RICHTMANN
PUBLISHING

Enhancing Second Language Incidental Vocabulary Learning Through Technology

Halil Asllani

English Lecturer, Ph.D. Candidate,
Department of English Language and Literature,
Faculty of Philology, University of Prishtina,
George Bush St., Nr.31, 10 000 Prishtina, Kosovo

Rrahman Paçarizi

Associate Professor of Linguistics,
Department of Linguistics,
Faculty of Philology, University of Prishtina,
George Bush St., Nr.31, 10 000 Prishtina, Kosovo

Abstract

The emergence of digital learning environments has resulted in remarkable interest to researchers and professionals in pursuit of finding effective second language learning and teaching methodologies with the help of technology. Hence, this study intended to investigate whether different multimedia annotation modalities (i.e., L1 definition, L2 definition + audio, L2 definition + image) have different effects on enhancing L2 incidental vocabulary learning. Language learning and technology have received particular attention for quite some time now, yet, a critical review of earlier research led to the identification of a research gap as there was no previous research on settings where participants' first language was Albanian. The nature and focus of research questions required the use of a quantitative deductive approach. More specifically, the study employed a quantitative quasi-experimental design with the utilization of a pre-test and an immediate post-test. Fifteen-year-old pupils at a secondary school read a second language text under different annotation conditions. Independent and paired samples t-tests were utilized in analyzing data collected through an immediate word recognition test. The findings yielded evidence that L1 definition and L2 definition + image is more effective in enhancing L2 incidental vocabulary learning compared to non-multimedia reading environment and L2 definition + audio, therefore providing positive pedagogical implications for the application of technology in developing second language incidental vocabulary learning.

Keywords: multimedia, annotations, second language, incidental vocabulary learning, pedagogy

1. Introduction

Technology in general and information technology, in particular, has become an integral part of a wide variety of human enterprises, including its impact on language as one of the most sophisticated and complex human systems. Language learning and technology have established themselves in the

academic and scientific world and have now long served researchers and professionals of SLA as an interesting field of inquiry. Second language teaching and learning have developed and changed dramatically, especially from the second half of the twentieth century due to a number of social, economic, and political factors and mainly as a result of expanding globalization processes. In this regard, "the rapid internationalization of business and industry, together with a sustained immigration influx, has resulted in an unprecedented interest in enhancing second language (L2) learning" (Koda 2005, p. 3.). Researchers and professionals in applied linguistics have been investigating different approaches to second language teaching and have made considerable progress in both theory and practice, thus, providing impressive insights in quality and quantity into the area of second language reading and vocabulary learning (Koda, 2005). In this regard, advances in technology and the emergence of Computer Assisted Language Learning (CALL), as a relatively new field, have inevitably influenced second language teaching and learning. As a result, the increase of information technology use in school and home environments has set up opportunities for increased use of technology in second language teaching and learning (Hubbard and Levy, 2006). Consequently, a plethora of research on vocabulary learning has surged, especially in the last two decades, intending to understand the potential of technology in enhancing second language vocabulary learning. While describing the role of technology in second language reading and vocabulary learning, Grabe (2009, p. 383), emphasizes, among others, two relevant issues: "the growth of electronic and multimedia texts themselves and how they are read and understood. . .and the effectiveness of reading instruction involving new electronic genres and with technology resources". In line with Grabe's suggestions, this study intends to examine what mode of multimedia annotation best enhances second language incidental vocabulary learning. It is noteworthy to define here incidental vocabulary learning. Unlike intentional vocabulary learning, where learning of vocabulary happens intentionally and consciously through the use of different methods and exercises, incidental vocabulary learning, according to Schmitt (2010), happens as a result of language use for purposes other than vocabulary learning such as reading for general comprehension. Research findings on the utilization of technology as a pedagogical tool are mixed and inconclusive due to a number of factors. Moreover, much of research on the effectiveness of multimedia annotations on vocabulary learning has been conducted in diverse socio-cultural settings and contexts. A critical review of the literature of the current body of research on multimedia annotations and their impact on second language vocabulary learning led to the identification of the research gap. Previous research investigated the relationship of annotation use and vocabulary learning in diverse multicultural settings with differing first language backgrounds as well as differing metalinguistic and cognitive awareness levels due to age difference and second language proficiency, as well. Therefore, SLA research community and academia are always encouraging research on endeavors to find the usefulness and relationship of technology to language learning in different contexts. In this regard, this present study intends to give a modest contribution to this research community call by conducting research in a unique research setting. It is the first time that a study of this nature is conducted in a context where participants' first language is Albanian. In fact, one of the main research criteria for conducting research on second language reading and vocabulary learning, according to Bernhardt (2011), is the "delineation of first-language backgrounds of subject population and explanation of the linguistic relationship of the cognizant first and second languages" (p. 122). In this regard, this study presents a good opportunity to conduct research in a unique socio-cultural setting, hence, contributing with some insights to the current body of knowledge.

