The Effects of Multimedia Annotations on Iranian EFL Learners' L2 Vocabulary Learning

*Saeideh Ahangari**
Zeinab Abdollahpour
Department of English Language, Tabriz Branch, Islamic Azad
University, Tabriz, Iran

In our modern technological world, Computer-Assisted Language learning (CALL) is a new realm towards learning a language in general, and learning L2 vocabulary in particular. It is assumed that the use of multimedia annotations promotes language learners' vocabulary acquisition. Therefore, this study set out to investigate the effects of different multimedia annotations (still picture annotations, dynamic picture annotations, and written annotations) on L2 vocabulary learning. To fulfill this objective, the researchers selected sixty four EFL learners as the participants of this study. The participants were randomly assigned to one of the four groups: a control group that received no annotations and three experimental groups that received: still picture annotations, dynamic picture annotations, and written annotations. Each participant was required to take a pre-test. A vocabulary post-test was also designed and administered to the participants in order to assess the efficacy of each annotation. First for each group a paired t-test was conducted between their pre and post test scores in order to observe their improvement; then through an ANCOVA test the performance of four groups was compared. The results showed that using multimedia annotations resulted in a significant difference in the participants' vocabulary learning. Based on the results of the present study, multimedia annotations are suggested as a vocabulary teaching strategy.

* Corresponding author. E-mail: s_ahangari@yahoo.com

The Journal of Applied Linguistics Vol. 3, Issue 1

Vocabulary, as "the building block of language" (Schmitt, Schmitt, & Clapham, 2001, p. 53), is considered by some to be "the most important aspect of foreign language learning" (Knight, 1994). One of the things that students, teachers, materials writers, and researchers have all agreement upon is that the important part of mastering a second language is learning vocabulary (Groot, 2006). However, the best means of achieving good vocabulary learning is still unclear, partly because it depends on a wide variety of factors.

Advances and increased availability of computers have altered and expanded the field of second/foreign language education. The concern has been narrowed to the investigation of the efficacy of presenting information using multiple modalities, such as text, audio, still picture, and dynamic videos in the field of SLA. An area that has recently received attention is the impact of glossing vocabularies via annotations embodied by different modes and media.

In recent years with the development of computer-assisted language learning (CALL) the need and opportunity for investigating the impact of multimedia on vocabulary acquisition has been increasing (Nikolova, 2002). " Through surveys of acquisition theories, researchers have suggested guidelines for the design of CALL programs for vocabulary or described programs they developed for vocabulary learning" (Son, 2001, p.28). In fact technological advances make the presentation of computer and web-based multimedia instruction possible through motion, voice, data, text, graphics, and still images (Moore, Burton, & Myers, 2003, as cited in Grabowski, 2006). One of the most important advancements in this regard is animation, i.e., showing pictures in motion (Dwyer & Dwyer, 2003). Much of the conducted research (Al-Seghayer, 2001; Jones & Plass, 2002) has shown that visual annotations do help in vocabulary acquisition, especially when they are combined with textual annotations.

There are three famous accepted theories that are believed to explain the value and effect of multimedia presentations in language learning environments and their effect on better vocabulary learning: (a) *Dual Coding Theory, (b) Generative Theory of Multimedia Learning, (c) Cognitive Theory of Multimedia Learning*

Dual Coding Theory

The first theory is Paivio's *Dual Coding Theory* which includes two mental systems for storing and processing information: the verbal system for storing and processing linguistic information such as printed words and a non-verbal system for storing and processing spatial information and mental imagery such as static and dynamic pictures or objects. Mayer and Moreno (2000) have stated that "The visual channel takes input initially from the eyes and ultimately produces pictorial representations; the verbal channel takes input initially from the ears and ultimately produces verbal representations" (p.110).

According to dual coding theory, if a learner encodes information in both visual and verbal forms, the information will more likely be remembered because it has been stored in more than one way through cognitive processes in the brain. This allows the learner two ways to retrieve information because it is stored in more than one way (dually coded) (Rieber, 1990). Lin (2001) argues that "Animation, due to its unique dynamic qualities, is more likely to be dually coded deeper and harder into the long-term memory than are static graphics" (p. 20).

