

The Effects of Form- and Meaning-Focused Hypertextual Input Modification on L2 Vocabulary Acquisition and Retention

Értekezés a doktori (Ph.D) fokozat megszerzése érdekében az angol nyelvészet
tudományában

Írta: Sankó Gyula okleveles angol nyelv és irodalom, és orosz nyelv és irodalom szakos
középiskolai tanár.

Készült a Debreceni Egyetem Szinkron és diakron nyelvészet doktori programja (Angol
nyelvészet alprogramja) keretében.

Témavezető: Dr. Hollósy Béla

A doktori szigorlati bizottság:

Elnök: Dr

Tagok:

Dr.

Dr.

A doktori szigorlat időpontja:

Az értekezés bírálói:

Dr.

Dr.

Dr.

A bírálóbizottság:

Elnök: Dr

Tagok:

Dr.

Dr.

Dr.

Dr.

Az értekezés védésének időpontja:

Én Sankó Gyula teljes felelősségem tudatában kijelentem, hogy a
benyújtott értekezés a szerzői jog nemzetközi normáinak
tiszteletbentartásával készült

Acknowledgements

I am sincerely indebted to my consultant Hollósy Béla for his encouragement, support and guidance in conducting this study as well as his numerous contributions in this to the various drafts of this manuscript. Heartfelt thanks are also expressed to colleagues: James.Ted Riordan and Csépes Ildikó for their insightful comments and suggestions on a draft of this paper. I am especially indebted to Verle Norbert for his kind help in setting up my Web pages and for his assistance with information technology in general. My thanks are also due to Ispány Márton for his help and professional advice on statistics. My deepest gratitude is extended to teachers Csernoch Lászlóné, Fehérné Kiss Ágota, Kelemenné Nagy Anikó, Kokas Marianna Kozárné Fazekas Anna, Lazarovits Csilla, Lupsán Beatrix, Nagy Ágnes, Nagy Szabolcs, Papp Judit, Potyókné Makonyi Erika, Szebeni Vera and Wolffné Vígh Dóra, for their cooperation and assistance in organizing and conducting the experiment in their secondary schools. I wish to thank students of the DE Kossuth Lajos Gyakorló Gimnáziuma, Dienes László Gimnázium és Egészségügyi Szociális Szakképző Iskola, Medgyessy Ferenc Gimnázium and Tóth Árpád Gimnázium for participating in the experiment. Finally, I would also like to thank my family and friends for their infinite tolerance and patience.

Abstract

This study represents an effort to investigate the efficacy of interactionally modified input made salient through hypertext glosses on second language vocabulary acquisition. After reviewing the theoretical and empirical research background of the problem, an experiment was conducted with the aim of comparing the effect of form- and meaning-focused glosses embedded in a hypertext computer program and traditional paper-and-pen bilingual word lists on L2 vocabulary acquisition and retention under both incidental and intentional learning conditions.

Beyond the main aims examining the participants' attitudes to and their perceptions of the application of such hypertext glosses to vocabulary learning, together with scrutinizing learners' actual cognitive behaviour (e.g. strategies applied) were also among the purposes of the current research. Participants' attitudes and perceptions were measured by using a questionnaire with both closed and open-ended questions. Aspects of subjects' cognitive behaviour were recorded in log files by a tracking device attached to the software program used in the experiment.

A total of 120 intermediate level EFL students aged between 14-17 were randomly divided into three groups of 40 with each group allocated to a different learning mode (using text-based a) meaning-focused hypertext annotations, b) form-focused hypertext annotations, c) traditional bilingual word lists). A self-report pre-test was administered to make sure that the words to be learned were unknown to all participants. A between-subjects experimental design was applied to investigate the differences in learning modes, and a within-subjects design was used to compare incidental and intentional learning conditions with all the variables strictly controlled to make sure that the results of the study would provide a true representation of the issues studied in the experiment.

Two texts were used: one for the incidental condition and the other for the intentional learning condition. In learning modes a) and b) they were accessed from the WWW, in learning mode c) subjects got them on paper. Participants' receptive acquisition and retention of the target words was checked through an immediate (right after the study sessions) and a delayed (three weeks later) banked cloze tests. Test output was analysed with nonparametric (Kruskal-Wallis MANOVA complemented with paired Mann-Whitney U Test for between subjects; Friedman Test MANOVA followed by paired Wilcoxon Signed Rank Test for within-subjects repeated measures) statistical analyses. Possible correlations were looked for using Spearman's Rank Correlation technique.

The results showed that subjects learning vocabulary intentionally significantly outperformed those acquiring the same target words incidentally. Participants using cognitive scaffolding through hypertextually-enhanced salient input outperformed students using the traditional word list with no-enhancement (with students using meaning-focused glosses achieving best). However, statistically significant differences in favour of the form-focused and meaning-focused input enhancement were spotted only on the immediate post-tests (acquisition) in the intentional learning condition. Although students using hypertext glosses also performed better on both the immediate post-test in incidental learning condition and the delayed post-test in the intentional condition, the lack of statistically significant differences in these cases made the interpretation of the results merely tentative. Results of the questionnaire indicated that the majority of participants assumed a positive attitude towards the application of hypertext glosses, and perceived them as effective for vocabulary learning. Concerning the importance of the various gloss types there was a contradiction between the answers to the questionnaire and the results gained through the use of the tracking device, which suggests that students may speak and act differently. The frequency of gloss look-ups and the test results achieved showed no significant correlation in the study.

