Using hypermedia annotations to teach vocabulary on the Web

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This project measured the effect of using hypermedia annotations on short and long-term vocabulary retention in teaching vocabulary through Web-based language learning activities. A total of 62 university students were randomly assigned into two homogeneous groups; and then both groups were given a pre-test. Both groups covered 12 expository passages selected by the researchers from the BBC website. The subjects had to sit for an immediate quiz to measure the short-term effect of the treatment and finally, at the end of the course and a two-week interval, subjects sat for their post-test. Findings revealed that there was a significant effect of the hypermedia annotations on the retention of vocabulary in the short term ($p < 0.05$). However, the post-test results indicated that the effect of the treatment in the long term faded away, and the significance of the means was not sufficiently high to reject the null hypothesis.

Keywords: hypermedia annotations; plain text; vocabulary retention; WBLL

Introduction

Teaching vocabulary through Web-based language learning (WBLL) activities has been popularly used in English as a foreign/second language learning (EFL/ESL) context (Son 2008). Hypermedia as a multidimensional computer tool has been practiced by language teachers to facilitate learning and teaching processes (Cummins 2008a). It provides an integrative network tool utilised in classrooms around the world. Knowledge of vocabulary is the backbone of learners' competency which facilitates learning of any language tasks. Decarrico (2001, as cited in Celce-Murcia 2001) claims that "vocabulary learning is central to first and second language acquisition and specialists now emphasise the need for a systematic and principled approach to vocabulary by both teachers and learners" (285). Therefore, learning vocabulary is often perceived to be "of critical importance to the typical language learner" (Zimmerman 2001, 5).

Teachers and learners can utilise website resources for various pedagogical purposes to scaffold teacher–student interaction in and outside the classroom (Cummins 2008b). The present study evaluated the effect of using hypermedia annotations, as opposed to plain or printed texts, on learners' vocabulary retention. Hypermedia is defined as an audio and external presentation of the passage in addition to the picture presentation of the passage provided by the authors of the passages. Slatin (1991) defined hypermedia (or hyper-document) as an assemblage of texts, images and sounds-nodes-connected by electronic links so as to form a system

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whose existence is contingent upon the computer. The passage may accompany extra-textual annotations or computer software (i.e. encyclopedias or online dictionaries). In contrast, plain or printed texts are paper print of the material to provide the learners with vocabulary learning tasks. For instance, monolingual or bilingual dictionaries (e.g. monolingual Longman Dictionary of Contemporary English) which are used by learners to pick up the right definition at the time they recognise a need.

Statement of the problem

Baker and Westrup (2003) refer to the stages of vocabulary teaching as: "First the teacher conveys the pronunciation and meaning of the new vocabulary item (Presentation). Second, the teacher checks that the student has understood properly (Practice). Third, the teacher consolidates and tries to get the students to relate the word to their personal experience, and use it in context (Production)" (37). This is the teachers' point of view: at the same time that the teachers are trying to teach vocabularies based on Presentation, Practice, Production (PPP) approach, most learners feel embarrassed, trying to look each and every word up in their dictionaries, making them easily give up. When it comes to vocabulary learning in foreign languages, Nguyen and Khuat (2003) assert that "vocabulary learning is considered as boring as they [foreign language learners] have to memorise unfamiliar words and spelling". In both cases (teaching and learning vocabulary), eventually we see that most of the class time is spent on activities other than the intended one (Hulstijn, in press).

Therefore, vocabulary teaching and learning is a time-consuming effort in traditional approaches. First, learners will always show a need for more and teachers will always see and attempt to satisfy it. Second, because of the time and energy involved in teaching and learning vocabulary, the prime focus is on the meaning of the intended vocabulary: other features of the vocabulary (multidimensionality of vocabulary knowledge) would be overshadowed for the sake of meaning. According to Hulstijn and Laufer (2001), "if learners pay careful attention to the words' pronunciation, orthography, grammatical category, meaning and semantic relations to other words, they are more likely to retain the word than if they pay attention to only one or two of the above word properties" (541).

Nation (2005) claims that successful comprehension requires automatic recognition and decoding of 95–99% of the words in a text. It has also been claimed that reading is one of the main ways language learners acquire new vocabulary knowledge (Bogaards 2001). For these reasons, in this study a reading approach will be used to examine vocabulary retention. On the other hand, the researchers attempted to eliminate parameters which hindered the acquisition of vocabulary and introduced the medium through WBLL activities which language learners may focus more on their learning, rather than being distracted by the process of finding a vocabulary meaning in their dictionaries. Using Computer-Assisted Language Learning (CALL) approaches to teaching vocabulary, teachers are also freed from the long and boring process of teaching vocabulary and are allowed to focus more on other needs of language learners (Gorjian 2008).