2. Research Questions

This present research aims to investigate effects of different multimedia annotation modes on second language incidental vocabulary learning. For this purpose, the researcher has formulated the following research questions:

Research question 1: Does the utilization of technology, i.e., multimedia annotations, enhance second language incidental vocabulary learning?

Out of four groups in the study, there was one group with no multimedia annotation use, i.e., control group, and three other groups under different annotation conditions described under research question two.

Research question 2: What annotation mode is the most effective in enhancing second language incidental vocabulary learning?

There were three multimedia annotation modes used in this study for three different groups:

a) Group one used L1 translation, i.e., translation for the unknown words was provided in the mother tongue while reading the English text on a computer program.

b) Group two used L2 definition + audio pronunciation, i.e., English contextual definition of unknown words was provided as well as the possibility of hearing the word pronounced in English.

c) Group three used L2 definition + image annotation, i.e., English contextual definition of unknown words was provided, accompanied by an image/picture of the unknown word.

3. Literature Review

Vocabulary learning is central to language learning and one of the most important parts in the area of second language acquisition (Knight 1994; Laufer 1992; Nation 2001; Yoshi and Falitz 2002). Studies in vocabulary acquisition and learning in a second language have led researchers and professionals in the field to investigate the modalities of vocabulary growth, both in traditional and digital learning environments. Although "researchers generally agree that the use of vocabulary glosses in L2 reading materials is a common practice and glosses facilitate reading comprehension and vocabulary learning in both printed materials and electronic materials" there is still an ongoing debate as to whom and under what conditions annotations can enhance reading comprehension and vocabulary learning (Hong 2010, p. 60). Furthermore, Mohsen and Balakumar (2011) find that studies related to annotation mode and vocabulary learning are inconclusive due to a number of factors, including differences in participants' socio-cultural backgrounds, target language, L2 proficiency, and assessment instruments used. Nevertheless, a good body of research, stemming from theories of second language vocabulary learning with the help of technology, has been established. However, before we review some specific studies, it is noteworthy to mention here that multimedia annotation or glossing is used to refer to any explanation given to an unknown word in a second language reading activity in the form of a text such as L1 translation or L2 definition or a multimedia format such as visual, i.e., picture/image and video or auditory, i.e., sound.

Some of the key studies investigating the relationship between annotation use and vocabulary learning are the following: Al-Seghayer (2001), Chun & Plass (1996), Akbulut (2007), Yanguas (2009), Ko (2017), Varol & Erçetin (2016), Yoshii (2006), Yeh & Wang (2003), Yoshii & Flaitz (2002), Ramezanali & Faez (2019), etc. In this regard, the utilization of multimedia annotations for the enhancement of L2 reading comprehension and vocabulary learning has received particular interest from the research community; therefore, "the role of computer technology in L2 reading pedagogy has long served as a significant and fascinating area of inquiry for many scholars of SLA" (Askildson 2011, p. 50).