Generative Theory of Multimedia Learning

Mayer's (1997) generative theory of multimedia learning which is based on Wittrock's generative theory and Paivio's dual-coding theory, proposes that second/foreign language learners have two separate verbal systems (L1 and L2) and a common imagery system in learning new vocabulary (Al-Seghayer, 2001). The generative theory of multimedia learning views the learner as knowledge constructor who actively selects relevant words and

images from the information presented, organizes these words and images into coherent mental representations, and integrates the newly constructed visual and verbal representations with one another (Mayer, 1997).

Chun and Plass(1997) state that when the learner is presented with visual and verbal information, thus he/she is engaged in three processes: "selecting information, organizing the presented information into a coherent structure, and integrating these new ideas into the existing mental model" (p.65). According to the generative theory, successful learning is facilitated when a learner builds and coordinates visual and verbal representations of the same object at the same time. In other words, according to Wittrock (1974, 1990), this model focuses on integration of new ideas with the learner's existing schemata through using four types of learning strategies: a) recall, b) integration, c) organization, and d) elaboration

Cognitive Theory of Multimedia Learning

Mayer (1997) proposed and developed the cognitive theory of multimedia learning that includes three important assumptions: dual channels, limited capacity, and active processing (Mayer, 2001). This theory was based on Wittrock's (1974, 1990, as cited in Mayer, 2001) generative theory and Paivio's (1986) dual-coding theory. According to cognitive load theory the processing capacities of visual and verbal working memories (or information-processing channels) are limited. Mayer and Moreno (2000) state that "in short, presenting too many elements to be processed in visual or verbal working (i.e., too many words or too complex a picture) can lead to overload in which some of the elements are not processed" (p.111).

Mayer (2001) differentiates between the visual channel (eyes) and the auditory channel (ears); Information such as pictures, video or printed texts are processed in visual channel, while information such as spoken words or background sounds are processed in the auditory channel. Each of these channels is assumed to have limited cognitive capacity. In other words, when facing new information presented via multimedia, limited amount

of this information can be processed in either the visual or auditory channel at one time. For example, when the learner looks at some pictures on the computer screen, he/she receives all the pictures by the visual modality, but only a few numbers of these images can be brought into and held in the working memory at any one time. The same fact is true about auditory modality.

Empirical Background to the Study

Many studies have been done to investigate the effect of using multimedia on improvement of language skills. For example, in a survey conducted by Al-Seghayer (2001) he provided his participants with three types of annotations: video + text, still picture + text and text only. In his survey, he found that words annotated with video + text yielded the best results in correct memory or production, followed by words annotated with still pictures + text. Words annotated with text only yielded the worst results.

Kost, Foss, and Lenzini (1999) also measured how different types of glosses influenced incidental vocabulary growth in a non-multimedia environment. Results showed that those participants who had access to both textual and pictorial glosses outperformed those under the textual and pictorial gloss conditions in the recognition of target words on both short-term memory and retention tests.

Chun and Plass (1997) conducted a research on the effectiveness of annotations on text comprehension and vocabulary learning. They found that annotations were beneficial to several aspects of reading comprehension and vocabulary learning.

Inspired by the above mentioned theoretical views and noticing the lack of such a study in Iranian EFL learning context the researchers intended to investigate the role of three different types of multimedia annotations in the improvement of Iranian EFL learners' vocabulary knowledge.

Method

This research followed a quasi-experimental design in order to investigate the effects of multimedia annotations (still picture annotations, dynamic picture annotations, and written annotations) on Iranian EFL learners' vocabulary learning. The research also involved a pre-test and a post-test. This study was incorporated into the participants' regular course content.

Participants

To test the research hypotheses of this study 90 learners of Zabansara Language Institute in Naghadeh were given a Preliminary English Test (PET). Those whose scores ranged from 40 to 55 out of 90 were selected to participate in the study. The participants in this study with an age range of 15 to 19 were in the pre-intermediate level, based on their performance on the Proficiency (PET) test. All participants came from a bilingual background, i.e., Turkish and Persian. Then, the participants were randomly assigned to four groups: a control group that used no annotation strategies and three experimental groups that used dynamic pictures, still pictures, and written annotation strategies.

Instrumentation

1. Program

The researchers downloaded an interactive multimedia computer software including animated dictionary called Kid Crosswords, picture dictionary called Little Explorers and Oxford Picture dictionary and Oxford desktop dictionary) to be used in this study to enhance L2 vocabulary acquisition by providing readers with the meaning of target words. The computer software provided the participants with annotations for target words in various modes such as definition, still pictures, and dynamic pictures, all of which intended to aid the understanding and learning of unknown words. The participants read the target word's printed textual definition, or viewed its meaning via a dynamic picture or still picture. The course material to be taught

was a book called English File by Latham-Koenig and Seligson (2007).