Table of Contents

CHAPTER 1: INTRODUCTION	1
1.1 GENERAL THEORETICAL AND RESEARCH CONTEXT OF THE STUDY	1
1.2 THE PURPOSE OF THE STUDY	2
1.3 CLARIFICATION OF TERMS AND IMPORTANT CONCEPTS	4
1.3.1 <i>What is a word?</i>	4
1.3.2 <i>What is an unknown word?</i>	4
1.3.3 <i>What does it mean to know a word?</i>	5
1.3.4 <i>Other terms frequently used in the study</i>	9
CHAPTER 2: LITERATURE REVIEW	12
2.1 INTRODUCTION	12
2.2 PSYCHOLINGUISTIC PROCESSES IN SECOND LANGUAGE ACQUISITION	13
2.2.1 <i>The role of attention and noticing in SLA</i>	13
2.2.2 <i>Factors affecting noticing</i>	14
2.2.3 <i>The role of consciousness and noticing in SLA</i>	14
2.3 INFORMATION PROCESSING RESEARCH IN SLA	16
2.3.1 <i>The role of input and input processing in SLA</i>	16
2.3.2 <i>The role of linguistic interaction in SLA</i>	17
2.3.3 <i>Interactionist theories of SLA</i>	18
2.4 THE ROLE OF MEMORY IN LEXICAL ACQUISITION	20
2.4.1 <i>Models of human memory</i>	20
2.4.1.1 <i>The Atkinson-Shiffrin Model</i>	21
2.4.1.2 <i>Levels of Processing Approach</i>	22
2.4.1.3 <i>Tulving's Memory Model</i>	24
2.4.2 <i>Ways of enhancing memory skills</i>	25
2.5 THE MENTAL LEXICON	28
2.5.1 <i>Storing vocabulary in the mental lexicon</i>	28
2.5.2 <i>Retrieving vocabulary from the mental lexicon</i>	35
2.6 THEORIES OF VOCABULARY ACQUISITION	36
2.6.1 <i>Factors affecting vocabulary acquisition</i>	36
2.6.2 <i>The role of context and reading comprehension in L2 vocabulary acquisition</i>	40
2.7 THE ROLE OF INCIDENTAL AND INTENTIONAL LEARNING IN SECOND LANGUAGE VOCABULARY ACQUISITION	44
2.7.1 <i>Conditions of successful incidental vocabulary learning</i>	48
2.7.2 <i>The role of context in incidental vocabulary learning - Reading comprehension and incidental vocabulary learning</i>	50
2.8 THE POTENTIAL OF HYPERTEXT AND HYPERMEDIA IN SECOND LANGUAGE VOCABULARY ACQUISITION	53
2.8.1 <i>Hypertext/hypermedia in language learning</i>	54
2.8.1.1 <i>Advantages of hypertext/hypermedia-supported language learning environments</i>	55
2.8.1.2 <i>Limitations of hypertext/hypermedia-supported language learning environments</i>	57
2.8.1.3 <i>Principles of effective hypermedia design for language learning</i>	58
2.8.1.4 <i>Learners' epistemic beliefs and learning with hypertext</i>	60
2.8.2 <i>Vocabulary learning with hypertext/hypermedia cognitive learning support environments</i>	60
2.8.2.1 <i>Hypertext and the mental lexicon</i>	62

2.8.2.2 The impact of hypertext/hypermedia on vocabulary acquisition	63
2.8.3 <i>Modified interaction in hypertext/hypermedia-based computer assisted L2 vocabulary learning</i>	65
2.8.4 <i>The value and effect of input enhancement through electronic glossing</i>	67
2.9 THE ROLE OF FORM AND MEANING IN L2 VOCABULARY ACQUISITION	73
2.9.1 <i>Introduction</i>	73
2.9.2 <i>Form-meaning relations in input processing</i>	74
2.9.2.1 Dominance of form in input processing	74
2.9.2.2 Dominance of meaning in input processing	75
2.9.2.3 Complex approach to the importance of form and meaning in input processing	76
2.9.3 <i>Formal and semantic intralexical and intralingual factors, crosslinguistic interaction affecting L2 lexical acquisition</i>	77
2.9.3.1 The role of intralingual factors in L2 vocabulary acquisition	78
2.9.3.2 The role of formal and semantic cross-linguistic interaction in L2 vocabulary acquisition	83
2.9.4 <i>Form-meaning mapping in L2 vocabulary acquisition</i>	85
2.9.5 <i>Form and meaning in the L2 mental lexicon</i>	87
2.9.6 <i>The role of hypertext links in strengthening form-meaning mappings in the mental lexicon</i>	90
CHAPTER 3: DESCRIPTION OF THE RESEARCH	93
3.1 RESEARCH QUESTIONS AND HYPOTHESES	95
3.1.1 <i>Research questions</i>	95
3.1.2 <i>Hypotheses</i>	96
3.2 RESEARCH DESIGN	97
3.3 METHOD	100
3.3.1 <i>Subjects</i>	100
3.3.2 <i>Materials</i>	102
3.3.2.1 Computer program	102
3.3.2.1.1 Software: overview of content and organization	102
3.3.2.1.2 Screen design principles	103
3.3.2.1.3 Multimodal presentation of information	104
3.3.2.1.4 Hypertext/ hypermedia glosses	105
3.3.2.1.5 Tracking device and log files	106
3.3.2.2 Selection of texts and stimulus words	109
3.3.2.2.1 Validating the selection of the texts used in the experiment for lexical complexity	109
3.3.2.2.2 Validating the selection of final stimuli words	112
3.3.2.3 Testing instruments	115
3.3.2.3.1 Self-report vocabulary pre-test	115
3.3.2.3.2 Reading comprehension test	116
3.3.2.3.3 Immediate vocabulary acquisition post-test.....	117
3.3.2.3.4 Delayed vocabulary retention post-test.....	118
3.3.2.4 Questionnaires.....	118
3.3.2.4.1 Questionnaire 1	118
3.3.2.4.2 Questionnaire 2	119
3.3.3 <i>Procedure of data collection</i>	120
3.3.3.1 Week 1: pre-test and preliminary survey sessions	121
3.3.3.2 Week 2: incidental study and immediate post-test sessions	122
3.3.3.3 Week 3: intentional study and immediate post-test sessions.....	123
3.3.3.4 Week 7: delayed post-test and survey session.....	123

