and inflectional and derivational suffixes for each of twenty verbs, once near the beginning of their academic year and once near the end. The results showed their average vocabulary gain was three hundred and thirty words. The students showed rather poor knowledge of the allowable suffixes for the verbs, especially the derivative suffixes. Likewise, the subjects did not show very good mastery of the verbs' word associations. Even for verbs rated as known, the students as a group were able to produce only about 50% of the word associations possible on the test as judged by native speaker norms. Word association knowledge and suffix knowledge were shown to correlate with each other and with total vocabulary size. The subjects overall had from 19 to 25 percentage points more receptive knowledge than productive knowledge.
2.2.2 Studies at College Level

The abstracts of six studies at college level reviewed by the investigator are presented below.

Oberg (2011) studied comparison of the effectiveness of a call-based approach and a card-based approach to vocabulary acquisition and retention. In this study, two study methods for the support of acquisition and retention of 10 vocabulary items were compared; one method used representative picture cards and the other a CALL interface. Seventy-one first-year Japanese university students comprising two classes participated in the study. The students studied a practice set of 10 vocabulary items using both of the two methods and then a treatment set of 10 different items using only one of the methods to which the students were randomly assigned. A "t" test done on the groups' vocabulary pretest scores showed no significant difference between the two groups in terms of knowledge of the items at the outset of the experiment. The result showed no significant difference between the groups. Finally, a post treatment survey revealed a slight preference for the CALL method among the students.

Cottam (2010) investigated the effects of textual and visual annotations on Spanish listening comprehension and vocabulary acquisition in the context of an online multimedia listening activity. The study focused on 95 students who were enrolled in different sections of first year Spanish classes at a community college and a large southwestern university was randomly assigned to one of four versions of an online multimedia listening activity that contained textual and visual annotations of several key words. Students then took a comprehension and vocabulary posttest and a survey to measure cognitive load and general attitudes towards the program. Results indicated that textual annotations had a significant positive effect on listening comprehension and that visual annotations had a significant positive effect on how successful students felt.
Macintyre and Gardner (2008) examined the arousal of anxiety caused by the introduction of a video camera at various points in a vocabulary learning task. The study focused on Seventy-two students of 1st-year university French were randomly assigned to one of four groups: (a) one group who had anxiety aroused during their initial exposure to the stimuli, (b) a second group who had anxiety aroused when they began to learn the meanings of the words, (c) a third group who had anxiety aroused when they were asked to produce the French word (when prompted with the English), and (d) a control group who did not experience anxiety arousal. Significant increases in state anxiety were reported in all three groups when the video camera was introduced, and concomitant deficits in vocabulary acquisition were observed.

Ofelia (2004) investigated the effects of visible and invisible links for annotated words in a computer module on the vocabulary acquisition of two types of students – high – and average-achievers. The study identified Two hundred and sixty four second-semester students of French as high- or average-achievers. Each type of students was then randomly assigned to two groups – with visible or invisible hyperlinks. All students were instructed to read a short passage in French (181 words) for general comprehension and allowed to consult the annotated words as much as they needed. The students took a vocabulary pre test and an immediate and delayed (two weeks) vocabulary and reading comprehension post test. The results of the study showed that average-achievers benefited more from the visible links for vocabulary acquisition than high-achievers.

Pulido (2004) examined the effects of cultural background knowledge on immediate incidental vocabulary gain through reading brief narratives. The study focussed on high-intermediate adult learners of Spanish. Independent variables included (a) cultural familiarity, (b) group assignment, and (c) L2 passage sight vocabulary. The dependent variable was an adapted version of the Vocabulary Knowledge Scale
(Paribakht & Wesche, 1993). Each narrative contained 5 nonsense words depicting concepts frequently associated with the scenarios. The Results of an ANCOVA revealed significant effects of cultural familiarity whereby vocabulary gains were greater after participants read within the culturally familiar versions of the scenarios. No significant effects were obtained for the variables of group or of L2 passage sight vocabulary; although a significant positive correlation was obtained on one passage.

