



## Hypermedia gloss in the teaching and learning of implicit vocabulary in the English language

Renata Bittencourt Procópio<sup>1</sup> e Patrícia Nora de Souza Ribeiro<sup>2\*</sup>

<sup>1</sup>Colégio de Aplicação João XXIII, Juiz de Fora, Minas Gerais, Brazil. <sup>2</sup>Universidade Federal de Juiz de Fora, Rua José Lourenço Kelmer, s/n., 36036-900, São Pedro, Juiz de fora, Minas Gerais, Brazil. \*Author for correspondence. E-mail: [patnora.souza@gmail.com](mailto:patnora.souza@gmail.com)

**ABSTRACT.** Owing to the relevance of hypermedia in a foreign language's vocabulary learning and to the lack of studies on the influence of the linguistic proficiency in implicit vocabulary learning within a hypermedia environment, current study investigates the relevance of hypermedia glossary in the teaching and learning of implicit vocabulary by students of English as a foreign language, at elementary level. Current research is foregrounded on the Connectionism Approach, which explains human cognition and knowledge acquisition, and on the Cognitive Theory of Multimedia Learning by Mayer (2001) which explains information processing within a multimodal learning environment. Selection and development of hypermedia material featuring hypermedia glossary for implicit vocabulary learning are forwarded according to parameters outlined in the theoretical framework. The material used in data retrieval was applied to 39 students of English, at the elementary level, of the Federal University of Juiz de Fora, Brazil, divided into 2 groups (A and B). The average gain of learning in the two groups (A = 28.5 [p.p.] and B = 21 [p.p.]) reveals that hypermedia glossary may contribute towards implicit vocabulary learning by elementary level students, with special reference to visual annotation.

**Keywords:** lexis, English, annotations, reading, hypermodality.

## Glossário hipermídia no ensino-aprendizagem implícito de vocabulário em língua inglesa

**RESUMO.** Considerando a carência de estudos sobre a influência da proficiência linguística no aprendizado implícito de vocabulário em ambiente hipermídia, este estudo investiga a relevância do glossário hipermídia no ensino-aprendizagem implícito de vocabulário de alunos de nível elementar de inglês como língua estrangeira. No plano teórico, o estudo é fundamentado nos pressupostos das seguintes teorias: Abordagem Conexionista, que busca explicar a cognição humana e a aquisição de conhecimento, e Teoria Cognitiva do Aprendizado Multimídia, proposta por Mayer (2001), que busca explicar o processamento da informação em ambiente de aprendizagem multimodal. Este estudo apresenta a seleção e o desenvolvimento de um ambiente hipermídia de leitura contendo um glossário hipermídia orientado por parâmetros delimitados no plano teórico. Esse material, utilizado na geração de dados, foi aplicado a 39 alunos de nível elementar de inglês da Universidade Federal de Juiz de Fora, divididos em dois grupos (A e B). O ganho médio de aprendizagem obtido tanto no Grupo A, 28,5 [p.p.], quanto no Grupo B, 21 [p.p.], indicam que o glossário hipermídia pode contribuir para o aprendizado implícito de vocabulário de alunos de nível elementar, com destaque para a anotação visual.

**Palavras-chave:** léxico, inglês, anotações, leitura, hipermodalidade.

### Introduction

Hypermedia brings a new conception of learning and information exchange from its non-linear network and its multiple possibilities of interaction (Ferrari, 2012). It is characterized by the interactivity promoted by hypertextual structure and the integration of different modalities. Hypermedia is an important tool in the teaching-learning process of a foreign language (FL) because it enables, according to Braga (2013), the construction of learning environments as well as more didactic materials.

In the field of vocabulary teaching-learning in FL and in the teaching of reading context, researches (Nagata, 1999; Al-Seghayer, 2001; Laufer & Hulstijn, 2001; Sun & Cheng, 2007; Yun, 2011; Sadeghi & Ahmadi, 2012) point out the relevance, especially concerning hypermedia glossary, to implicit vocabulary teaching-learning, which is given through context, mainly by inference, involving the learner's conscious decisions towards the unknown vocabulary. This glossary, which comes with the text, enables the associative and non-linear presentation of short definitions or words

explanations, using different medium, accessed at only one click on the target-word.

Among the benefits of hypermedia glossary, Nagata (1999) highlights: (1) it is easier to be used than a dictionary; (2) it draws the learner's attention towards the target-words; (3) it helps to immediately connect words and meanings; (4) it contributes towards the process of performing correct inferences and the lexical knowledge retention, since the glossary encourages the student to go and return between the target-words and the multimodal annotations, bringing greater student's involvement in the information processing.

Although studies show positive impacts of hypermedia glossary upon vocabulary acquisition (Souza, 2004; Sakar & Ercetin, 2005), it is important to note that there are factors, such as the learner's level of proficiency, which will determine the use and efficiency of the glossary. Consequently, due to the fact that there are few studies in this field, we focused on the relevance of hypermedia glossary towards the vocabulary learning of English elementary students as a FL in our study.