In this study it is believed that using hypermedia may enhance the quality of the input which ultimately encourages meaningful language learning; provision of such detailed information, often called "Rich instruction" or "Rich scripting" (McWilliam 1998) which aims to provide a deeper understanding of a word, and

make it an "accessible vocabulary item" (Nation 2001, 95). Accordingly, the main research questions to be pursued in this study are: (1) could enriched texts (hypermedia) help Iranian EFL learners acquire and retain new vocabularies? and (2) regarding multidimensionality of vocabulary knowledge, could hypermedia be used as a solution to teach a comprehensive knowledge of the intended vocabularies? The study seeks to address the following null hypothesis: enriched texts (hypermedia annotations) have no effect on Iranian EFL learners in learning and retaining new vocabulary.

Background

The ideas mentioned above are all well dealt with the advent of hypermedia. The use of computer technology in teaching languages has been dramatically increasing worldwide over the past decade (e.g. O'Dowd 2003; Chen, Belkada, and Okamoto 2004; Hayati 2005; Hubbard and Levy 2006; Son 2008). Using this technology not only facilitates learning processes (Gorjian 2008), but also holds other great potentials for language learning. One of these potentialities is the ability to present information in different formats using graphics, sound, text and video with links to other chunks of information through using WBLL activities (Robb 2006; Son 2007; Cummins 2008a, 2008b).

Hypermedia annotations have several advantages; researches carried out by Boers, Eyckmans, and Stengers (2004) and Abraham (2008) have provided evidence of an overall beneficial role for computer-mediated text glosses providing lexical support on comprehending authentic readings and learning vocabulary. Researchers were inspired by the premise that a variety of glosses for words in various modalities, such as printed text, graphics, dynamic video and sound, might have differing capacities to facilitate vocabulary acquisition and retention (De Ridder 2002; Boers and Lindstromberg 2005).

Presenting information in this way enables readers to access information in the order most appropriate to their purposes. Using appropriate presentation methods enables learners to obtain a deeper impression of and richer information about the target words to make them enter the long-term memory more easily (Zhang 2008). In addition, in traditional approaches any unexpected subject matter (vocabulary, in our case) cannot be dealt with in advance, no matter how necessary. In our case, if a word out of the blue poses a problem, in traditional approaches teachers could not think of ways of dealing with that word without shifting the focus in class and diverting time (McDonald 2008). For these reasons, comprehensive vocabulary knowledge seems indispensable but almost impractical to achieve in traditional classes.

The idea of hypermedia learning/teaching is also suggested by cognitive psychology. Cognitive psychologists and language acquisition scholars working within the framework of cognitive psychology believe that retention of information is determined by the way in which this information is processed (Hulstijn and Laufer 2001). They suggest the Involvement Load Hypothesis that "the retention of unfamiliar words is, generally, conditional upon the degree of involvement in processing these words" (545).

Son (2008) proposed that "hyperlinked multimedia documents and computer mediated communication (CMC) tools; the Web can support language teachers to integrate Web resources into the language classroom" (34). Smith and Stacy (2003) emphasised that CMC "has changed the nature of distance from an individual

experience that is largely remote and isolated from other students, to one in which the technology can enable more ongoing interaction with fellow students'' (165). The potential for manipulating online technology within a collaborative learning environment is one of the greatest strengths of CMC.

Hubbard and Levy (2006) argue that the influence of technology on language teaching and learning has developed along with the parallel growth in the development of course work to prepare language teachers with appropriate methods of using the technology in the classrooms. They focused on classroom teachers who should use CALL "to promote, manage, or assess their students' learning. Note that 'classroom' is used in its broadest sense to subsume language teaching in a traditional physical space, a computer lab, a mix of physical classroom or lab and online, or entirely online'' (13). Robb (2006) believes in maximising the opportunities for the EFL/ESL teachers to experience "with technology, both new and old, to interact with their colleagues and to access other sources of information on technology'' (346). He also emphasises the effect of fostering positive attitudes towards computer technology in the classroom and educational settings "by providing multiple examples of good practice, as well as the printed, digital and human resources that are required to attain this goal'' (346).