Our review of literature will, inevitably, have to start with Chun and Plass (1996) who did some pioneering research on the topic of multimedia annotations and vocabulary acquisition, which later served as an interesting area of inquiry for many scholars along with the advancement of technology and the emergence of digital learning environments. The study intended to identify the effects of different annotation modes and modalities for vocabulary learning while using a computer program for L2 reading. "The results showed a higher rate of incidental learning than expected (25% accuracy on production tests, 77% on recognition tests), significantly higher scores for words that were annotated with pictures + text than for those with video + text or text only (p. 183). Chun and Plass employed a within-subjects design in their study; however, they recommended between-subjects design in future studies.

Some years later, Al-Seghayer (2001), in a study consisting of 30 participants using a within-

subject design, examined the effects of three annotation conditions, namely text alone, text + picture, and text + video, on vocabulary learning. Surprisingly, this study "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" (p. 202).

Ko (2017, p. 47) investigated the relationship between second language proficiency and annotation mode in incidental vocabulary learning. Four groups under different annotation conditions, i.e., no annotation, L1 annotation, L2 annotation, and L1 + L2 annotation, were used in the study. Findings of the study showed that L1 annotation and L1 + L2 annotation were effective for lower-level learners, whereas L2 annotation and L1+L2 annotation were effective for higher-level learners.

Similarly, Yanguas (2009) studied the effects of different types of multimedia annotations, namely textual, pictorial and textual + pictorial, on comprehension of the text and vocabulary learning. "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" (p, 48).

Yoshii (2006) examined the effects of L1 and L2 annotations on incidental vocabulary learning in a multimedia learning environment and found that "both L1 and L2 glosses are effective for incidental vocabulary learning, but long-term retention may differ between the two types" (p. 85).

Akbulut (2007, p. 499) investigated the effectiveness of different annotation modes, namely definitions of words, definition + picture, and definition + video, on incidental vocabulary learning and reading comprehension. "Results showed that the groups that had access to definitions along with both types of visuals had significantly higher vocabulary scores on both immediate and delayed post-tests than the definition-only group. However, no differences were observed on the reading comprehension test".

Varol and Erçetin (2016) went on further and studied the effects of working memory, annotation mode, and incidental vocabulary learning. Using a between-groups experimental design, the study found "a significant relationship between working memory and reading comprehension regardless of treatment condition and immediate positive effects of glosses on incidental vocabulary learning" (p. 759).

Ramezanali and Faez (2019) conducted research on vocabulary learning with the help of multimedia annotations. The study drew on Mayer's cognitive theory of multimedia learning, which is the theoretical framework for this present study, as well. Their study intended to identify which annotation modes, namely L2 definition, aural, and video animation, are effective in enhancing vocabulary learning and retention. "The quantitative findings revealed that dual glossing modes were more effective than single glossing modes for many test sessions. . . and that learners preferred the dual glossing mode of L2 definition and video animation" (p. 105). In a similar fashion to the present study, yet with a distinct socio-cultural setting and methodological approach, Yeh & Wang (2003) investigated the effects of three annotation modes, namely text annotation only, text plus picture, and text + picture coupled with sound. Findings of the study revealed that text + picture was the most effective mode in vocabulary learning.

Yoshii and Falitz (2002) examined the effect of annotation mode on incidental vocabulary retention. 151 beginner and intermediate adult learners of English participated in the study and read a story under different annotation conditions, namely text-only, picture-only, and a combination of text and picture.

Each of the studies described above was conducted in different research settings and circumstances, therefore producing mixed results. For example, Chun and Plass (1996) reported that text + picture is more effective than text + video for incidental vocabulary learning in contrast to Al-Seghayer's study, whose findings revealed the opposite. This could be caused by a number of factors such as the socio-cultural and language background of participants, age difference, second language proficiency, as well as research design and data collection instruments. The research community is continually encouraging other studies similar to the above-mentioned ones. Hence, this present study aims to contribute to the current body of knowledge by conducting research in a specific setting,

therefore, aiming to produce first-hand findings and insights.