The proposal of this study investigation is foregrounded by the following questions:

1- Does the hypermedia glossary enable the English elementary student's vocabulary learning?;

2- Which annotations (verbal, visual, sound) contribute the most towards the elementary students' learning?

This study is grounded on the following theories assumptions: Mayer's Cognitive Theory of Multimedia Learning (2001), which attempts to explain the multimodal information processing in multimedia environment of learning and approach or language connectionist paradigm, which aims at explaining human cognition and knowledge acquisition (Ellis, 1998; Leite, 2008; Zimmer, 2008; Rossa & Rossa, 2009), approaching basic questions for vocabulary learning.

In order to reach the aimed goals, in sections 1 and 2, we will discuss the theories that ground the study, focusing on vocabulary learning in hypermedia environment. In the following section, we will present the study methodology and in section 4, data analysis. In the last section, final considerations regarding this study will then be presented.

#### **Information processing models for multimedia environment**

We start this section emphasizing that literature in Portuguese language, up to this moment, does not present models focused on learning in hypermedia environment (associative and non-linear

environment), but it does in multimedia environment (linear and sequential environment). However, Mayer's Cognitive Theory of Multimedia Learning (2001) can be applied for understanding the information processing in hypermedia environment, although it was created for multimedia environment.

This theory, according to a cognitive guidance, assumes that learning is benefited by the use of two or more ways of information presentation, once the multimedia effect would enable learners to build richer mental representations, as well as to establish connections among them, thus enlarging understanding.

The theory is based on three hypotheses upon the human mind functioning: the Dual-Channel Hypothesis, the Limited-Capacity Hypothesis and the Active Processing Hypothesis. The Dual-Channel Hypothesis, derived from Paivio's Dual-coding Theory (1971; 1986), claims that the human being processes visual and auditory information in separated channels. The Limited-Capacity Hypothesis, derived from Sweller's Cognitive Load Theory (1994), claims that the human being's capacity of information processing is limited within each channel, visual and verbal. Finally, the Active Processing Hypothesis claims that the human being is engaged in active learning when they focus their attention on relevant visual and verbal information, organizing them in coherent mental representations and integrating them with their previous knowledge.

According to Mayer (2001), learning in multimedia environment is, therefore, facilitated when information is presented through the verbal and visual channels in such way it does not overwhelm the working memory. Thus, the different representational codes (verbal and pictorial information) must be combined in a way they do not damage information processing. For instance, it is presumed that the verbal text presentation, together with animation or picture in movement, must be avoided, because it divides the student's attention and overwhelms the information channels.

The above mentioned Mayer's theory has been used in researches in the field of computer mediated teaching for it is one of the few models which attempt to explain the multimodal information processing and can be applied in the hypermedia environment (Sadeghi & Ahmadi, 2012). However, the proposed model is still very simple and limited to explain vocabulary learning in hypermedia environment, although it presents meaningful advances for the field. Thus, to understand the learning process in hypermedia environment, this study will be grounded on the assumptions of the

Cognitive Linguistic approach – the connectionism, a paradigm that attempts to explain the human cognition and knowledge acquisition, discussed in section 2.

#### **Foreign language acquisition according to connectionism: focus on vocabulary learning**

Emerging in the 1980s, the connectionism studies the nature of cognitive mechanisms which are responsible for learning the phonologic, semantic and syntactic processes in the language acquisition process. In this process, the role of the environment in language learning is highlighted, be it mother or foreign language, in a way it accounts for the interaction between the cognitive apparatus, the linguistic stimulus and social interaction. Yet, for MacWhinney (2002), language learning happens through the interaction between three aspects: the input, which provides necessary data for the language learning; the context, which can be controlled or natural, enabling greater or lower opportunities of exposition to input; and the learner, who will perform the task of language learning more or less successfully, depending on their individual differences concerning attention, learning styles and motivational levels.

Furthermore, it is claimed that learning is a result of association between information, rejecting the hypothesis of language as an innate faculty and of a mind organ modularly different from other cognitive systems.

Especially concerning vocabulary learning, according to the connectionist approach, it is associative; i.e., each knowledge network is connected with many other networks. Each lexical item is related to other lexical items in a structure of interconnected networks and sub-networks. In this sense, the knowledge of a lexical item does not only happen at the linguistic level, but also depends on the extra-linguistic knowledge, such as world and previous knowledge. Thus, the more a neural network related to a lexical item is activated, the more this knowledge is consolidated. Therefore, learning a language vocabulary is to deepen and enrich the knowledge network and interconnections of this language (Waring, 1997).