Methodology

Subjects

This study was conducted with sample of 62 Iranian EFL students based on non-random convenient sampling. They had entered university for their undergraduate studies. Subjects were selected based on a given TOEFL test, Barron's 2003 edition, and the results of the test indicated that in terms of educational background, level of English mastery and vocabulary knowledge, the subjects were homogeneous and could be considered as intermediate in their proficiency stamina. Then they were divided into two groups based on systematic random sampling. The subjects were 62 (15 males and 47 females) students with the age ranging from 21 to 39. They were measured under two conditions: plain text group (i.e. control group who dealt with the plain texts) and hypermedia group (i.e. experimental group who dealt with hypermedia annotations).

Instrumentation

This study used the following instruments:

1. Pilot test: To investigate the suitability of the level of the text and to examine how much time it would take the subjects to complete the task, a pilot test of hypermedia version of the text was conducted with five students who did not take part in the actual research. The reliability of each and every test used in this research was calculated by Kuder-Richardson formula (KR-21). The reliability coefficients for the pre-test and the post-test were 0.75 and 0.74 respectively.

2. Pre-test: A pre-test containing the actual test items was administered to the subjects before treatment in order to determine how well the subjects knew the contents before treatment. The subjects were asked to answer 40 multiple-choice

vocabulary questions, selected from the course passages, in 30 minutes. To ensure that students did not give more attention than they should to the words appearing in the pre-test, no mention was made of the subsequent learning lessons and the immediate quizzes or post-test.

3. Immediate quizzes: After each session where students had covered the two passages given to them to be read for the sake of comprehension, there was a 2–3 minutes rest and right after that there was a short multiple question quiz asking the meaning of the new vocabularies learnt in that session.

4. Post-test: Two weeks later after the end of the course, the instructor administered the post-test without notice. The sudden presence of the instructor in the class was to test the retention of words in a longer period to see the real effect of the treatment. The only difference of this test to the pre-test was that the order of questions was changed to wipe out the probable recall of pre-test answers.

5. Multidimensionality (MI) test: It was claimed earlier that hypermedia can boost multidimensionality knowledge of vocabulary in language learners. Therefore a pronunciation test was designed at two levels, in one level, which was comprised of a written part of the test, components of vocabulary were put into questions. This part consisted of 10 items and each item was testing phonetic transcription, part of speech, past form of the verb, superlative form of adjective and plural form of noun for a chosen vocabulary from the passages covered.

Procedure

Since this comparative study consists of two distinct approaches to vocabulary learning, the materials used were the same for both groups except for the medium of presentation, for this reason two kinds of presentation were used, namely, hypermedia presentation and the plain text presentation.

Expository passages from the BBC website (www.bbclearningenglish.com) were selected for this study. Subjects viewed 12 passages over six sessions where each session lasted for about one hour. Subjects in both groups were not informed in advance that they would be tested because it was assumed that if they knew, they would consciously try to learn the new words. It was hoped that attempting to prevent the subjects from making such a conscious effort would create a more natural environment.

The subjects in the hypermedia group ($n = 31$) were introduced to a hypermedia-learning programme, designed by the researchers for the vocabulary retention. The programme provides users reading an expository English text with a variety of glosses or annotations for words in the form of text, graphics, video and sound, all of which are intended to aid in the understanding and learning of unknown words. The plain text group ($n = 31$) were put into the control group with the same material except for the medium of presentation (i.e. paper).

A pre-test containing the actual test items was administered to the subjects before treatment in order to determine how well the subjects knew the contents before treatment. Both groups completed an identical pre-test; subjects were asked to answer 40 multiple-choice vocabulary questions in 30 minutes. These 40 questions were selected from words picked out from the course passages.

Based on the interactive theory of reading, two types of annotations were identified as facilitators of top-down and bottom-up processes: textual annotations provide information about the text, such as definitions of words (text annotations), their pronunciation (audio annotations) and illustration (graphics annotations). Extra textual annotations provide extra background information about the topic in the form of text, audio, illustration and video.

Textual annotations were linked directly to the text which gave students the same amount of information about each word, while extra textual annotations, on the other hand, were not directly linked to the text and were presented in the form of encyclopedia in this study. This information was different for each student and students selected different annotations based on their preferences in the form of media the information was available (i.e. text, graphics, sound or video). To make sure everyone had at least studied the passages once and in order to expedite the process, the instructor used a CD player available in the laboratory to play the audio track for the passages, so that students heard the words pronounced by a native speaker. After playing the audio track for each passage the students were asked a few comprehension questions.