4. Theoretical Framework

Along with the development of CALL, a number of theories have evolved in an attempt to shed light on what happens when "humans interact with materials and one another through the mediation of digital devices, programs, networks, and tools in the pursuit of language learning objectives" (Hubbard and Levy 2016, p. 24). From a variety of theories in CALL, three distinct ones in SLA have emerged, namely the interaction theory, socio-cultural theory, and constructivism (Chapelle 2007; Hubbard and Levy 2016). Nevertheless, since there is a broad variety of studies and theories within CALL, the one that corresponds to our research purpose is The Cognitive Theory of Multimedia Learning (CTML) developed by Mayer (2009, p. 57):

> *The cognitive theory of multimedia learning assumes that the human information-processing system includes dual channels for visual/pictorial and auditory/verbal processing. . .where each channel has limited capacity for processing, and active learning entails carrying out appropriate cognitive processing during learning. Five steps in multimedia learning are: selecting relevant words from the presented text or narration, selecting relevant images from the presented illustrations, organizing the selected words into a coherent verbal representation, organizing selected images into a coherent visual representation, and integrating the visual and verbal representations and prior knowledge.*

In each of the experimental groups in this study, we will have an opportunity to understand if the processing of information via dual channels, i.e., visual/pictorial and auditory/verbal channels, has different effects on incidental vocabulary learning. Processing of information via The Cognitive Theory of Multimedia Learning is presented in figure 1 below:
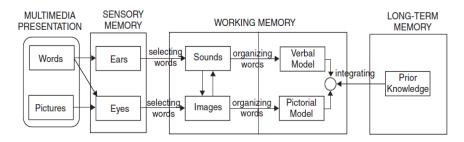

Figure 1. Cognitive theory of multimedia learning (Mayer 2009, p. 61).

As it can be seen from the figure above, "processing of pictures occurs mainly in the visual/pictorial channel; the processing of spoken words occurs mainly in the auditory/verbal channel; but processing of printed words takes place initially in the visual/pictorial channel and then moves to the auditory/verbal channel" (Mayer 2009, p. 57).

This theory is based on three assumptions:

1. Dual channels - where humans possess separate channels for processing visual and auditory information.
2. Limited capacity – where humans are limited in the amount of information that they can process in each channel at one time.
3. Active processing – where humans engage in active learning by attending to relevant incoming information, organizing selected information into coherent mental representations, and integrating mental representations with other knowledge (Mayer 2009, p. 63).

5. Methodology

Research questions formulated for this study have led to the use of a quantitative deductive approach. More specifically, the present study employed a quantitative quasi-experimental design with a pre and an immediate post-test. The rationale for choosing the quasi-experimental design rests mainly on the sample selection. True and quasi-experimental designs are very popular in experimental research that mainly investigate causal relationships of different variables. However, the main difference between a true experimental design and a quasi-experimental design is that the first one uses random assignment of participants, whereas the latter utilizes a non-random selection of subjects. Quasi-experimental designs, first introduced by Stanley and Campbell in 1963, "involve research in settings in which full control over the experiment is not possible through randomization . . . and that such designs require that any compared groups used in the study be tested to ensure that they are equivalent in all important respects in order to make the inferences about scores sound" (Hudson 2015, p. 58). All measures undertaken before treatment intended to create groups of participants with a high degree of homogeneity so that any difference in the post-test mean scores be attributed to intervention.

5.1 Participants and setting

This study was conducted in a public upper secondary school in Kosovo. An initial pool of 109 fifteen-year-old Albanian-speaking pupils divided into four groups was set. One control (N=24) and three experimental groups (N=28, N=29, N=28) were selected for this study. However, in order to avoid unmatched groups regarding English language proficiency, a placement test was administered. After the placement test, 59 pupils were eligible to participate with the following results: Control Group (N=14), Experimental Group 1 (N=15), Experimental Group 2 (N=15), and Experimental Group 3 (N=15). The sample of 59 participants is considered representative in second language studies. Fraenkel and Wallen (2003) (cited in Mackey and Gass 2016, p. 176) suggest that a number of 15 to 30 participants for each group should be selected for second language experimental studies. Participants were assigned to four different groups under different annotation conditions. The first group/class represented the Control Group (hereafter, CG) that learned English in a traditional classroom, i.e., no multimedia annotation. The second group was labeled as Experimental Group 1 (hereafter, EG1) that used L1 translation, i.e., translation for the unknown words was provided in the mother tongue while reading the English text on a computer program. The third group was Experimental Group 2 (hereafter, EG2) that used L2 definition + audio pronunciation, i.e., English contextual definition of unknown words was provided as well as the possibility of hearing the word pronounced in English. And the fourth group was Experimental Group 3 (hereafter, EG3) that used L2 definition + image annotation, i.e., English contextual definition of unknown words was provided coupled with an image/picture.