2. Words

Words were the important components of the experiment. In this study, the researchers concentrated on three most common word types: *nouns, verbs* and *adjectives*. The reason for using just three word types was to limit the list of the words to work with. If all word types were to be included, the experiment would become too extensive. Since it is not always easy to visualize a word in a clear, unambiguous manner, the researchers tried to choose concrete words rather than abstract words.

3. The Pre-test and the Post-test

The participants were asked to complete a teacher made multiple choice Word Recognition Test (WRT). In this test, the 50 target words were presented in their original context taken from the text book (English File). For each word, the participants were asked to choose one correct meaning out of four given choices. The scoring procedure was straightforward; a score of 0 was given for an incorrect or not attempted answer and a score of 1 was given for a correct answer.

Furthermore, in order to make sure of the reliability of the test, Cronbach's Alpha was calculated, which turned out to be low. So 18 questions out of 40 which showed a low reliability were deleted and consequently the reliability came out to be 0.808.

Then, a recognition test, consisting of 22 words, was designed as a measure of different stages in the learners' developing knowledge of particular words to assess the effect of each strategy. Again in this test, 22 target words were presented in their original context taken from the text book (English File). For each word, the participants were asked to choose one correct meaning out of four given choices.

Procedure

For carrying out this research project, the researchers selected 64 EFL learners as the participants. Each participant was

randomly assigned to one of the four groups. So, there were three experimental groups and one control group. Each group was given one of the four types of treatments: group A received no annotations, group B received still picture annotations, group C received dynamic picture annotations, and group D received written annotations. The participants of each experimental group had an access to the assigned annotation of new words in their text book.

The data was collected from each of the four groups during their normal class time. First, the participants were given a brief introduction to the software, its objectives, and its methods. The researchers demonstrated to the participants how the software worked, that is, how to move from one section to another, and how to click on an annotated word. The researchers also showed each participant that clicking on words allowed them to hear the selected word pronounced, read a definition, and see either a picture or a video clip. They were told that they could consult the annotated words whenever they wished and as many times as they wished.

The point which should be indicated is that, group A (control group) received no annotations. The participants in group B were required to run the downloaded program in the computer. They typed new words and pressed the Enter key, and then the information related to each word was shown on the screen. First, the participants read contextualized examples and tried to guess the meaning of the new word. Then, they could press the picture button on the screen to access its visual presentation (still picture). The participants in group C like the participants in group B typed new words and pressed the Enter key in order to see its meaning, an example, and its visual presentation or dynamic picture. Both group B and group C participants could see the phonetic form of the pronunciation that was screened in front of the word. Moreover, the participants could hear the pronunciation, in both British and American accents, by a native speaker. They could repeat the one they liked to improve their pronunciation. But group D was asked to work just with the desktop dictionary. In this situation, they were provided with the written phonetic

transcription of the word, the meaning of the word, and its pronunciation in both British and American accents.

Design

This study investigated the effect of different types of multimedia annotations (still pictures, dynamic pictures and written annotations) on L2 vocabulary learning. The design of the study was quasi- experimental, with different treatments for the experimental and control groups. A pre-test and post-test was conducted for each group to measure their vocabulary learning.

Results

Having collected all data from the pre-test and post-test, the researchers employed SPSS for Windows (version 15-evaluation) to calculate the impact of different types of vocabulary teaching strategies: still pictures, dynamic pictures and written annotations on vocabulary learning. The Participants had not been told about the posttest to prevent them from paying more than usual attention to the words after the learning session, which might invalidate the results.

First the mean and standard deviation of each individual test was calculated. Then the researchers conducted within group comparison between the pre-test and post-test of each group to check how well each group had learned the presented vocabularies. Afterwards, between groups analysis was carried out to compare different groups in order to find out which strategy had a better impact on learning new words.