Within this concept, Leite (2008) highlights the several aspects involved in the vocabulary learning process, such as: learner's interaction with the environment, the frequent exposition to lexical items and the importance of emotion and attention. Such aspects can interfere in the synapses responsible for learning with more or less power. Thus, the greater the learner's exposition to a word, the more synapses are reinforced in the network.

This same view is shared by Lightbown and Spada (1999) when they claim that the lexical items need to be frequently repeated or found in order to activate the connections of neural networks, in a way they produce the connections enhancement. The relevance of Mayer's Cognitive Theory of Multimedia Learning (2001) is highlighted here, which claims the several medium provide the creation of rich learning contexts, exposing the learner to a varied input in the foreign language, something which contributes towards the awakening of their interest and attention.

It is yet noteworthy that factors not directly connected with cognition, such as interest, emotion and motivation, for instance, can interfere in learning both positive and negatively.

According to the current literature, concerning the role of attention towards input, it is recognized that this is a determinant factor for the acquisition process. In the light of connectionism, the processing of a certain aspect of input, such as an unknown word, for instance, implies at first, the attention towards such aspect.

In the following section, we describe the study methodology, addressing the aims and questions of the research that guide it. Afterwards, the data analysis and our conclusions will be presented.

#### **Research methodology**

In this section we present and discuss the experiment, which studied the impacts of hypermedia glossary on vocabulary teaching-learning. Note that in this study, our aim is to evaluate at what extent the hypermedia glossary enables English elementary student's implicit vocabulary teaching-learning and what annotations contribute towards learning. The sub-sections 3.1 to 3.4 describe the adopted methodology in the experiment and section 4 presents data analysis.

#### **Research participants**

Thirty-nine elementary English students of the Languages Course at the Federal University of Juiz de Fora took part in the research; they were divided in two groups. The first one (Group A) were constituted of 11 students of group A – English III (totalizing 23 students) in the first semester of 2013, selected and characterized given their performance in the placement test. The students aged between 19-25 years old. The second group (Group B) had 28 elementary students of groups B and C – English I and III, respectively (totalizing 40 students) in the second semester of 2013, selected and characterized given their performance in the placement test. The students were aged the same as the first group

(between 19-25 years old). Due to presenting intermediate level in the placement test, twelve students (totalizing 24) were rejected from each group (A+B).

To outline Group A's profile, an identification questionnaire was used. It was applied in the beginning of the research, adapted from the questionnaire created by Souza (2004). This questionnaire has 10 questions. Questions 1 to 4 identify the research participants. Questions 5 to 8 aim at helping to identify the students' proficiency level. Question 9 analyses the student's relation with vocabulary learning. Question 10 concerns the attention given to the computer mediated English learning in general, and to vocabulary learning, in particular.

Considering the obtained answers, 100% of students categorized as elementary ones have self-evaluated as learners at this level. Concerning vocabulary learning, 73% found vocabulary study important and reported they use learning strategies, such as: associating the new word to some objects, situation, sound or other words. However, only 9% told they use the computer to study vocabulary. Analyzing the recording of Group A's surfing, we observed that the students accessed the links to the medium after they were presented in the glossary, i.e., first they performed the written verbal annotation, then the image and/or video, and finally, the word sound, for all the noted words, as Figure 1 shows.

Possibly, the verbal annotation was chosen as the participants' first access option due to the glossary

organization that presents it first, as if there was a hierarchy or order of importance, and not because it is considered the annotation which most contributed towards the vocabulary learning. It is noteworthy to emphasize that the presentation of verbal annotation before the glossary was not intentional. Actually, the glossary organization was determined, mostly, by the program used in the construction of the learning environment that did not allow us to place the medium side by side, as we would like to, but vertically (Figure 1).

Based on the obtained result, we decided to change the order of the links of annotations provided by Group B, in the hypermedia glossary, to investigate if there would be changes in the order of access to annotations and, consequently, in learning. At this second moment of the study, we present the first link to visual annotation, followed by verbal written annotation and, finally, the sound, for all the words noted in the text.

To outline Group B's profile the same identification questionnaire of Group A was used. Considering the obtained answers, from 28 students, 89% of the students, classified in the placement test as elementary, self-evaluated as learners at this level. Only 11% evaluated themselves as intermediate students because they had already studied English. However, according to the proficiency test, these students were still elementary ones. Regarding vocabulary learning, 50% of participants reported they used learning strategies and 43% reported they used computer to learn vocabulary.