5.2 Data collection

The following instruments were used to collect data: demographic questionnaire, placement test, and immediate word recognition test. The demographic questionnaire provided participants' characteristics, therefore enabling generalizability and replicability in different research contexts and settings. This instrument collected data regarding participants' age, gender, nationality, mother tongue, foreign language competency, English language learning period, living and travel to English-speaking countries, experience with English outside school, and technology/computer use. Due to a unique research setting, participants' characteristics had a high degree of homogeneity in all measured characteristics. The placement test aimed at identifying and level participants with a similar English language competency. An immediate word recognition test was used when pupils finished the reading task and had to provide answers for incidental vocabulary learning.

5.3 Procedures

Institutional consent and individual learner consent were initially collected as a first prerequisite. All ethical issues, as an essential component in second language research, especially when children and teenagers are targeted, were carefully considered. Full voluntary consent ensuring confidentiality of each and every participant was received. Considering participants' L2 proficiency, the consent to participate in research was provided in participants' mother tongue. However, special attention was paid when explaining the purpose of the research in the consent form. Phakiti (2014) emphasized that researchers should be very cautious when explaining the aims and objectives of the study to participants. Giving a detailed explanation of the objectives and hypotheses to be tested in a study could be critical to changing participants' natural behavior since they would focus exclusively on aspects of language under investigation, thus, leading to reactive effects. This potential threat, also referred to as an interfering variable, was eliminated or minimized by giving a general explanation of the study. After institutional and individual learner consent, a placement test followed targeting participants with the same or similar English proficiency. Participants below or above CEFR B1-low and B1-low-medium levels were excluded from the study. Then the pre-test was administered that showed a high degree of homogeneity in the competence measured. In the intervention stage, participants in experimental groups read a 576-word text on a computer screen at the school computer laboratory under three different annotation modes. Participants in the control group read the non-annotated English text in the paper format, i.e., traditional classroom. All targeted words were identified by non-participating pupils and validated by experienced English teachers as unknown to participants. Since the purpose was to measure incidental vocabulary learning, participants were first told to read the text and answer questions for general comprehension. The idea here was to focus on general comprehension of the text so that participants would not be focused on learning individual unknown words; therefore, vocabulary learning measurement at post-test was identified as incidental learning. Finally, an immediate unannounced word recognition test was handed out to each participant to measure incidental vocabulary learning.

6. Results and analysis

Participants took an immediate word recognition post-test containing ten targeted unknown English words from the story. Word recognition test was designed with ten sentences consisting of an unknown word taken from the reading text. For the unknown word, which was underlined in each sentence, participants had to choose one correct translation. Out of four alternatives provided, only one was the correct translation, and the other three were distractors. Each correct answer received one point; therefore, the maximum score was ten.

The first research question intended to identify if the utilization of technology, i.e., the use of multimedia annotations, can enhance second language incidental vocabulary learning in contrast to the traditional classroom, i.e., no multimedia annotation. Therefore, all three experimental groups (labeled EGs) under different annotation modes were grouped and were compared with the control group (labeled CG) using an independent-samples t-test. Results are presented in the table below.