Table 1.
Descriptive Data for the Proficiency Test (PET)

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
1.00	16	49.0625	5.44633	1.36158	40.00	55.00
2.00	16	49.0000	4.13118	1.03280	43.00	55.00
3.00	16	50.1875	3.76331	.94083	42.00	55.00
4.00	16	49.7500	4.20317	1.05079	40.00	54.00
Total	64	49.5000	4.35343	.54418	40.00	55.00

As it was mentioned before to check the homogeneity of the participants, a language proficiency test was administered. Then a one-way ANOVA was run on their proficiency scores. Table 1 above shows the descriptive data for the proficiency scores of all four groups.

Table 2 summarizes the results of ANOVA test of between groups regarding the participants' proficiency scores.

Table 2.
ANOVA Test of Between Groups for Proficiency Scores

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	15.625	3	5.208	.265	.850
Within Groups	1178.375	60	19.640		
Total	1194.000	63			

As the results of the ANOVA test in Table 2 show, there was no significant difference among the four groups in terms of their proficiency scores, f (3,60) = .265 , p= .850 .

The first research question in this study addressed the effect of dynamic pictures vocabulary teaching strategy on the vocabulary learning of EFL learners. To answer this question, the researchers conducted a paired t-test between the pre-test and post-test of dynamic pictures group. As the descriptive data in Table 3 show, during the pre-test the mean score of this group was 12.00, but in the post-test it increased to 14.62. In order to see whether this difference was statistically significant, the researchers conducted a paired t-test, the results of which are presented in Table 3.

Table 3.
Descriptive Data and T-Test for the Comparison of the Dynamic Picture Group's Pre-Test and Post- Test

Group	Mean	N	T	Std	Df	Sig
Pretest Dynamic Pictures	12.00	16	-6.801	4.6043	15	.000
Post test	14.6250	16		3.5568		

As shown in Table 3, the difference was statistically significant, t (15) = - 6.801, p= 0.00. Therefore, the result indicated that dynamic pictures strategy had a significant effect on improving the learners' vocabulary learning.

The second research question investigated the effect of still pictures vocabulary teaching strategy on EFL learners' vocabulary learning. As the data in Table 4 indicates the mean score of the pre-test for this group was 11.8125 and the mean of post-test was 14.0625, thus it indicated an increase in the mean scores from the pre-test to the post-test situations in learner's performance in vocabulary learning through still picture strategy. But, in order to see whether this difference was statistically significant, the researchers conducted a paired t-test. Table 4 illustrates the results.

Table 4.
Descriptive Data and T-Test for the Comparison of the Still Pictures Group's Pre-test and Post-test

Group	Mean	N	T	Std	Df	Sig
Pretest Still Pictures	11.8125	16	-4.463	4.9695	15	.000
Post test	14.0625	16		4.0738		

According to the results presented in Table 4, it can be said that the difference between the pre-test and the post-test of the still picture annotations group was significant, t (15) =-4.463, p= .000.

Therefore, still picture annotations had significant impact on improving the learners' vocabulary learning.

The investigation of the possible effects of written annotation vocabulary teaching strategy on EFL learners' vocabulary learning was the concern of the third research question. As the descriptive data in Table 5 indicate, the mean score of written annotation group in the pre-test was 11.5 which increased to 13.5 in the post-test.

Table 5.
Descriptive Data and T-Test for the Comparison of the Written Annotations Group's Pre-test and Post- test

Group	Mean	N	T	Std	Df	Sig
Pretest Written annotations	11.5000	16	-6.606	5.2789	15	.000
Post test	13.5000	16		4.2895		

Since the difference between the pre-test and post-test mean scores of the written annotations group was significant, t (15) =-6.606, p= .000, it can be said that written annotations had improved the learners' vocabulary mastery.

The fourth research question investigated whether there were any significant differences among vocabulary instruction strategies (dynamic picture annotations, still picture annotations, and written annotations) in terms of promoting Iranian EFL learners' vocabulary learning. In order to see whether the difference between the control group and three experimental groups was meaningful or not, the researchers carried out an ANCOVA test (an analysis of covariance). Table 6 below presents the results.

Table 6.
ANCOVA for the Four Groups' Scores

Tests of Between-Subjects Effects

Dependent Variable: POSTTEST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected M	985.156a	4	246.289	182.135	.000	.925
Intercept	163.310	1	163.310	120.771	.000	.672
PRETEST	952.343	1	952.343	704.276	.000	.923
GROUP	33.375	3	11.125	8.227	.000	.295
Error	79.782	59	1.352			
Total	3110.000	64				
Corrected T	1064.938	63				

a. R Squared = .925 (Adjusted R Squared = .920)

As the results in Table 6 reveals, there was a significant difference between the control group and three experimental groups including still picture annotations, dynamic picture annotations, and written annotations, $f(3, 59) = 8.227$, P=0.00. This means that using annotations as a vocabulary teaching strategies had a positive effect on improving the participants' vocabulary learning. To identify the location of the difference a post hoc analysis was also conducted. Table 7 below reveals the results.