3.4 ANALYSIS OF DATA.....	124
3.4.1 <i>Analysing test results</i>	124
3.4.2 <i>Analysing questionnaire results</i>	125
3.4.3 <i>Analysing the log files</i>	126
CHAPTER 4: RESULTS AND DISCUSSION	131
4.1 INTRODUCTION	131
4.2 TEST RESULTS.....	131
4.2.1 <i>Descriptive analysis of test results</i>	132
4.2.2 <i>Analysing test results with distribution-free inferential statistical methods</i>	138
4.2.2.1 <i>Analysing test results concerning research focus A</i>	138
4.2.2.2 <i>Analysing test results concerning research focus B</i>	144
4.2.3 <i>Validating the testing instruments</i>	155
4.2.4 <i>Linguistic analysis of the differences observed in students' performance</i>	157
4.2.4.1 <i>Pronounceability</i>	159
4.2.4.2 <i>Orthography</i>	160
4.2.4.3 <i>Word length</i>	160
4.2.4.4 <i>Morphology</i>	160
4.2.4.5 <i>Grammtical – syntactic features</i>	161
4.2.4.6 <i>Semantic features</i>	163
4.2.4.7 <i>Frequency</i>	164
4.2.4.8 <i>Summary of the linguistic analysis</i>	165
4.3 RESULTS OF THE FOLLOW-UP QUESTIONNAIRE	167
4.3.1 <i>Results of the closed questions</i>	167
4.3.2 <i>Results of the open-ended questions</i>	179
4.3.3 <i>Comparison of answers and test results achieved</i>	183
4.3.4 <i>Comparison of answers given by students working with form-focused and meaning-focused annotations</i>	185
4.4 RESULTS GAINED THROUGH THE USE OF THE TRACKING DEVICE	188
CHAPTER 5: DISCUSSION AND CONCLUSION	198
5.1 SUMMARY AND IMPLICATIONS OF THE FINDINGS	198
5.1.1 <i>Discussion of the findings gained by using the testing instrument</i>	199
5.1.2 <i>Discussion of the findings gained by using questionnaires</i>	203
5.1.3 <i>Discussion of the findings gained by using the computer tracking device</i>	206
5.2 LIMITATIONS OF THE RESEARCH	206
5.3 CONCLUSIONS.....	208
5.4 SUGGESTIONS FOR FURTHER RESEARCH.....	209
REFERENCES	211
APPENDICES	239

List of Figures

Figure 1. A consensus model of the cognitive processes in SLA (Ellis, 1994:347)	18
Figure 2. The distribution of the immediate post-test results (incidental condition) with the frequency polygon indicating the normal distribution curve.....	136
Figure 3. The distribution of the immediate post-test results (intentional condition) with the frequency polygon indicating the normal distribution curve.....	136
Figure 4. The distribution of the delayed post-test results (incidental condition) with the frequency polygon indicating the normal distribution curve.....	137
Figure 5. The distribution of the delayed post-test results (intentional condition) with the frequency polygon indicating the normal distribution curve.....	137
Figure 6. Perceived usefulness of hypertext for vocabulary learning	168
Figure 7. Where/when to use computers for vocabulary learning?	168
Figure 8. How often would you like to use computers for vocabulary learning?	169
Figure 9. Perceived difficulty of using a computer for vocabulary learning.....	170
Figure 10. To what extent did the highlighting of words (+ the information provided in the gloss) help you learn the target words?	171
Figure 11. Perceived usefulness of gloss types applied in the study: phonemic transcription	172
Figure 12. Perceived usefulness of gloss types applied in the study: sound files (audio-format pronunciation of the target words)	172
Figure 13. Perceived usefulness of gloss types applied in the study: English definition.....	173
Figure 14. Perceived usefulness of gloss types applied in the study: Hungarian equivalent(s)	174
Figure 15. Perceived usefulness of gloss types applied in the study: synonyms, antonyms and other sense relations	174
Figure 16. Perceived usefulness of gloss types applied in the study: affixed and derived forms	175
Figure 17. Perceived usefulness of gloss types applied in the study: examples of using the word in context	175
Figure 18. Summary of perceived usefulness of all gloss types applied in the study	176
Figure 19. Perceived importance of the possibility of interaction with the computer for learning outcome	177
Figure 20. Have you ever learnt English words while looking for some other information on the World Wide Web?	178
Figure 21. Can you still remember any of the words you have learned in this way?.....	179