Table 1. Group statistics for control and experimental groups

Group Statistics					
	Groups	N	Mean	Std. Deviation	Std. Error Mean
Pre-test incidental vocabulary learning	CG	14	7.2143	1.67233	.44695
	EGs	15	7.6444	.96335	.24874
Post-test incidental vocabulary learning	CG	14	8.2857	1.06904	.28571
	EGs	15	9.1000	.81601	.21069

Statistics on the table above show a mean of 7.21, a standard deviation of 1.67, and a .44 standard error mean at pre-test for the control group, whereas the experimental groups present a mean of 7.64, a standard deviation of .96, and a standard error mean of .24. Results at the post-test show a mean of 8.28, a standard deviation of 1.06, and a standard error mean of .28 for the control group. Experimental groups at post-test showed a mean of 9.10, a standard deviation of .81, and a standard error mean of .21. However, to understand if there is a statistically significant difference, the table below is presented.

Independent Samples Test results revealed a statistically significant difference at post-test. The *p*-value of experimental groups at post-test was p = .028. Experimental groups showed higher scores on the post-test, indicating positive effects for the use of multimedia annotations for second language vocabulary learning (p < .05).

The second research question examined the most effective mode of multimedia annotation in second language incidental vocabulary learning. To answer the question a paired-samples t-test was administered, showing the results of each group at pre and post-test. The table below presents statistics of each group.

Table 2. Paired samples statistics of each group

Paired Samples Statistics					
	Groups	**Mean**	**N**	**Std. Deviation**	**Std. Error Mean**
EG1 Pair	Pre-test incidental vocabulary learning	7.53	15	1.727	0.446
	Post-test incidental vocabulary learning	9.33	15	1.047	0.270
EG2 Pair	Pre-test incidental vocabulary learning	7.69	15	2.097	0.582
	Post-test incidental vocabulary learning	8.38	15	1.609	0.446
EG3 Pair	Pre-test incidental vocabulary learning	7.53	15	2.232	0.576
	Post-test incidental vocabulary learning	9.40	15	0.632	0.163
CG Pair	Pre-test incidental vocabulary learning	7.21	14	1.672	0.447
	Post-test incidental vocabulary learning	8.29	14	1.069	0.286

As one can see from the table above, EG1, or the group that used L1 translation, scored a mean of 7.53 in the pre-test with a standard deviation of 1.727 and a standard error of 0.446, whereas the post-test resulted in a mean of 9.33 with a standard deviation of 1.047 and a standard error mean of 0.270. On the other hand, EG2, or the group that used L2 definition + audio pronunciation, scored a mean of 7.69 in the pre-test with a standard deviation of 2.097 and a standard error mean of 0.582, whereas the post-test scores resulted in a mean of 8.38 with a standard deviation of 1.609 and a standard error mean of 0.446. EG3, or the group that used L2 definition + image, resulted in a mean score of 7.53 in the pre-test with a standard deviation of 2.232 and a standard error mean of 0.576, whereas the post-test results revealed a mean of 9.40 with a standard deviation of 0.632 and a standard error mean of 0.163. Lastly, the CG, or the group that did not use multimedia annotations, scored a mean of 7.21 in the pre-test with a standard deviation of 1.672 and a standard error mean of 0.447, whereas the post-test score resulted in a mean of 8.29 with a standard deviation of 1.069 and a standard error mean of 0.286.

However, to check if there are statistically significant differences, the table below with paired differences for each group is presented.

Table 3. Paired differences for each group

		Paired Samples Test								
		Paired Differences								
Groups		**Mean**	**Std. Deviation**	**Std. Error Mean**	95% Confidence Interval of the Difference		**t**	**df**	**Sig. (2-tailed)**
					Lower	**Upper**			
EG1 Pair 1	Pre-test incidental vocabulary learning – Post-test incidental vocabulary learning	-1.800	1.474	0.380	-2.616	-0.984	-4.731	14	0.000
EG2 Pair 1	Pre-test incidental vocabulary learning – Post-test incidental vocabulary learning	-0.692	1.932	0.536	-1.860	0.475	-1.292	12	0.221
EG3 Pair 1	Pre-test incidental vocabulary learning – Post-test incidental vocabulary learning	-1.867	2.503	0.646	-3.253	-0.480	-2.888	14	0.012
CG Pair 1	Pre-test incidental vocabulary learning – Post-test incidental vocabulary learning	-1.071	2.018	0.539	-2.236	0.094	-1.987	13	0.068