As shown in Table 7, the mean score of the control group had significant difference with the mean scores of the dynamic picture annotations, still picture annotations, and the written annotations groups. The mean score of the control group was lower than the mean score of the aforementioned strategies.

Table 7.
Post hoc Analysis of Mean Differences Among Four Groups

Group		Difference	Sig.
Control	Dynamic video	-1.938*	0.000
	Still pictures	-1.525*	0.000
	Written annotation	-1.213*	0.005
Dynamic video	Control	1. 938*	0.000
	Still pictures	0.412	0.320
	Written annotation	0.724	0.084
Still pictures	Control	1.525*	0.000
	Dynamic video	-0.412	0.320
	Written annotation	0.312	0.451
Written annotation	Control	1.213*	0.005
	Dynamic video	-0.724	0.084
	Still pictures	-0.312	0.451

Therefore, it can be claimed that these strategies (dynamic picture annotations, still picture annotations, and the written annotations) had an impact on vocabulary learning. Yet, the difference between the performances of the three experimental groups on the post-test did not reach significance level.

Discussion

The findings of this study showed that multimedia annotations had an impact on Iranian EFL Learners' vocabulary learning. This finding was in line with what Mayer (2001) refers to as multimedia effect whereby " presenting an explanation with words and pictures results in better learning than does presenting words alone" (p. 78). He also found that using the coordinated presentation in a visual format was effective.

Several studies have indicated the positive effects of electronic annotations on vocabulary learning or reading comprehension. Chun and Plass (1996) for example, in an experiment regarding the effectiveness of annotations with

different media types for vocabulary learning found that recall of words learned with text + picture was significantly better than for those learned with text only or with text + video.

The findings of the present study also supports the idea proposed by Oxford and Crookball (1990) who suggest that when a text is presented along with pictures, it can access more parts of the brain, therefore, it leads to greater depth of processing than when a text is processed alone.

The results of the study also showed that, although there was not any significant difference among three experimental groups, the mean score of the dynamic picture group and still picture group was better than the written annotation group. These findings confirm the effectiveness of visual images and are in line with what Underwood (1989) believes, i.e., "a commonplace principle of human learning is visual memory. We remember images better than words; hence we remember words better if they strongly associated with images" (p. 19).

The findings of the present study were also consistent with findings of some researchers who have claimed that images carry a structural message that complements the language presented. Jones and Plass (2002), for example, in their research with some students have found that students who accessed pictorial annotations alone or combined with written annotations outperformed those without access to any pictorial annotations on a written vocabulary recognition posttest.

Conclusion

An overview of the studies on L2 vocabulary annotations suggests that there is little information about how different annotations affect foreign language vocabulary learning. This study focused on this issue by comparing the effect of dynamic video, still pictures, and written annotations on the mastery of English language vocabulary by EFL learners.

The results indicated that multimedia annotations had an impact on the learners' vocabulary learning because the use of multimedia helps learners to have meaningful learning through the cognitive processes. As Mayer and Moreno (2000) have stated,

selecting relevant words and images, organizing them into coherent verbal and visual representations, and integrating corresponding verbal and visual representations though multimedia improves learners' vocabulary acquisition.

Based on the findings of the present study multimedia annotations, especially pictorial ones are recommended for language teachers as an effective instrument for vocabulary teaching.

The Authors

Saeideh Ahangari is an assistant professor in TEFL at the English department, Tabriz Branch of Islamic Azad university. Her main interests are Task-based language teaching, CALL, language testing and systemic functional linguistics. She has published and presented many papers in international conferences and journals.

Zeinab Abdollahpour holds an MA in TEFL from Tabriz Branch of Islamic Azad University. She is teaching English at Islamic Azad University, Nagadeh Branch. Her areas of research interest include CALL and vocabulary learning.

References

Al-Seghayer, K. (2001). The Effect of Multimedia Annotation Modes on L2 Vocabulary Acquisition: A Comparative Study. *Language Learning Technology*, *5*(1)*,* 202-232.