List of Tables

Table 1. The comprehensive research design box for the study.....	98
Table 2. Lexical profile of stimulus text 1 (Pirates).....	110
Table 3. Lexical profile of text 2 (Pickpockets).....	110
Table 4. Syntactic characteristics of the texts used in the study.....	111
Table 5. Schedule of data collection during the experiment	121
Table 6. Descriptive analysis of the mean test results.....	132
Table 7. Ranges of test scores expressed as a percentage of the total test scores	133
Table 8. Standard deviations of test scores expressed as a percentage of the mean test scores	133
Table 9. Descriptive statistics of the test results in the study	134
Table 10. The mean rank of the test results of the different participant groups.....	139
Table 11. The asymptotic significance of differences between the group test results as calculated by the Kruskal-Wallis test.	140
Table 12. Comparison of the mean ranks and rank sums of test results of the meaning-focused and the form-focused groups (immediate post-test in intentional learning condition) using the Mann-Whitney U test.....	141
Table 13. Test of significance in relation to the Mann-Whitney U test	141
Table 14. Comparison of the mean ranks and rank sums of test results of the meaning-focused and the control groups (immediate post-test in intentional learning condition) using the Mann-Whitney U test	142
Table 15. Test of significance in relation to the Mann-Whitney U test	142
Table 16. The comparison of the mean ranks and rank sums of tests of the form-focused and the control groups (immediate post-test in intentional learning condition) using the Mann-Whitney U test.	143
Table 17. Test of significance in relation to the Mann-Whitney U test	143
Table 18. Comparison of the rank sums of test results of the incidental and the intentional learning conditions using the Friedman test.....	145
Table 19. Test of significance in relation to the Friedman test	145
Table 20. Comparison of the mean ranks of immediate post-test scores under the incidental and intentional learning conditions	146
Table 21. Test of significance in relation to the Wilcoxon Signed Rank Test.....	146
Table 22. Comparison of the mean rank of delayed post-test scores under the incidental and intentional learning conditions.	147
Table 23. Test of significance in relation to the Wilcoxon Signed Rank Test.....	147
Table 24. Comparison of the mean rank of test scores across time in incidental learning condition	149
Table 25. Test of significance in relation to the Wilcoxon Signed Rank Test.....	149
Table 26. Comparison of the mean rank of test scores across time in intentional learning condition	150
Table 27. Test of significance in relation to the Wilcoxon Signed Rank Test.....	150

Table 28. Comparison of the mean ranks and rank sums of the immediate post-test results of the meaning-focused group (incidental learning condition) and the control groups (intentional learning condition) using the Mann-Whitney U test.....	151
Table 29. Test of significance in relation to the Mann-Whitney U test	152
Table 30. Comparison of the mean ranks and rank sums of the immediate post-test results of the form-focused group (incidental learning condition) and the control groups (intentional learning condition) using the Mann-Whitney U test.....	152
Table 31. Test of significance in relation to the Mann-Whitney U test	152
Table 32. Item analysis statistics of the post-test results for all 120 participants.....	156
Table 33. Total number of correct answers per test item in Text 1 (incidental learning condition).....	158
Table 34. Total number of correct answers per test item in Text 2 (intentional learning condition).....	158
Table 35. Words retained correctly by the largest and smallest number of students as reflected by the test results	159
Table 36. Co-occurrences of words retained correctly by the largest and smallest number of students in the study.	162
Table 37. Length and complexity of sentences with the words retained correctly by the largest and smallest number of students in the study	163
Table 38. Rank in usage of the words retained correctly by the largest and smallest number of students out of the 86.800 most frequently used British English words (based on the ESOL Online frequency calculator, Ministry of Education, New Zealand).	165
Table 39. Summary of Spearman correlation values (with approximate significance) between the answers to Question 1. and the test results achieved	184
Table 40. Summary of Spearman's correlation values (with approximate significance) between the answers to Question 5. and the test results achieved.....	184
Table 41. Summary of Spearman's correlation values (with approximate significance) between the answers to Question 7. and the test results achieved.....	185
Table 42. Comparison of the perceived usefulness of hypertext technologies for vocabulary learning across learners exposed to form- and meaning-focused annotations	186
Table 43. Spearman's Rank Correlation between answers given to Q1 by students working with form-focused and meaning-focused input enhancement.....	186
Table 44. Comparison of the perceived usefulness of highlighting (+ explanations) for vocabulary learning across learners exposed to form- and meaning-focused annotations	187
Table 45. Spearman's Rank Correlation between answers given to Q5 by students working with form-focused and meaning-focused input enhancement.....	187
Table 46. Comparison of the perceived importance of interaction with the computer across learners exposed to form- and meaning-focused annotations.	187
Table 47. Spearman's Rank Correlation between answers given to Q7 by students working with form-focused and meaning-focused input enhancement.....	188
Table 48 . Mean number of target words consulted (without repeated clicks) in the form-focused and meaning-focused versions of the two texts applied in the study	189
Table 49. Summary of the most and least frequently consulted target words and of the glosses with the Hungarian equivalents in the two texts used in the study.....	190
Table 50. Number of students consulting the phonemic transcription and the audio-format pronunciation of target words in text 1 (Pirates) and text 2 (Pickpockets).	192

Table 51. Summary of the total number of various glosses consulted (repeated clicks inclusive) in the two texts used in the study.....	193
Table 52. Summary of the mean number of various gloss types consulted (without repeated clicks) in the two texts used in the study.....	194
Table 53. Summary of the mean time lapses between clicking on a target word and some within gloss annotation types in the two texts used in the study.....	195
Table 54. Comparison of the most frequently retained words and the most frequently consulted words.....	196
Table 55. Comparison of the least frequently retained words and the least frequently consulted words.....	196
Table 56. Comparing the number of correctly retained test items and the number of gloss consultations using Spearman's correlation values (with approximate significance)..	197