The results of the paired differences in the table above present some statistically significant differences in some groups. Results of EG1 reveal the t = - 4.731 value with a degree of freedom of 14 and a *p*-value =.000, which is within the confidence interval of 0.05%, therefore showing significant statistical differences in the post-test. Similarly, results of EG3 show t = -2.888 value with a degree of freedom of 14 cases and a *p*-value = .012, which is significant at 0.05% confidence. On the other hand, paired differences of EG2 and CG showed no statistically significant differences with p-value = 0.221 and = 0.068, which are above the confidence interval of 0.05%. In sum, participants in EG1 that used L1 translation and those in EG3 that used L2 definition + image annotation showed greater scores in the post-test, therefore, indicating positive effects on enhancing incidental vocabulary learning.

7. Discussion and Conclusions

Findings of this research study yielded some positive evidence on the impact of technology, i.e., the use of multimedia annotations, on second language vocabulary learning. The first research question aimed at identifying if the use of multimedia annotations in second language reading can enhance vocabulary learning as compared to the non-multimedia environment, i.e., the traditional classroom. Analysis revealed statistically significant results (p < .05) in favor of the technology-enhanced learning environment. However, as it can be seen from the results, not all multimedia annotation modes were effective, hence, proving the general statement held by scholars and researchers in the field that technology is rather effective in language learning, but the question is for whom and under what conditions. Results and analysis of research question two, which aimed at identifying the most effective annotation mode, proved that L1 translation and L2 definition + image can improve vocabulary learning in contrast to L2 definition + audio and traditional learning, i.e., no multimedia annotation. It is very likely that L2 definitions provide less comprehensible input in contrast to L1 translation or L2 definition + picture. It seems that fifteen-year-old Albanian speakers of English with a CEFR B1-low and B1-medium competency better improve incidental vocabulary learning when provided with L1 translation as well as L2 definition + picture. L1 translation provided the correct contextual meaning of the unknown word, therefore avoiding any wrong guessing. For example, wrong guessing could probably occur when provided with the L2 definition + audio alone for the second experimental group. On the other hand, L2 definition + image proved to be more effective, thus providing statistically significant differences similar to some previous studies like Yeh & Wang (2003). One can conclude that dual annotations, i.e., L2 definition + image, provide good evidence that they can be useful means in enhancing second language vocabulary learning, especially to learners with a lower English competency. People process information through different verbal channels in different languages; however, all people, no matter what language they speak, have a common non-verbal system or what Paivio (1986) calls the imagery system. Furthermore, Mayer (2009, p. 1) states that "people learn better from words and pictures than from words alone - made possible through multimedia instruction -

however, the question is how can we design multimedia instruction that improves learner understanding of presented material?".

As for the pedagogical implications, we can conclude that annotating second language texts on different modes can improve vocabulary learning. Therefore, the use of multimedia annotations in second language vocabulary learning is recommended as a useful pedagogical tool.

This study was limited to a specific age group and English proficiency, as well as a specific research design, methodology, and cultural setting. It was also limited to investigating only incidental vocabulary learning. Future studies are recommended using different first language backgrounds and cultures, different age groups, and different methodological and study perspectives.

References

Akbulut, Y. (2007). Effects of multimedia annotations on incidental vocabulary learning and reading comprehension of advanced learners of English as a foreign language. Instructional Science, Springer Netherlands, Vol. 35, No. 6, pp. 499-517.

Al-Seghayer, K. (2001). The effect of multimedia annotation modes on L2 vocabulary acquisition: A comparative study. Language Learning & Technology, 5(1), 202-232.

Askildson, L. R. (2011). A Review of CALL and L2 Reading: Glossing for Comprehension and Acquisition. International Journal of Computer-Assisted Language Learning and Teaching (IJCALLT), 1(4), 49-58.

Bernhardt, E. B., (2011). Understanding Advanced Second Language Reading. New York: Routledge.