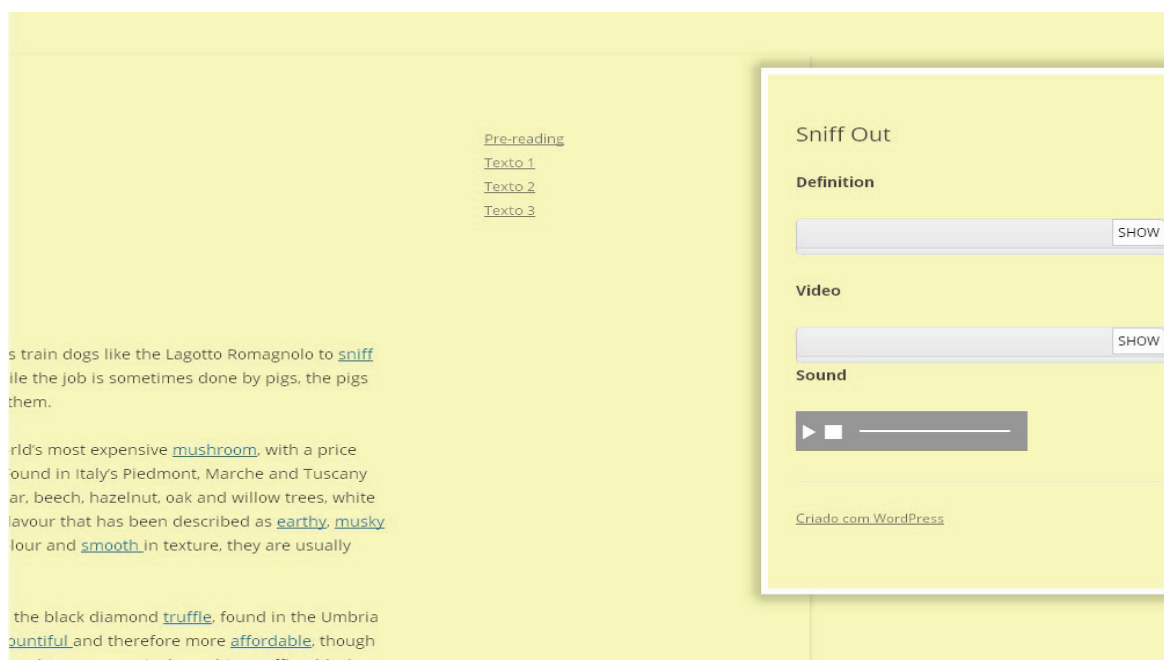


Figure 1. Presentation of annotations in the glossary (www.hipermodalidade.com).

### Tools and procedures of research

This study has several phases that, together, allowed us to evaluate the impact of hypermedia glossary on elementary students' vocabulary learning, in the context of reading teaching.

### Vocabulary tests

The test adopted to assess the lexical knowledge of the two students' groups was proposed by Scaramucci (1995), which has a verification scale based on the one proposed by Dale (1965), with the alterations suggested by Souza (2004) in items 'C' and 'D', which started to require the students gave the meaning of the words they claimed to know. Thus, we attempt to assure the veracity of provided information. The test presents the following verification scale of familiarity with the vocabulary:

- A** – I have never seen this word before;  
**B** – I have already seen this word, but I do not know its meaning;  
**C** – I have already seen this word before, but I am in doubt about its meaning. *I think it is;*  
**D** – I know this word. I know what it means. *The meaning is:.*

A pre-test was used to identify the level of the students' previous knowledge on the tested words. The test was applied one week before the students performed the reading activity. The post-test was used to evaluate the knowledge acquired immediately after the performance of the proposed activities. The tests were answered without the teacher's, classmates' or any other support material's help.

The pre-test presented a list of 25 words. Among these words, there were 17 target-words selected according to the assumption that they would not be known by the subjects of the research, namely: truffle, mushroom, orchard, sniff out, musky, earthy, garlicky, smooth, shaved, bountiful, affordable, rougher, harvest, driven up, tasty, four-course-lunch and hike. The other 8 words were distracter ones, selected according to the theme of the text: culinary, fungus, hunt, edible, flavor, dish, slice and aromatic. The words were presented out of context to avoid inference based on it. The post-test, however, only presented the 17 target-words, excluding the distracter words.

The research data generation was carried out in the first semester of 2013 (Group A) and second semester of 2013 (Group B), presentially, at the time

of regular classes, during three weeks for each group.

### Elaboration of hypermedia glossary

The hypermedia glossary was created based on the theories that foreground the work, discussed in sections 1 and 2. For the glossary implementation, we used the free tool *Word Press*, which presents several modules and *plug-ins* for activities creation. The hypermedia glossary created to testing can be found in the following address: [www.hipermodalidade.com.br](http://www.hipermodalidade.com.br).

The criteria used to choose the text were: a) authenticity, b) informative text, c) not very long text and d) text in English. The chosen text was taken from the site <http://www.bbc.com/travel/blog/20120322-travelwise-hunting-for-the-worlds-most-expensive-fungus>. The text in its original site was too long and was about the culture of truffles in several countries. However, to adjust it to the screen, we omitted part of it and segmented it in units, dividing it into three parts: Text 1 (Introduction), Text 2 (Italy) and Text 3 (France), as shown in Figure 2.