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

Chun, D.M., Plass, J.L. (1997). Research on Text Comprehension in Multimedia Environments. *Language Learning & Technology*, *1*(1)*,* 60-81.

Dwyer, F. M., & Dwyer, C. (2003). *Effect of animation in facilitating knowledge acquisition.* Paper presented at the meeting of the Pennsylvania Educational Research Association, Hershey, PA.

Grabowski, B. L. (2006). Web-based animation or static graphics: is the extra cost of animation worth it? *Journal of Educational*

Multimedia and Hypermedia. Retrieved February 10, 2009 from http://thefreelibrary.com

Groot, A. M. B. (2006). Effects of stimulus characteristics and background music on foreign language vocabulary learning and forgetting. *Language Learning, 56*(3), 463–506.

Jones, L.C., & Plass, J.L. (2002). Supporting Listening Comprehension and Vocabulary Acquisition in French with Multimedia Annotations. *The Modern Language Journal, 86*(4), 546-561.

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

Kost, C. R., Foss, P., & Lenzini, J. J. (1999). Textual and pictorial glosses: Effectiveness on incidental vocabulary growth when reading in a foreign language. *Foreign Language Annals, 32*(1), 89-113.

Latham-koenig, C., & Seligson, P. (2007). *New English file (Pre-intermediate).* Oxford: Oxford University Press.

Levie, H.W. (1987). *Research on Pictures:* A Guide to the Literature. In D.M., Willows & H.A. Houghton (Eds.), *The Psychology of Illustration*, *Vol. 1* (pp. 1-50). New York, Berlin, Heidelberg, Tokyo: Springer Verlag.

Lin, C. L. (2001). The effect of varied enhancements to animated instruction tests measuring different educational objectives. *Language Learning Technology*, *6* (1), 202-232.

Mayer, R. E. (1997). Multimedia learning: Are we asking the right questions? *Educational Psychologist, 32*(1), 1-19.

Mayer, R. E. (2001). *Multimedia learning.* Cambridge, UK: Cambridge University Press.

Mayer, R. E., & Moreno, R. (2000). *Aids to computer-based multimedia learning, Learning and Instruction,* 107–119. Retrieved February 21, 2009 from http://www.elsevier.com /locate/learninstruc. html

Najjar, L. J. (1998). Principles of educational Multimedia User Interface Design. *Human Factors, 40*(2), 311-323.

Nikolova, O. R. (2002) Effects of Students' Participation in Authoring of Multimedia Materials on Student Acquisition of Vocabulary. *Journal of Language Learning & Technology, 6*, 215-241.

Oxford, R., & Crookall, D. (1990). Vocabulary learning: A critical analysis of techniques. *TESL Canada Journal, 7*(2), 9-30.

Paivio, A. (1986). *Mental representation: A dual-coding approach*. New Oxford University Press.

Rieber, L. P. (1990). *Computers, graphics, and learning*. Retrieved February 20, 2009 from http://www.nowhereroad.com /cgl/toc2535.html

Schmitt, N., Schmitt, D., & Clapham, C. (2001). Developing and exploring the behavior of two new versions of the Vocabulary Levels Test. *Language Testing, 18* (1), 55-88.

Son, J. B. (2001). CALL and vocabulary learning: A review. *English Linguistic Science, 7*, 27-35 [Online]. Retrieved November 15, 2009 from http://www.usq.edu.au/users/sonjb /papers/elsak01.htm

Underwood, J. (1984). *Linguistics, computers and the language teacher: a communicative approach.* Rowley, MA: Newbury House.

Wittrock, M. C. (1990). Generative processes of comprehension. *Educational Psychologist, 24*, 345-376.

Consulted online dictionaries:

http://www.kidcrosswords.com

http://www.dicts.info/picture-dictionary.php?lan=dutch

http://www.enchantedlearning.com/Bisfor.shtml

http://www.pidic.com/

http://www.csdm.qc.ca/stejarc/dictionnaire/dico.htm

http://www.ldoceonline.com/

http://www.infovisual.info/01/pano_fr.html

http://www.pdictionary.com/

http://www.visualthesaurus.com/?ad=google.vocabulary.thinkvisu ally&gclid=CJXex6e4towC FQPqXgodgX-HNw

http://www.matton.fr/search.php?next=1&lsok=1&sok=soaking% 20we