List of Appendices

Appendix A: Self-report vocabulary pre-test	239
Appendix B: Preliminary questionnaire	239
Appendix C/1: Text chosen for the incidental vocabulary learning condition.....	239
Appendix C/2: Text chosen for the intentional vocabulary learning condition	239
Appendix D/1: Annotated words in the text selected for the incidental vocabulary learning condition	239
Appendix D/2: Annotated words in the text selected for the intentional vocabulary learning condition	239
Appendix E: Illustration of screen design (texts used for incidental and intentional vocabulary learning conditions)	239
Appendix F/1: Illustration of the structure and content of form-focused glosses:	239
Appendix F/2: Illustration of the structure and content of meaning-focused glosses	239
Appendix G: Illustration of the cards participants used a) to access the web page with the target text, and b) to identify themselves.....	239
Appendix H: Comprehension test administered at the end of the incidental vocabulary learning tutorial session	239
Appendix I/1: Immediate post-test administered for students learning vocabulary incidentally (exactly the same test was given as delayed post-test).....	239
Appendix I/2: Immediate post-test administered for students learning vocabulary intentionally (exactly the same test was given as delayed post-test).....	239
Appendix J/1: Hungarian version of the questionnaire administered at the end of the study	239
Appendix J/2: English translation of the questionnaire administered at the end of the study	239
Appendix K/1: Text and bilingual word list used by control group students in incidental vocabulary learning condition	239
Appendix K/2: Text and bilingual word list used by control group students in intentional vocabulary learning condition	239
Appendix L/1: Illustration of the original data set structure (with form- and meaning-focused annotations both in the incidental and the intentional learning conditions) as recorded in the log file (MS Excel format).....	239
Appendix L/2: Illustration of the simplified data set structure (with form- and meaning- focused annotations both in the incidental and the intentional learning conditions) of the log file after filtering out the data types irrelevant for the study (MS Excel format).....	239
Appendix M: The software program used in the experiment.....	239

Chapter 1: Introduction

1.1 GENERAL THEORETICAL AND RESEARCH CONTEXT OF THE STUDY

Learning vocabulary is probably the most important component of second language learning. Consequently, the acquisition of lexical units has been an issue of central importance in recent second language acquisition (SLA) research. The main research trends have been investigating the factors contributing to efficient word learning, and conditions of storing the most possible words in long-term memory.

Recent vocabulary learning research has been based on cognitive interactionist theories of psycholinguistics and SLA, which emphasize the importance of input, interaction and output in the second language acquisition process (see e.g. Huckin, Haynes, & Coady, 1993; Huckin & Coady, 1997; Nation, 1990; Schmitt & McCarthy, 1997; Singleton, 1999; Schmitt, 2000). It has also been proposed that learners can successfully integrate L2 input into their knowledge system, provided they apperceive and comprehend it (Gass, 1988; Schmidt, 1990; Hulstijn, 1990; Gass & Selinker, 1994). The first stage in this process is noticing input, which presupposes the allocation of attention to input, as unattended pieces of information are likely to go unnoticed, which in turn blocks the way to further stages of the language acquisition process. It has been suggested therefore that learners' attention should be directed to input by making it salient, which can be achieved through input enhancement and interactional modifications i.e. the negotiating of input (Long, 1983; 1996).

The interactive nature of computers, together with the potential of new hypermedia-platformed information technologies allow the learner to engage in interaction with input made salient through consulting hypermedia annotations of various contents. The majority of studies in this area have investigated the potential advantage of multimodal presentation of the material in the computerised annotations comparing the effects of text, graphics, video, and sound (e.g. Brett, 1997, 1998; Chun & Plass, 1996, 1997; Al-Seghayer, 2001; Chanier & Shelva, 1998, etc.). There are also studies examining the effect of using annotations on reading comprehension as well as on incidental and intentional vocabulary learning conditions (e. g. Hulstijn, Hollander, & Greidanus, 1996; Lomicka, 1998; Davis & Lyman-Hager, 1997;

Lyman-Hager, Davis, Burnett, & Chennault, 1993; Martinez-Lage, 1997; De La Fuente, 2002; Laufer & Hill, 2000; DeRidder, 2002; Harrington & Park, 1997; Rott & Williams, 2003; Son, 1998; Liu & Reed, 1995; Groot, 2000; Koren, 1999).

These studies usually yielded positive results concerning the impact of computerised glosses on the acquisition and retention of L2 lexical elements, but there are also sceptics like Cobb and Stevens:

... there is still no clear evidence that hypertext is necessarily superior to paper or non-hypertext computer systems as “there is no guarantee that making large and varied amounts of on-line text available automatically promotes particularly deep processing, even when the task is in a motivating, pleasurable game format and other types of information are on offer (Cobb and Stevens, 1996:117, as cited in Son, 1998:118).

Son (ibid.) draws the conclusion that empirical research on the practical benefit of using hypertext applications is greatly needed in language instruction. For instance, there has been comparatively little research into what effect the (at least partial) computer imitation of the form- and meaning-based associations in the mental lexicon might have on the acquisition and retention of unknown lexical units.

1.2 THE PURPOSE OF THE STUDY

The present research amalgamated the study of form and meaning connections and the investigation of hypertext computer applications in vocabulary learning taking place in both incidental and intentional conditions. Consequently, it had a double focus with the following main aims:

Aim 1: It aimed to find out whether interactionally modified input made salient through computer-based hypertext annotations would yield better L2 vocabulary acquisition and retention results among intermediate EFL learners than the application of a traditional paper-based text with a paired associates vocabulary list to assist learners.

A sub-problem belonging to this aim was to find out how the application of form-focused and meaning-focused hypertext annotations affected short-term and long-term retention of the target vocabulary, i. e. to shed light on whether the application of form- or meaning-focused gloss contents would give more support to intermediate learners of English involved in the experiment. This issue promised to be particularly interesting as previous

lexical memory research (see. Singleton, 1999) found that in earlier stages of language acquisition learners rely more on formal features in the L1 mental lexicon, while in later, more advanced stages they rely predominantly on semantic features of the lexical units to be acquired.

Aim 2: The second main aim of this study was to determine whether there was a difference between the achievement (both short-term acquisition and long-term retention) of the aforementioned intermediate students when they acquired new L2 lexical units incidentally and intentionally.

