

## **Electronic dictionaries and incidental vocabulary acquisition: does technology make a difference?**

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### **Abstract**

The paper investigates incidental vocabulary acquisition in two reading conditions: when unknown words are encountered in a paper text and glossed in the margin, and when they are read on computer screen and explained in an electronic dictionary. Two groups of adult learners of English as a foreign language, one in each condition, were unexpectedly tested on comprehension of 10 low frequency words, immediately after a reading task and two weeks later. The 'electronic text group' performed significantly better than the 'paper text group'. Long term retention was also affected by the type of information looked up in the electronic dictionary.

## **1 Background**

At the EURALEX symposium in Zürich, Henri Bejoint stated that if dictionaries are instruments for the acquisition of meaning, "the process remains so mysterious that one's recommendations cannot really be based on scientific evidence" (ZüriLEX '86 Proceedings: p. 146). Fourteen years later, there is a body of studies, albeit a modest one, which has investigated how much vocabulary is acquired incidentally when learners consult a dictionary during a reading activity. The conclusion that seems to have emerged is that people who use a dictionary almost always acquire more words than people who read without a dictionary. Without a dictionary, readers approach the unknown vocabulary through a combination of guessing and ignoring the unfamiliar words. If words ignored, i.e. unattended to, they are unlikely to be remembered. If guessing is attempted, it cannot always be carried out, which leads either to non retention of the word or to retention of incorrect meaning, if it was guessed incorrectly (Laufer 1997). On the other hand, when words looked up in a dictionary, some of them are retained (Luppesku and Day 1993, Knight 1994). Looked up words were shown to be remembered better than words inferred from context (Mondria 1993), or words whose meaning is given by the teacher (Hulstijn, Hollander and Greidanus 1996).

The advent of electronic dictionaries has raised the inevitable question whether electronic dictionaries have a similar effect to that of paper dictionaries and glosses and what type of electronic glossing techniques will produce the best results in vocabulary learning. Most studies, however, compared the effect of different types of glosses (paper, electronic textual, electronic pictorial, electronic and video) on reading comprehension, translation, on the number of words looked up by the learners, the length of time on task and the effect of gloss type on the reported satisfaction of dictionary users (Leffa 1992, Roby 1991, 1999, Aust, Kelly and Roby 1993, Lomicka 1998, Nesi 1999). Fewer studies investigated incidental vocabulary learning via computer glosses (Chun and Plass 1996, Plass, Chun, Mayer and Leutner 1998, Lyman-Hager, Davis, Burnett and Chennault 1993, Laufer and Hill 2000), and, to my knowledge, only Lyman-Hager et al. (1993) specifically compared vocabulary retention resulting from the use

of paper and electronic dictionaries. And yet, researching the effect of electronic dictionaries on vocabulary learning is important as it may influence pedagogical decisions with regard to recommendations of dictionaries for learners.

## 2 The study

### 2.1 Research questions and test items

The paper investigates incidental vocabulary acquisition during a reading task in two conditions: paper gloss condition and electronic gloss condition. It addresses two questions:

1. Which type of gloss, paper or electronic, will result in higher scores on vocabulary learning test?
2. Which types of looked up information in the electronic dictionary (L1 translation, L2 definition, example of usage, or combinations of these) are associated with better vocabulary learning scores?

Ten low frequency words and expressions were selected for investigation: *rigmarole*, *wrath*, *grist*, *not one whit*, *sanitise*, *privy to*, *morally derelict*, *curb*, *inflammatory*, *deeply ingrained*. In this study, vocabulary learning was considered to be the recall of word meaning. The target words were pre-tested on a group similar to the experimental group and were found to be unfamiliar.

### 2.2 Subjects and procedure

The subjects were two parallel groups of advanced university learners of English as a foreign language in Israel, one group in each condition. Students in condition one (n=31), the paper gloss condition, received a 621 word text and a set of ten multiple choice comprehension questions. The ten target words were highlighted by being typed in bold print and glossed in L1 on the margin of the text. The task of the students was to read the text and answer the ten comprehension questions. Students in condition two (n=24), the electronic dictionary condition, read the same text on computer screen and answered the same ten comprehension questions on paper. The target words were highlighted. The learners were told that, in the course of reading, they could look up information about the highlighted words by clicking on them with the mouse and then choose the options or options that would best clarify the meaning of the word in the text. Whenever the word was clicked on, a window appeared on the screen with 3 options: translation, definition in English, examples of usage. The three main options and their various combinations offered seven look up possibilities (translation + definition, translation + example, definition + example, etc.). In practice, however, only 3 look up patterns were selected by students: translation only, translation + definition, translation + definition + example. Students could return to look up the same word as many times as they wished. While they were looking up the words, the log was recording every mouse click. The results screen (available to

researchers only) displayed the following information: which words were selected, what dictionary information was looked up, the number of times each word was selected and how much time was spent on the entire task.

After the completion of the task, the work sheets were collected and the students were unexpectedly given a list of the ten target words and asked to provide the L1 equivalents or English explanations for these words. Two weeks later, the same test was repeated. The scoring was done as follows: a word that was not translated, or translated wrongly received zero points. A correct response received 2 points. A semantically approximate response received one point. Thus, a student could receive a maximum of 20 points (10 words x 2 points) if all the responses were correct.