Chapelle, C. (2007). Technology and Second Language Acquisition. Annual Review of Applied Linguistics, Vol. 27, 98–114.

Chun, D. M., & Plass, J. L. (1996). Effects of multimedia annotations on vocabulary acquisition. The Modern Language Journal, 80(2), 183-198.

Fraenkel, J., & Wallen, N. (2003). How to design and evaluate research in education (5th ed.). New York: McGraw-Hill.

Grabe, W. (2009). Reading a Second Language: Moving from Theory to Practice. New York: Cambridge University Press.

Hong, X. (2010). Review of Effects of Glosses on Incidental Vocabulary Learning and Reading Comprehension. Chinese Journal of Applied Linguistics, Vol. 33, No. 1.

Hubbard, P. & Levy, M., (2016). Theory in computer-assisted language learning research and practice (pp. 24-38). In: Farr, F. & Murray, L. (Eds). The Routledge handbook of language learning and technology. Abingdon, Oxon, United Kingdom: Routledge.

Hubbard, P., & Levy, M. (2006). Teacher education in CALL. Amsterdam, The Netherlands: John Benjamins.

Hudson, T. (2015). Essentials of quantitative research for classroom teachers. In: Brown, J.D. & Coombe, C. (Eds.). The Cambridge Guide to Research in Language Teaching and Learning. Cambridge: Cambridge University Press.

Knight, S. (1994). Dictionary use while reading: The effects on comprehension and vocabulary acquisition for students of different verbal abilities. The Modern Language Journal, 78 (3) 285-299.

Ko, M. H. (2017). The relationship between gloss type and L2 proficiency in incidental vocabulary learning. Modern English Education, Vol. 18, No. 3, 47-69.

Koda, K. (2005). Insights into second language reading: A cross-linguistic approach. Cambridge: Cambridge University Press.

Laufer, B. (1992). How Much Lexis is Necessary for Reading Comprehension? (pp. 126–132). In: Arnaud, P.J.L., & Béjoint, H. (Eds). Vocabulary and Applied Linguistics. London: Palgrave Macmillan.

Mackey, A. & Gass, S., (2016). Second Language Research: Methodology and Design (2nd Ed.). New York: Routledge.

Mayer, R. E. (2009). Multimedia learning (2nd Ed.). New York: Cambridge University Press.

Mohsen, M. A., & Balakumar, M. (2011). A review of multimedia glosses and their effects on L2 vocabulary acquisition in CALL literature. ReCALL, 23, pp 135-159.

Nation, I. S. P. (2001). Learning vocabulary in another language. Cambridge: Cambridge University Press.

Paivio, A. (1986). Mental representations: A dual coding approach. New York: Oxford University Press.

Phakiti, A. (2014). Experimental research methods in language learning. London: Bloomsbury Academic.

Ramezanali, N., & Faez, F. (2019). Vocabulary learning and retention through multimedia glossing. Language Learning & Technology, 23(2), 105–124.

Schmitt, N. (2010). Researching vocabulary: A vocabulary research manual. Basingstoke, Hampshire: Palgrave Macmillan.

Varol, B., & Erçetin, G. (2016). Effects of Working Memory and Gloss Type on L2 Text Comprehension and Incidental Vocabulary Learning in Computer-Based Reading. Procedia - Social and Behavioral Sciences, Vol. 232, pp. 759-768.

Yanguas, I. (2009). Multimedia glosses and their effect on L2 text comprehension and vocabulary learning. Language Learning & Technology, 13(2), 48–67.

Yeh, Y., & Wang, C. (2003). Effects of Multimedia Vocabulary Annotations and Learning Styles on Vocabulary Learning. CALICO Journal, 21(1), 131-144.

Yoshii, M. (2006). L1 and L2 glosses: their effect on incidental vocabulary learning. Language Learning & Technology, Vol. 10, No. 3. pp. 85-101.

Yoshii, M., & Flaitz, J. (2002). Second Language Incidental Vocabulary Retention: The Effect of Text and Picture Annotation Types. CALICO Journal, 20(1), 33-58.