A sub-problem of this issue was to examine how the potential impact of incidental or intentional learning condition on the acquisition and retention of L2 vocabulary was modified through the application of either form- or meaning focused hypertext annotations.

Even though most of the earlier investigations in this field of research have been consulted and taken into consideration, in a strict sense not one of them can be considered as a base-line study for the present work. Rather than exactly replicating any of the rather diverse studies, the current work intends to amalgamate some of their intriguing and promising features into a complex investigation in the Hungarian context. The current study is predominantly text-based, as the author was interested in the effect of various linguistic tools on the success of the acquisition and retention of L2 lexical units, rather than in the influence of multimedia elements that the majority of the previous studies dealt with.

Following the cognitive interactionist framework of second language acquisition research (Gass, 1988), the present study focuses exclusively on input, even though the researcher is fully aware of the significance of output and pushed output (Swain, 1985) formulated as a reaction to the corrective feedback provided in the process of input negotiation. The study aims to measure only receptive knowledge gain (i. e. recognition) of the target vocabulary.

Besides the above mentioned main aims of the investigation, students' hypertext-based vocabulary study strategies as reflected by their requests for input modifications (i.e ignoring or consulting glosses) and their attitudes towards the use of computerised hypertext glosses in vocabulary acquisition were also examined. The former was studied with the help of a tracking device incorporated in the computer program that could follow up participants' clicking behaviour, while the latter was surveyed in a questionnaire.

1.3 CLARIFICATION OF TERMS AND IMPORTANT CONCEPTS

When investigating the issue of second language vocabulary acquisition one needs to specify what a "word" is, what qualifies as an "unknown word", and, more importantly, what it means to learn and consequently to "know a word".

1.3.1 What is a word?

Bogaards (2001) notes that in linguistics there have been many definitions of what 'word' is. For instance, Chrystal (1985:333) defines 'word' as "a unit of expression which has universal intuitive recognition by native speakers, in both spoken and written language". Cruse's (1986:35-36) definition is "the smallest element of a sentence which has positional mobility – that is, the smallest that can be moved without destroying the grammaticality of the sentence (ignoring any semantic effects)", and as "the largest units which resist 'interruption' by the insertion of new material between their constituent parts". Following Cruse (1986), Bogaards proposes replacing the notion of "word" with the concept of "lexical unit" (2001:323). He suggests that a lexical unit may be identical with a word in the traditional sense, but it has to be monosemic, i. e. it may have only one single sense. This also implies that polysemous words cover as many lexical units as many senses they have. "The linguistically founded concept of "lexical unit" seems to be useful in applied linguistics in that it makes it possible to describe in more detail the many steps that learners have to take in acquiring vocabulary in an L2" (Bogaards 2001: 326).

Having defined what 'word' means, it also seems necessary to define the notion of 'unknown word' and to clarify when it can be said that a word has been learned, i. e. when it can be stated that the learner already knows a word.

1.3.2 What is an unknown word?

Bogaards (2001) notes that defining what an unknown word means is not easy as this concept may cover a word entirely new to the learners, but may also mean having to learn new meanings of an already well-known word or the unpredictable new meaning that arises from the combination of two well known words. Whether a compound word one of whose

constituents is completely new to the learner can be taken as known or unknown depends of the transparency of the compound word. The other side of the coin is that in some researchers' view "...many words are assumed to be known without the learners ever having seen them" (Bogaards, 2001:322). Laufer & Nation (1995:312) define a word in the Lexical Frequency Profile as a "... base form with the inflected and derived forms, i. e., a word family...", which implies that knowing the stem would mean knowing all derived and inflected forms too.

Bauer & Nation (1993:253) assume that all the inflected and derived forms of a given base word "... can be understood by a learner without having to learn each form separately". Identifying the base form is a particularly great problem with programs like Laufer & Nation's Lexical Frequency Profile, which are not intelligent enough to differentiate between different families that have seemingly common base forms. Bogaards (2001:323) concludes that knowing the form does not automatically mean knowing all its senses, "... let alone knowledge of all of its family relationships and members".

1.3.3 What does it mean to know a word?

When can we say then that we have learned a word? Unfortunately, this question cannot be answered in a simple way either, as there is a knowledge continuum ranging from total ignorance to complete productive proficiency. N. Ellis (1995) contends that learners must recognise the sound pattern or the orthographic pattern of the word, and for production tune a motor programme for pronunciation or activate the spelling output lexicon for writing. Besides, one must learn the syntactic properties of the word, its relations to other words in the lexical structure, its semantic and referential properties, and its place in the conceptual system.

Faerch, Haastrup, & Phillipson's (1984:100) definition of vocabulary knowledge is "... a continuum between ability to make sense of a word and ability to activate the word automatically for productive purposes". At one end of the continuum there is 'potential vocabulary' meaning new, unknown words that may be potentially easily understood due to their cognate status. The next stage they call 'real' vocabulary, including words that learners have learnt and "... they can either understand (passive real vocabulary) or both understand and use (active real vocabulary) " (Ibid.).

One type of scale of word knowledge is presented by Paribakht and Wesche (1993), who list five different stages or types of knowledge of words:

- The word is not familiar at all.
- The word is familiar but its meaning is not known.
- The meaning is known – the student can supply a correct synonym.
- The word is used with semantic appropriateness in a sentence.
- The word is used with semantic appropriateness plus grammatical accuracy in a sentence (as cited in Schmitt, 1998: 284)

Henriksen (1996) breaks down the passive-active continuum into three further parts:

- a partial-precise knowledge continuum, where levels of knowledge equal different levels of word comprehension;
- a depth of knowledge continuum, which includes knowledge of the word's syntagmatic and paradigmatic relations with other words; and
- a receptive-productive continuum. The first two are knowledge-related, the third, a control continuum, reflects how well the learner can access and use the word (as cited in Laufer & Paribakht, 1998: 367).