It was placed on the left hand of the screen, following AbuSeileek's (2011) studies. The target-words of the text are links that present the reader, on the right hand of the screen, multimodal annotations, aiming to provide its meaning (Figure 1).

The aim of the reading activity was the vocabulary learning. Thus, besides offering multimodal annotations for the target-words, multiple choice questions of text comprehension were elaborated, whose expected answers were the target-words themselves. In the end of each text there was a link for the questions and answers, which should be noted in a white sheet of paper, handed out to each participant (Figure 3). The questions were answered in a printed format. We highlight that the understanding of the target-words were basic for the students to answer the proposed comprehension questions, motivating them the check their meaning in the glossary, in case they had not done it yet, or return to the glossary to see the concerned target-word again.

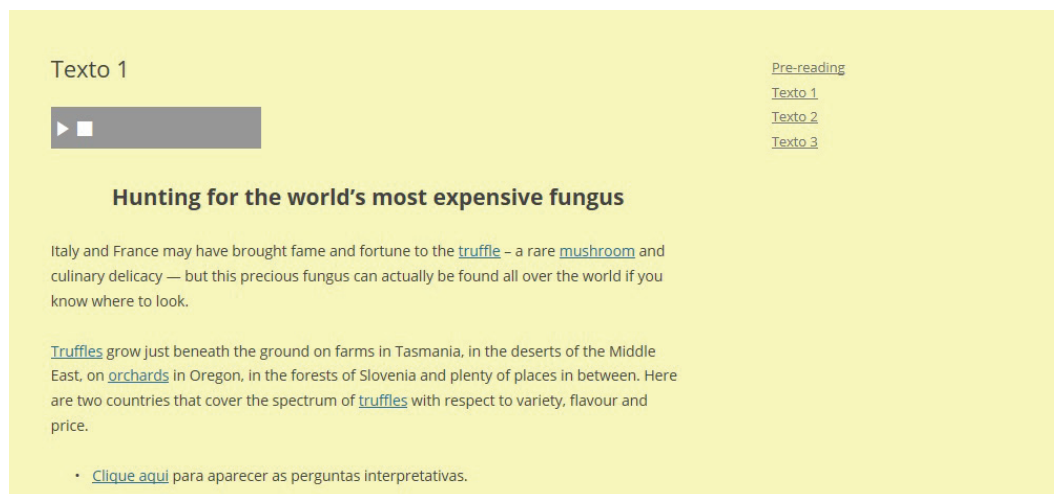
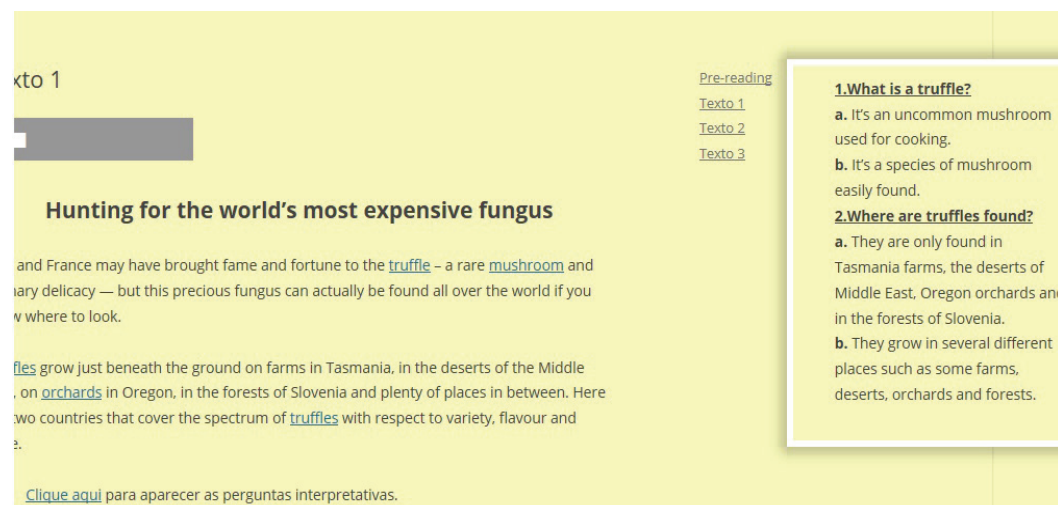
### Evaluative questionnaire

At this stage of the experiment, our aim was to obtain information upon the students' evaluation concerning the value of annotations in vocabulary learning. This questionnaire consists of 11 questions, from which 10 are multiple choice and only one is open. The aim of each question is explained in Table 1.

**Table 1.** Aim of each question of the evaluation questionnaire.

Questions 1, 2, 3 and 4	Investigate as the student evaluated the environment;
Questions 5 and 6	Identify the annotations, used or not, for the inference of the new words meaning and its reason;
Questions 7 and 8	evaluate the efficiency of the annotation upon the vocabulary learning;
Question 9	Identify the students' preferences concerning the type of annotation.
Question 10	Identify the pattern of annotations checking;
Question 11	Identify possible faults of the proposed environment.