Subjects on the plain text group were taught according to the convention of teaching in normal class in Iranian University context. That is to say, a printed form of the material designed for this study was prepared and distributed to the students. Students were told to bring their dictionaries (mono and bilingual dictionaries) into the class to compensate for textual annotation in the hypermedia group; the extra textual annotations used in the hypermedia group were not available for these students unless they asked the instructor (as is the case in traditional classrooms). Students were told to read the passage in groups (five groups of five, and one group of six students). The reason behind this division was to make the condition as close as possible to the hypermedia group. The criterion for the division of students in conventional group was the MI test (as was for the hypermedia group). The time allocated to complete the task was also the same one hour as was for the hypermedia group. Subjects in both groups read a text that contains words that the researchers have targeted for learning, but the subjects did not know this. They read the text in the normal way, that is, they read to comprehend its informational content.

Two weeks later after the end of the course and again without warning the post-test was conducted. Statistical analyses were performed using SPSS software version 15.

Results

Descriptive statistics of the pre-test were computed for both groups. The results showed that both groups were almost at the same level in terms of vocabulary knowledge of the mean scores (before the treatment) which also could be counted as another indication of homogeneity of both groups as it is presented in Table 1.

Table 1.   Descriptive statistics for pre-test.

Groups	N	Mean	SD
Hypermedia	31	8.8065	2.01112
Plain text	31	8.5323	2.81643
Total	62		

Table 2. Descriptive statistics for immediate quizzes.

Immediate quizzes	Groups	Mean	SD	Min	Max
1	Hypermedia	12.9286	3.28778	2	18
	Plain text	9.2500	2.81687	4	18
2	Hypermedia	7.7857	4.66156	0	18
	Plain text	7.0833	4.60545	0	16
3	Hypermedia	13.3333	3.33563	8	20
	Plain text	9.7143	3.59894	2	16
4	Hypermedia	12.4667	3.43143	2	18
	Plain text	10.1429	4.10703	6	18
5	Hypermedia	12.2222	4.05096	4	20
	Plain text	12.0000	4.17029	4	20
6	Hypermedia	9.1111	3.05505	2	16
	Plain text	9.0833	3.86643	2	14
Total	Hypermedia	11.3529	4.17716		
	Plain text	9.5658	4.09113		

Immediate quizzes were administered to the subjects of both groups to check their short-term memory retention. First, mean and standard deviation of each immediate quiz was determined for both groups. Then the total mean and standard deviation of these six quizzes were calculated. As can be seen in Table 2, hypermedia group outperformed the subjects of the plain text group in each immediate quiz.

Since descriptive statistics could not offer the researchers valid information to reject or sustain the null hypothesis, a two-tailed independent t-test was run to see whether the observed difference between the groups was significant or not. Table 3 presents descriptive statistics of immediate quizzes.

Table 3. Immediate quizzes results.

Test	Groups	Mean	SD	t_{obs}
Immediate quizzes	Hypermedia	11.3529	4.17716	3.049*
	Plain text	9.5658	4.09113	

*Significant at $p < 0.05$.

The t observed value for immediate quizzes was 3.049, while the critical value is 2.042 at 0.05 level of significance. So the results of the immediate quizzes indicate that the difference between mean scores of both groups was significant enough to reject the null hypothesis.

For the post-tests, long-term memory of both groups was necessary. Table 4 shows the results of post-test.

Table 4. Results for post-test.

Test	Groups	Mean	SD	t_{obs}
Post-test	Hypermedia	10.7800	3.28215	−0.119
	Plain text	10.6731	2.98644	

The results showed that observed t (−0.119) was less than the critical t which indicated that the treatment did not work for the long-term retention. The results of immediate quizzes were in favour of hypermedia group but in the long run both plain

text group and hypermedia group had close results. Therefore, the plain text group had a growth in its mean (from 9.5658 to 10.6731); on the other hand, hypermedia group had a regression (from 11.3529 to 10.7800). The hypermedia groups' retention, although it has regressed, still is higher than that of the plain text group. Table 5 shows the results of immediate quizzes and post-test were put into calculation.

Table 5.   Matched pairs: immediate quizzes and post-test.