Laufer & Paribakht (1998) contend that the relationship between an L2 learner's passive and active vocabularies in L2 has been unexplored. It has been generally assumed that passive vocabulary is larger than active (see also Aitchison, 1989; Channell, 1988), but there is no knowing how much larger, or whether the increase of the passive vocabulary also induces the increase of active vocabulary, etc. Laufer (1998) concludes that the two develop differently. Controlled active (elicited) vocabulary grows more slowly than does passive vocabulary, and the gap between the two gets bigger as passive vocabulary increases. Laufer & Paribakht (1998:369) assert that a deeper understanding of the relationship between active and passive vocabulary "... may help better understand lexical knowledge, which in turn may have implications for teaching vocabulary".

In Harrington & Park's (1997) opinion "A word is considered 'learned' when the user can readily retrieve the appropriate word form when given a meaning, or retrieve the appropriate meaning when encountering the spoken or written form".

Laufer & Paribakht (1998:366) admit that “... no clear and unequivocal consensus exists as to the nature of lexical knowledge”. They state that when native speakers consider a word as known, they are definitely capable of matching word form to its conceptual meaning. Contrary to this, an adult L2 learner may state that they know the word when they can identify the form only (i.e. they merely know that it exists in the L2 without being aware of its meaning). Other, usually more proficient learners sometimes tend to claim they do not know an L2 word, just because they do not think they can use it in context.

Bogaards (2000) lists three approaches (Cronbach, 1942; Richards, 1976; Nation, 1990) that complement each other in their attempt to try and give an exhaustive answer to the question what it means to know a word. In an early attempt to establish an exhaustive list of criteria of lexical knowledge, Cronbach (1942, as cited in Bogaards, 2000: 491) distinguishes the following five aspects:

- generalization (knowing the definition),
- application (knowledge about use),
- breadth of meaning (knowing different senses of a word),
- precision of meaning (knowing how to use the word in different situations),
- availability (knowing how to use the word productively)

Richards (1976) offers a list of seven criteria of word knowledge:

- knowing the degree of probability of encountering that word in speech or print;
- knowing the limitations imposed on the use of the word according to variations of function and situation;
- knowing the syntactic behaviour associated with that word;
- knowledge of the underlying form of a word and the derivations that can be made from it;
- knowledge of the network of associations between word and other words in the language;
- knowing the semantic value of the word
- knowing many of the different meanings associated with the word.

(as cited in Bogaards, 2000: 491).

Nation (1990: 31) proposes four aspects of vocabulary knowledge:

- form (oral or written),
- position (grammar and collocations),
- function (frequency and appropriateness) and
- meaning (conceptual and associative).

In Nation's system of aspects all knowledge forms can be productive and receptive. Partly based on the aforementioned works Bogaards selects the following aspects to define word knowledge:

- The written and spoken form, which is the first stage of knowledge;
- One or more of the word meanings, connotations and its (their) place in the semantic network.
- Morphological features concerning derivation and compounding. Bogaards warns that even after learning standard morphological behaviour, many relationships still have to be learned one by one. "Especially for productive use it is difficult for the L2 learner to know whether a given form is possible and in what sense it may be used" (1994: 53-57).

Learning to apply the right syntactic rules to the right lexical units, learning obligatory and possible arguments that go with verbs in a given sense, or what prepositions have to be used with adjectives or verbs in a certain sense is not easy at all. Free and restricted collocates may also give L2 learners great trouble. Its discourse features including knowledge of style, register and appropriateness of particular senses of a word is "... notoriously difficult to acquire for L2 learners, and it takes a long time before they have a feeling about the relative frequency of lexical units in different kinds of contexts" (Bogaards, 2000: 492-93).

Compared to Nation's (1990) taxonomy of word knowledge components cited above, Laufer (1990) suggests a slightly different taxonomy, consisting of phonological, graphic, morphological form, syntactic behaviour, referential, associative, pragmatic meaning as well as paradigmatic and syntagmatic relations with other words. Claiming that speed is an indication of fluency, Meara (1996) proposes channel capacity, i. e. speed of access to words as a component of lexical knowledge.

Schmitt (1998) holds Nation's (1990:30-33) taxonomy of eight categories (with each including both receptive and productive aspects) the most complete and balanced description of word knowledge:

- The spoken form of a word;
- The written form of the word;
- The grammatical behaviour of the word;
- The collocational behaviour of the word;
- The frequency of the word;
- The stylistic register constraints of the word;
- The conceptual meaning of the word;
- The associations the word has with other related words

After studying relevant theories and research results Koren (1999) concludes that “... knowing a word is a subjective concept that depends on the learner’s purposes, standards, situation (extensive reading, testing, active reusage), teacher or tester’s requirements, and so on”.

The current study is aiming at the low end of vocabulary knowledge. The tests involved in the experiment measured receptive knowledge of the target vocabulary, which is hardly surprising considering the fact that participants expected to supply the appropriate words in the gaps after only one exposure to them.

1.3.4 Other terms frequently used in the study

Below there is a description and interpretation of the main terms as they were used in this thesis:

Form-focused glosses include:

- Spelling
- Pronunciation (in audio-format)
- Phonemic transcription
- Inflexions
- Derivations
- Hungarian equivalent(s)

Hyperdocument

A collection of documents in a hypertext system.

Hyperlinks

Words or phrases in one document that point to another text with more information related to that word or phrase. “Difficult words highlighted in a bold typeface, different colour or underlining” (DeRidder, 2002).