Plass et al. (2003) studied about how multiple representations of information in second-language learning help and how they hinder learning. English-speaking college students (N=152), enrolled in a second-year German course, read a 762-word German story presented by a multimedia computer program. The study showed that students received no annotations, verbal annotations, visual annotations, or both for 35 key words in the story. Recall of word translations was worse for low-verbal and low-spatial ability students than for high-verbal and high-spatial ability students, respectively, when they received visual annotations for vocabulary words, but did not differ when they received verbal annotations. Text comprehension was worst for all learners when they received visual annotations. Results are consistent with a generative theory of multimedia learning and with cognitive load theory which assume that multimedia learning processes are executed under the constraints of limited working memory.

2.3 Synthesis of the Reviewed Studies

The investigator reviewed 71 related studies. Of which, 57 were on English language vocabulary and the remaining 14 were on other languages vocabulary, carried out between 1994 and 2014. Among the reviewed studies, 57 studies employed experimental method and 14 employed other methods which include survey method, case study and meta-analysis.
The reviewed studies imply that the acquisition of vocabulary was successfully made with computer based word for word (Kang, 1995), computer based instruction (Saffarian, 2000), computer based diglot method (Christensen, 2007), word lists and word cards supported with computer (Nakata, 2008), computer assisted pronunciation (Neri et al., 2008), and computer assisted language learning (Lee, 2009; Lin, 2010; Tozcu & Coaldy, 2010; Esit 2011; Mustafa, 2012; Shao, 2012; Reynolds, 2013; Lin 2014).

The acquisition of vocabulary was also effective with pictures (Al-Seghayer, 2001; Plass, 2003; Yeh & Wang, 2003; Musallam, 2006; Yoshii, 2006; Yanguas & Kilickey, 2009), video clips (Verhallan, 2010; Huang et al., 2012; Ghamrawi, 2014), visible and invisible links (Ofelia, 2004), online (Pelletreau & Timothy, 2006; Cottam, 2010; Al-Jarf, 2007), linear multimedia text (Akbulut, 2007; Yavuz 2007; Meli, 2009; Silverman & Rebecca, 2009; Acha, 2009; Chen & Plass, 2011), Getty, 2008; hypermedia (Farhan, 2008), visual text spoken text and graphics (Kim et al., 2008), video camera point task (Macintyre & Gardner, 2008), word game (Saffarian, 2000; Uzun & Levent, 2009; Fredrick, 2010; Haan et al., 2010; Al-Sharafat, hypertext (Yun, 2011), Letchumanan et al., 2012), use of skype (Yanguas, 2012), and web-site games (Bataineh, 2014).

The acquisition of vocabulary was admirable using mobile technologies too viz., SMS (Song & Fox, 2005; Lu, 2008), dictionary use (Song & Fox, 2008), and video caption (Hsu, 2012).

The acquisition of vocabulary was also effective with the interventions namely, textual word meaning (Marjorie, 1999), reading style treatments (Greene Brabham et al., 2002), synonymy, polysemy, and collocation (Qian, 2002), written exercises of fill in the blanks (Folse, 2006; Hashemzadeh, 2012), meaning of words (Folse, 2006), reading plus
vocabulary enhancement activity (Min, 2008), multiple choice (Nakata, 2011), matching, paraphrasing and glossing (Hashemzadeh, 2012), and crossword puzzle (Orawiwatnakul, 2013).

The acquisition of vocabulary was also effectual with the word knowledge (Schmitt, 1997), identification of high (May, 2003; Matsuoka & Hirsh, 2010), low frequency words (May, 2003), brief narratives (Pulido, 2004), word concreteness, word imagability, word familiarity (Scott, 2010), words read aloud curriculum (Puhalla, 2011), reading comprehension (Taboada, 2011), glossary type (Chen, 2013), and story translation method (Ulanoffa & Sandra, 2014).

In addition to the above, vocabulary acquisition was made effective with phonological and morphological awareness, word span, rhyme, and memory span (Avonsa, 2008), advanced word recognition and spelling (Rispens, 2008); novel compounding (Liu, 2010), word reading (Zhou, 2012; Liu, 2013), oral and alphabetic knowledge (Ouellecta, 2013), and multiple meaning of the new words (Carlo, 2004).

From the above 71 reviewed studies, the present study is varied from other groups encompassing two experimental groups, namely, ‘computer-based instruction and conventional cum computer-based instruction’ which made it to stand unique.

*The ensuing chapter deals with methodology of the study.*