Test	Groups	quizzes	Mean	SD	t_{obs}
Matched pair	Hypermedia	Immediate quiz	11.3529	4.17716	−0.475
		Post-test	10.7800	3.28215	
	Plain text	Immediate quiz	9.5658	4.09113	0.889
		Post-test	10.6731	2.98644	

In other words, hypermedia materials could benefit learners better in short-term effect. However, considering the data in Tables 4 and 5 in the long run, there would not be such a big difference between the two groups (plain text group's mean = 10.6731 and the hypermedia group's mean = 10.7800) and also there was not a significant difference between the groups (progress of the plain text group = 0.889 and regression of the hypermedia group = −0.475) that could be counted as superiority of one over the other. The results are depicted in Figure 1.

General performance

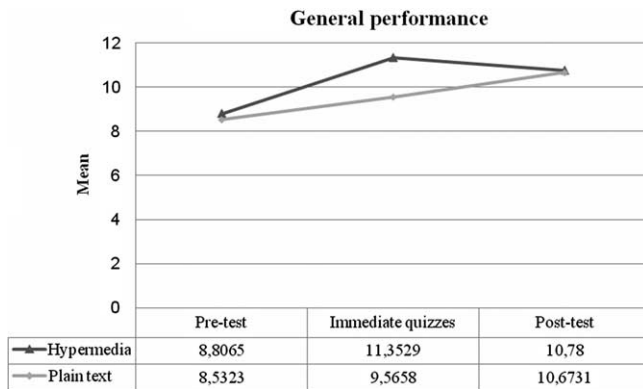|	Pre-test	Immediate quizzes	Post-test
Hypermedia	8,8065	11,3529	10,78
Plain text	8,5323	9,5658	10,6731

Figure 1.   Learners' vocabulary retention in hypermedia and plain text groups.

After the post-test was administered, subjects were asked to take part in a conversation test. To have a fair judgement about their performance another teacher was asked to subjects in scoring their pronunciation.

In order to divert their attention from the main objective of this test, the subjects were told they were to be scored based on the degree to which they could remember the passages they were going to be asked to recite. Although the subjects were struggling to remember different parts of the passages the instructor was naming, they had no clue that it was their pronunciation that was being scored rather than the memory of the passage they were reciting.

After the data were gathered from their conversation test, the scores each subject had achieved from two scorers was averaged, then the obtained score was averaged

with the score each learner had gained in the written part of the test. Then the scores of both groups were given to statistical t-test analysis and the results are presented in Table 6.

Table 6.   Results of multidimensionality vocabulary knowledge.

Groups	N	Mean	SD	t_{obs}
Hypermedia	31	15.2258	2.15576	0.424
Plain text	31	15.1333	2.23966	
Total	62			

Discussion

In light of the results obtained from Tables 1 to 6 and also as shown in Figure 1, the effect of the treatment on learning and retention of the vocabulary in the long run was not significant. Besides, the results of the immediate quizzes indicated that the retention of the vocabularies was better in hypermedia group, and the hypermedia group has outperformed their counterparts in short term in the mean scores of the plain text group (3.049 > 2.042). The results as indicated in previous sections showed a better retention of vocabularies in the hypermedia group at this stage (hypermedia group's mean was 11.3529, while the mean for plain text group was 9.5658 at the immediate quiz level).

The short-term results of this study were in compliance with the results obtained by Davis (1989) and Roby (1999). It could be implied from this study and other studies in the field of language learning that hypermedia could help language learners in achieving the desired results but care should be taken. As mentioned above, one of the benefits of hypermedia was providing fast, easy and accessible information. This advantage can turn into disadvantage if it becomes an end to itself rather than a means to an end.

Concerned with the first research question, the short-term retention of vocabulary was high enough in this study to reject the null hypothesis ($p < 0.05$); this was also supposed to be the result of the long-term retention of the study which was not obtained. It could be implied from this comparison that the plain text group not only kept the retention of vocabularies at the whole stage of the course, but also showed progress compared to previous tests (pre-test and immediate quizzes test) in comparison to post-test (8.5323 < 9.5658 < 10.6731). The hypermedia group showed progress in immediate quiz level but failed to progress in the post-test (8.8065 < 11.3529 > 10.7800).

Hypermedia was supposed to give an enhanced, comprehensive and in depth knowledge to the subjects to support the routes of the retention of the knowledge. However, the obtained results from this study have indicated that it falls short in proving the expected results of the treatment in the long run. The researchers believe the reason behind these results may lie in the advantage of the treatment over other media. That is to say, the fast, easy and accessible information available at the whole time demolishes the sense of need in subjects, which is in opposition with Involvement Load Hypothesis (Laufer and Hulstijn 2001). Subjects of this study felt no longer the need (thirst) to learn from what was supposed to be a learning experience, simply because they had already found the whole knowledge available

right in front of their eyes. It seems that providing all the information which a student needs will only work as long as the capacity of his/her short-term memory allows.