While the tests provided us with the retention scores, the log files showed which look up options were selected for which word, and how each option contributed to word retention, i.e. whether the looked up word was later retained.

### 3 Results

The difference between paper and electronic dictionary (research question 1) was examined by comparing the mean vocabulary retention scores of the two groups. Table 1 presents mean retention scores on the immediate and the delayed tests and the t- tests results comparing the means in the two conditions. Table 2 presents the above results as well. This time, however, the retention scores of the electronic group were calculated for words which were looked up in L1 only. This was done in order to eliminate the variable of additional L2 dictionary information which was available in the electronic gloss, but not in the paper gloss. Of the 24 students in the electronic gloss condition, 17 used Hebrew glosses only.

	Paper gloss (n=31)	Electronic gloss (n=24)	Difference
Immediate recall	M=3.87 (19%) Sd= 4.19	17.52 (87.6%) Sd= 4.29	T=9.66 p<.00001
Delayed recall	M=0.88 Sd= 1.72	4.8 (24%) Sd= 3.6	T= 3.9 p,.001

Table 1: Paper and electronic glosses: the effect on word retention – All electronic dictionary selections (Maximum retention score = 20)

Tables 1 and 2 show that both on the immediate recall test and the delayed test, the computer group achieved significantly higher retention scores than the paper gloss group. This was true for learners who consulted a variety of dictionary information and for learners who consulted L1 glosses only.

The effect of selected dictionary information on learning (research question 2) was examined by comparing word retention scores in all the look-up patterns. For each word, we calculated the number of times it was looked up in each of the 3 patterns that students adopted: L1 only, L1 +

	Paper gloss (n=31)	Electronic gloss (n=17)	Difference
Immediate recall	M=3.87 (19%) Sd= 4.19	14.59 (73%) Sd= 4.65	T=10.72 p<.00001
Delayed recall	M=0.88 (4%) Sd= 1.72	3.82 (19%) Sd= 3.52	T= 2.94 p p<.05

Table 2: Paper and electronic glosses: the effect on word retention – Only L1 selection

L2 definition, and L1 + L2 definition + L2 example. Then the number of correct test responses was calculated for each pattern and converted into percentage.

Table 3 presents the following information: the mean number of look ups in each of the three look up patterns for all the words; the mean retention percentage, i.e. the percentage of correct test responses for each look up pattern; the results of ANOVA comparing the retention scores of three look up patterns. The maximum mean of look ups per option could be 24, if all 24 students looked up all the 10 words using this option.

Dictionary information look up	L1 only	L1+ L2 definition	L1+ L2 definition +L2 example	Difference
Mean number of selections	14.3	1.1	0.4	
Retention rate Immediate recall	M=82.91% Sd=14.45%	M=90% Sd=20%	M=100% Sd=0%	F=0.9 Not significant
Retention rate Delayed recall	M=27.09% Sd=23.24%	M=0%	M=100% Sd=0%	F=18.5 P<001

Table 3: Look up patterns and word retention

Table 3 shows that the preferred dictionary look up pattern is translation of the unknown words (14.3 out of 24). The immediate recall does not seem to be significantly affected by the type of information selected even though the scores are higher for words looked up in both languages. The long term recall scores, however, are significantly higher when a combination of translation, definition and example is selected.

## 4 Conclusion

In the two research conditions, the new words were highlighted in the texts thus drawing learners' attention to them. And yet words looked up in an electronic gloss were retained better than words glossed in the margin of the text. Why is an electronic gloss superior to a paper gloss for acquiring new vocabulary? One reason may have to do with the visual impact produced by a word which embedded in a window and appears in a prominent position on the computer screen.

A marginal gloss in a paper text may not have the same prominence, and may therefore fail to create a memory trace to the word. Another explanation relates to the 'involvement hypothesis' proposed by Laufer and Hulstijn (forthcoming 2001). The hypothesis states that tasks which create a need for a word, elicit search for its meaning and 'evaluation' (decision involving processes of selection and combination) will have a better effect on the retention of the words than tasks which do not induce the three above mentioned elements of involvement. In our study, the paper group did not have to search for the meanings of the words as these were provided in the margin. The computer group, on the other hand, was actively involved in searching for the meanings of the target words.

With regard to the effect of look up patterns on learning, it is sometimes claimed that multiplicity of information (translation, definition, example) may provide several retrieval routes to the words and would therefore benefit retention (cf. Plass et al 1998). Our results which seem to support this position, should, nevertheless, be interpreted with caution. Though the delayed recall scores were highest in L1+definition+example condition, this look up pattern was observed only with two words (out of 10) and 4 students (out of 24). Furthermore, words looked up in L1 + L2 definition were not remembered at all on the delayed test while words looked up in L1 only were remembered in 27% of cases. The data of the study together with the results of Laufer and Hill (2000) suggest that, in most cases, combining dictionary information in two languages reinforces retention. The beneficial effect of this combination may lie in the richness of semantic encoding; it may lie in the prolonged attention that multiple items of information require; or it may lie in both.

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