Source: drawn up by the authors.

**Figure 2.** Copy of the Introduction (text 1) (Taken from www.hipermodalidade.com).**Figure 3.** Comprehension questions (Taken from www.hipermodalidade.com).

### Interview

The interview was the last stage of the experiment. As the aim was to confirm and deepen the obtained results in the questionnaires, in the recording to the surfing and in the post-test of vocabulary, the interview was applied only for the participants who had answered without giving reasons or who were contradictory. Furthermore, we interviewed some Group B's participants as an attempt to deepen our knowledge concerning the order of access to the provided annotations. In this study, we randomly selected 3 Group A's

participants and 4 Group B's participants to be interviewed. The questions were individual, based on the data analysis of each selected participant. It lasted for about 10 minutes and the questions were open, allowing free answers, enabling the interviewer to ask new questions given the interviewee's answer.

### Data analysis criteria

The aim of the vocabulary post-test was to verify the acquired knowledge after the exposition to the reading activity. The option 'A' of the test (I have



never seen this word before) and 'B' (I have already seen this word, but I do not know its meaning) were considered together, showing the lack of knowledge of the target-words. The options 'C' (I have seen this word before, but I am in doubt about its meaning. I think it is:) and 'D' (I know this word. I know what its meaning. The meaning is:) were also analyzed together, but they indicated knowledge of the target-words. We only considered known words the ones the students could provide a correct meaning in the post-test. The learning rate per word of students who indicated they knew them, before and after exposition to hypermedia environment, were calculated using percentage and percentage point. Note that percentage (%) is a measure of reason with base 100, whereas percentage point [p.p.] shows the absolute amount of the difference between the percentages.

In order to answer the first question – does the hypermedia glossary enable the elementary English student's vocabulary learning? –, we considered the categories of the vocabulary pre and post-test together: categories A + B = lack of knowledge and categories C + D = knowledge. The learning rate per word was calculated by the difference between the mean number of students who indicated they knew them before and after being exposed to the texts.

In order to answer the second question – which annotations (verbal, visual, sound) contribute the most towards the elementary students' learning? – we identified the most and least known target-words, adopting the same criterion used to answer question 1: categories A + B = lack of knowledge and categories C + D = knowledge. The data used to answer this question was obtained through the evaluation questionnaire, the recording of the participants' surfing in the hypermedia environment and the interview.

### Data analysis

This section initially analyses and discusses the performance data in vocabulary tests, investigating the contribution of hypermedia glossary towards the teaching-learning of English elementary students as a FL, in order to answer the first question: Does the hypermedia glossary enable the English elementary students' vocabulary learning?

Analyzing the obtained data for Groups A and B, it is observed that they, in general, offer evidences of the relevance of hypermedia glossary on the implicit vocabulary teaching-learning. In other words, the exposition of participants to several annotations (verbal definition, video, pictures and digitalized sound) has greatly contributed towards the retention

of inferred vocabulary, as shown in Tables 2 (for Group A) and 3 (for Group B).

Tables 2 and 3 show the percentage number of students who knew the target-words before and after performing the vocabulary activity, as well as the average gain of learning for each group, obtained by the difference between the percentage value of known words in the post-test, by the percentage value of known words in the pre-test. This gain was calculated from the addition of all percentage values obtained for the words, both in the pre-test and the post-test, divided by the total number of words (17).

**Table 2.** Average General learning of Group A.

Pre-test	Post-test		Average learning gain [p.p.]
know the word	2,0%	know the word 30,5%	28,5

Source: drawn up by the authors.

**Table 3.** Average General learning of Group B.

Pre-test	Post-test		Average learning gain [p.p.]
know the word	1,5%	know the word 22,5%	21,0

Source: drawn up by the authors.

It is noted that there was a learning gain both in Group A, 28,5 [p.p.], and in Group B, 21 [p.p.], showing that the participants' exposition to the multimodal annotations has contributed towards the inferred vocabulary retention. Group A presents a little superior gain, in terms of percentage points, to Group B. According to Mayer's Cognitive Theory of Multimedia Learning (2001), the positive effect of dual coding (use of two or more modes of information presentation) benefits learning enabling the learner to build richer mental representations, as well as establishing connections between them. Furthermore, based on the connectionist paradigm, we can suppose that the construction of associations between the annotations in the several medium enable a greater frequency of exposition to the lexical item, which is more meaningful and richer, facilitating the unknown words inference and their learning.