The subjects of hypermedia group, when given all they need and when they felt that there was no more pressure on them, started to establish what the researchers called "Go-ahead-I-Know character". In establishing this character, students no longer feel the necessity of the presence of their instructor because they know they can find the answers to their question without asking him/her. In addition, their sense of autonomy rose to a high level which kept them from appreciating the transient nature of hypermedia.

It seems that providing all that students need builds a mirage that learners know everything. Finding the answers to every question, learners may answer every related question to the passage by the help of textual and extra textual information, especially those which are related to vocabulary, seems to be enough to satisfy the immediate needs of the learners while not providing enough bonds for long-term retention. In other words, subjects, when finding the information available to them, forget their role as learners and just focus on a specific task. It seems that the results of this study support the Mental Effort Hypothesis (Rott, Williams, and Cameron 2002), that since the learners' effort reduced greatly in learning a vocabulary, the retention of vocabulary has been reduced greatly in the long-term memory.

Generally, it seems that the transient effect of hypermedia on learning could be to blame but the educational system in the Iranian context also contributed. The researchers believe that a factor is the long standing plain text-based nature of language learning and teaching in the Iranian educational system: learners were not accustomed to the roles and experiences this study was imposing on them. It seems that studies like this need more time before their real results will be judged. Until then serious thinking is needed to prepare the grounds to shift from the present situation to a more cutting edge one.

In respect to the second question proposed earlier, the results to this question have indicated that both groups performed equally. It should be added that considering the capacity of hypermedia it is obvious that it can support the multidimensional knowledge of vocabulary in different modalities. However, it became clear that the prime concern of the language learners in reading situations is to grasp the meaning of the unknown vocabulary. Other features of the vocabulary take second place for the language learner.

The results obtained from this study confirm Mayer (2003) who noted that the methods used in an instructional programme, not the delivery media by itself, impacts learning. Although every aspect of hypermedia was in favour of the hypermedia group, even a well-equipped study lends its success to practicality of the methods used in that study. In other words, no matter how equipped or multimodal a study could be, as long as the method used in that study does not generate the sense of need in learners it would not grant high-quality results.

But what could be said about the success of hypermedia group in the short-term retention of vocabulary could be due to the results of the immediacy of feedback and the effect of short-term memory on retaining the new vocabularies which fade in the longer term. In addition, this study suggests that when language learners are given the liberty to decide on what is right and what is needed for their future success, they are making wrong decisions. Iranian EFL learners take only what comes from the authoritative power of the class, that is, teachers, as the information to be learned and do not take material as seriously as when it is presented by their teacher. Thus as long

as teachers take the full responsibility of teaching, and learners see themselves as the sole recipient of the presented knowledge to them, independent, autonomous approaches like the one in this study will falter.

Conclusion

In the traditional classes the responsibility is two-folded; on one fold there is teacher, on the other students, whereas in hypermedia classes this responsibility turns out to be three folded where part of the teacher's knowledge disguises itself in the form of hypermedia. The considerable amount of information either needed by students or imposed by the material poses a great force on teachers, but using computers to take some of these pressures will liberate some time for teachers to think of other important issues.

As for extra textual annotations, the assumption was to provide learners with the background knowledge needed to understand the materials easily. It is quite clear that background knowledge plays a crucial role in understanding the materials, but heterogeneous classes in addition to the nature of traditional approaches make presenting background knowledge in the classroom impracticable while in hypermedia activities, learners found the information tailored to their needs. If they lacked any information needed to comprehend the passage, they would refer to extra textual information. The results showed that more than of the subjects used the use of encyclopedia, if available.

Hypermedia as one of the multidimensional tools of CALL approach plays a significant facilitative role in developing short-term vocabulary retention and recall. In long-term vocabulary retention this is not necessarily the case but we need to examine the hypermedia efficiency cautiously due to the parameters of the study as well as the effect of the Iranian setting as an EFL context. The study has provided preliminary work on using hypermedia concerned with WBLL tasks in teaching vocabulary. Thus there is a need to conduct further experimental research to discover the role of hypermedia annotations in teaching vocabulary and its effects on learners' vocabulary retention in the long run.

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