Although the average learning gain of Group B, 21 [p.p.], had been inferior to Group A, 28,5 [p.p.], we do not attribute this fact to the inversion of the order of annotations in the glossary for Group B, as reported in section 3.1. Based on the recording of the surfing of Group B, it was noted that 35,5% of students did not check the annotations provided in the glossary, maybe due to lack of interest or to the fact of having difficulties to explore the hypermedia environment. It was realized, in general, Group B's lack of interest in participating in the activity,

because the group understood that the experiment would bring a work overload. According to Connectionism, the inherent motivation is one of the important factors in learning, as it leads the learner to get cognitively engaged in the exploration of the provided material. Comparatively, it is believed that Group B's lack of interest has contributed to the low performance, as 100% of Group A's participants checked the glossary and were more motivated to participate. However, the results point a meaningful learning gain for both groups, something that shows the relevance of hypermedia glossary on elementary students' vocabulary implicit learning.

Afterwards, the modalities that can contribute towards the vocabulary implicit learning at elementary level are identified, answering the second question: Which annotations (verbal, visual, sound) contribute the most to the elementary students' learning?. For this, we will analyze the words that presented the largest learning rate in the post-test. Groups A and B will be analyzed together, as the learning rate of the most learned words did not present, comparatively, meaningful differences.

The most learned target-words were: truffle; mushroom and sniff out, as shown in Table 4, which presents the learning average rate obtained through the addition of the learning rates per word, of each group (A and B), divide by 2.

**Table 4.** Average learning rate of the most learned words of Groups A and B in the post-test.

Target-words	Learning average
<i>Truffle</i>	62%
<i>Mushroom</i>	57%
<i>Sniff out</i>	64,5%

Source: drawn up by the authors.

The high learning rate obtained for the words truffle (62%) and mushroom (57%) can be explained by the fact that they are key words and by the frequency, therefore, they appear in the texts (1, 2 and 3). The word truffle, for instance, appears 20 times in the texts and, in the pre-reading activity, it appears on a video. Furthermore, it is realized that the non-linear and multimodal structure of hypermedia tool enables the re-presentation of the linguistic input in several medium, providing a rich multimodal context, i.e., a contextualized repetition of input, basic for knowledge building. Based on connectionism, we can presuppose that the access to several medium enables the involvement of hearing, motor, visual and articulatory systems, which are necessary in the information processing. Consequently, the repeated exposition to the words truffle and mushroom, through the several medium,

contributes to activate and enhance the connections of neural networks, resulting in the retention of inferred words meaning.

The word sniff out, comparatively, had the greatest learning rate (64,5%), as shown in Table 4. This learning rate, in this case, is attributed to the frequent checking to the annotation for the word. For this word, 48% of the participants checked the verbal annotation + video or verbal annotation + video + audio.

In the analysis of the evaluative questionnaire, 54,5% of the participants of Group A said the picture is the annotation that contributed the most towards the learning of the unknown word meaning. The other 45,5% changed the preference to other types of annotation (verbal and video). However, it is important to highlight that the verbal annotation was the first checking option of all Group A's students for the word sniff out, and for most of the participants (78%) for the words truffle and mushroom, as shown in Table 5. Group A's preference for verbal annotation can be explained by the order of presentation of the medium in the hypermedia glossary, as discussed before.

**Table 5.** Pattern of access to annotations for Group A's most learned words.

Annotations	Truffle	Mushroom	Sniff out
Verbal	78%	78%	100%
Audio	11%	11%	0%
Video	-	-	0%
Picture	11%	11%	-

Source: drawn up by the authors.

Group B accessed the visual annotations first, because they were presented first in the glossary for the words truffle, mushroom and sniff out, as shown in Table 6. It is then proved, our perception that Group A first checked the verbal annotation due to its presentation in the glossary. This result leads us to conclude that the presentation of the medium in the glossary influences its access.

**Table 6.** Pattern of access to Group B's most learned words.

Annotations	Truffle	Mushroom	Sniff out
Verbal	0%	0%	0%
Audio	7,5%	0%	0%
Video	-	-	100%
Picture	92,5%	100%	-

Source: drawn up by the authors.

It is noteworthy mentioning that, although Group A's students had first accessed the verbal annotation and Group B the visual one, due to the position these medium were placed in the hypermedia glossary, the elementary students pointed, in the evaluative questionnaire and the interview, a preference for the visual annotation,



especially for the picture. To illustrate that, 52,5% of all the participants (Groups A and B) indicated in the evaluative questionnaire that, many times, the verbal annotation was not efficient to bring the meaning of the unknown word because it had unfamiliar words. We can claim that, based in this result, the students' performance was influenced by the little knowledge of the language, something which made the unknown words inference difficult and, consequently, the learning.

## Conclusion

This exploratory study investigated the benefits of hypermedia glossary on the implicit vocabulary teaching-learning of English elementary students as a FL. The obtained results bring evidences that the annotations in the several medium contribute towards the implicit vocabulary learning. It was observed that the students accessed the several annotations of the glossary for the target-words. It is important to highlight, however, that the elementary students highlighted the visual resource, especially the picture, as the one which contributed the most towards the words learning. Such preference can be caused by the little linguistic knowledge of the investigated group, an important component for learning, according to Connectionism.

We also emphasize that the choice for the type of annotation was influenced by the presentation of the annotations in the glossary, which revealed the lack of preparation of the students to learn in this type of environment. Although the glossary presented some hierarchy offering the annotations, they did not explore the material flexibility. Then, if on one hand the hypermedia glossary is relevant for vocabulary learning, on the other hand, the success of this tool depends, partly, on the students' preparation, offered by the teacher, for studying in the hypermodal environment, so that it can be explored in a conscious and productive way.

## References

- AbuSeileck, A. F. (2011). Hypermedia annotation presentation: the effect of location and type on the EFL learners' achievement in reading comprehension and vocabulary acquisition. *Computers & Education*, 57(1), 1281-1291.
- Al-Seghayer, K. (2001). The effect of multimedia annotation modes on L2 vocabulary acquisition: a comparative study. *Language Learning and Technology*, 5(1), 202-232.
- Braga, D. B. (2013). *Ambientes digitais: reflexões teóricas e práticas*. São Paulo, SP: Editora Cortez.
- Dale, E. (1965). *Vocabulary measurement: techniques and major findings*. *Elementary English* 42. p. 895-901.
- Ellis, N. (1998). Emergentism, connectionism and language learning. *Language Learning*, 48(4), 631-664.
- Ferrari, P. (2012). A web somos nós. In P. Ferrari (Org.), *Hipertexto, hipermídia: as novas ferramentas da comunicação digital* (p. 7-12). São Paulo, SP: Editora Contexto.
- Lauffer, B., & Hulstijn, J. (2001). Incidental vocabulary acquisition in a second language: the construct of task-induced involvement. *Applied linguistics*, 22(1), 1-26.
- Leite, A. de S. (2008). O paradigma conexcionista na aquisição lexical. *ReVEL*, 6(11), 1-11.
- Lightbown, P. M., & Spada, N. (1999). *How languages are learned* (2nd ed.). Oxford, UK: Oxford University Press.
- MacWhinney, B. (2002). Language emergence. In P. Burmeister, T. Piske, & A. Rhode. (Ed.), *An integrated view of language development* (p. 17-42), Trier, DE: Wissenschaftliche Verlag.
- Mayer, R. E. (2001). *Multimedia Learning*. Cambridge, UK: Cambridge University Press.
- Nagata, N. (1999). The effectiveness of computer-assisted interactive glosses. *Foreign Language Annals*, 32(4), 469-479.
- Paivio, A. (1971). *Imagery and verbal processes*. New York, NY: Holt, Rinehart & Winston, 1971.
- Paivio, A. (1986). *Mental representation: a dual-coding approach*. Oxford, UK: Oxford University Press.
- Rossa, A., & Rossa, C. (2009). O paradigma conexcionista e o ensino de língua estrangeira. *Letras de Hoje*, 44(3), 53-59.
- Sadeghi, K., & Ahmadi, N. (2012). The effect of gloss type and mode on Iranian EFL learners' reading comprehension. *English Language Teaching*, 5(12), 100-110.
- Sakar, A., & Ercetin, G. (2005). Effectiveness of hypermedia annotations for foreign language reading. *Journal of Computer Assisted Learning*, 21(1), 28-38.
- Scaramucci, M. V. R. (1995). *O papel do léxico na compreensão em leitura em língua estrangeira: foco no produto e no processo* (Tese de Doutorado). Universidade Estadual de Campinas, Campinas.
- Souza, P. N. (2004). *O uso da hipermídia para o ensino e a aquisição lexical no contexto da leitura em língua estrangeira* (Tese de Doutorado). Universidade Estadual de Campinas, Campinas.
- Sun, P. C., & Cheng, H. K. (2007). The design of instructional multimedia in e-Learning: a media richness Theory-based approach. *Computers & Education*, 49(3), 662-676.
- Sweller, J. (1994). Cognitive load theory, learning difficulty, and instructional design. *Learning and Instruction*, 4(4) 295-312.
- Waring, R. (1997). *Connectionism and second language vocabulary*. Temple University Occasional Papers. Recuperado de <http://www.fltr.ucl.ac.be/fltr/germ/etn/bibs/vocab/connect.html>
- Yun, J. H. (2011). The effects of hypertext glosses on L2

- vocabulary acquisition: a meta-analysis. *Computer Assisted Language Learning*, 24(1), 39-58.
- Zimmer, M. C. (2008). Cognição e aprendizagem de L2: uma abordagem conexionista. In A. C. Macedo, H. Feltes, & E. M. Farias (Orgs.), *Cognição e linguística: territórios, mapeamentos e percursos* (p. 229-248). Porto Alegre; Caxias do Sul, RS: Edipucrs; Educ.

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