Hyperlinked materials

Materials that provide information in an associative, non-linear format. Links connect the learner with definitions, examples, answers, etc. Most importantly, hypertextual materials allow the user to select his or her own learning path.

Hypermedia:

A hypertext document which includes media (pictures, sound, animation) is called hypermedia (multimedia + hypertext links to other media documents).

Hypertext

Hypertext is non-linear text, defined as “... the combination of natural language text with the computer’s capacities for interactive, branching or dynamic display, when explicitly used as a medium” (Nelson, 1967:195, as cited in Hammond, 1994)

Incidental learning

“...the accidental learning of information without the intention of remembering that information” (Hulstijn, Hollander & Greidanus, 1996:327)

Incidental vocabulary learning

“The learning of new words as a by-product of a meaning-focused communicative activity, such as reading, listening, and interaction” (Huckin & Coady, 1999:185).

Input

“The potentially processable language data which are made available by chance or by design, to the language learner” (Sharwood Smith 1993:167).

Intake

“A process which mediates between target language input and the learners’ internalised set of rules.” (Chaudron, 1985:206).

Intentional vocabulary learning

“...by definition, is intended learning of vocabulary”. (Koren, 1999)

Long-term memory

“A separate form of permanent memory representation that boosts recall in immediate memory tasks and that is not synonymous with short-term memory” (Hulme et al., 1991:688, as cited in Singleton 1999:151).

Meaning-focused glosses include:

- Basic (and literal) meaning(s) in the form of L2 definitions
- Derived (and figurative) meanings in the form of L2 definitions
- Semantic relations (synonyms, hyponyms, troponyms, etc.)
- Examples of use and some common collocations
- Hungarian equivalent(s)

Memory span

‘The maximum number of items that an individual can recall after they have been presented to him once’ (Evans, 1978: 212, as cited in Singleton 1999: 151).

Multimedia

The term multimedia refers broadly to an integrated delivery system that handles information in different formats: text, still images, sound, music, video and animation.

Short-term memory

“The capacity of the brain to hold information in a kind of immediate-access store for a short period after it has been presented” (Evans, 1978: 334, as cited in Singleton 1999: 148). The duration of storage is estimated between 30 seconds and one minute (Simpson, 1994:76).

Chapter 2: Literature Review

2.1 INTRODUCTION

Chapter two is going to provide an overview of the theoretical background of the study and present the relevant research that has been conducted in the field. It will discuss psycholinguistic processes in second language acquisition making use of the results of cognitive psychology and second language acquisition research.

The chapter will include current theoretical views on the significance of attention and noticing in information processing research, together with the importance of input and interaction in the interactionist framework of second language acquisition research.

It will deal with the role of memory processes in lexical acquisition including the most commonly used models of human memory and ways of enhancing memory skills, which is crucial for L2 vocabulary acquisition and retention. This will be complemented by describing theories on how lexical information is stored in and retrieved from the second language mental lexicon.

Next, theories of vocabulary acquisition will be described comprising the definition of knowing a word, outside factors and learner strategies affecting vocabulary acquisition. It will be followed by the role of incidental and intentional learning in second language vocabulary acquisition.

Another important part of this chapter will discuss the potential of hypertext/hypermedia computer technologies in second language learning and in L2 vocabulary learning in particular. A particularly important section here is the description of recent research investigating the impact of input enhancement and modified interaction through the use of electronic hypertext glosses on L2 lexical acquisition.

The final part of this chapter will summarise research on the functions of form and meaning in the language learner's mental lexicon and in L2 vocabulary acquisition specifying the role hypertext can play in strengthening form-meaning mappings in the mental lexicon.

2.2 PSYCHOLINGUISTIC PROCESSES IN SECOND LANGUAGE ACQUISITION

2.2.1 The role of attention and noticing in SLA

The idea about the significance of noticing originates in Schmidt's (1990) and Hulstijn's (1990) cognitively oriented works, in which they propose that a key factor of success in second language acquisition is noticing. The noticing hypothesis (Schmidt, 1990) states that learners must notice forms in the input to be able to process them fully. It has been theorized that textual enhancement draws learners' attention to forms in written input (Sharwood Smith, 1991). Noticing takes place as a result of paying attention to certain linguistic features in the input, which in turn is to do with consciousness.

Attention is essential for learning, as attention is the necessary and sufficient condition for long-term memory storage to occur, and it is necessary for input to become available for further mental processing. Hulstijn (1990) is of the opinion that "... the more a learner pays attention to a word's morphophonological, orthographic, prosodic, semantic, and pragmatic features and to intraword and interword relations, the more likely it is that the new lexical information will be retained" (Hulstijn, 1990, as cited in Laufer & Hill, 2000: 59).

De la Fuente (2002) refers to Long (1990); Robinson (1995); Schmidt (1990, 1993, 1994, 1995), who all state that comprehension and production are equally connected to the concept of attention in second language development. The role of attention is to notice and convert input into intake.

Having altered his view, Schmidt (1995) maintains that noticed input will become intake irrespective of the fact whether the learner was attending to the linguistic form deliberately or noticed it unintentionally, therefore noticing is a necessary precondition for L2 acquisition. Ellis (1994, 1997), Lewis (1993) and Skehan (1998) all support the importance of noticing in the process of linguistic input becoming intake. Ellis (1994) believes that noticing explains which features in the input are attended to and thus become intake, information stored in temporary memory, which may or may not be subsequently accommodated in the interlanguage system. There are several circumstances that can influence whether input will be noticed by the learner, or it will be left unattended.

2.2.2 Factors affecting noticing

Schmidt (1990) identifies six influences that operate on noticing: frequency, perceptual salience, instruction, processing ability, readiness to notice and task demands.

- Frequency – the more frequently a form occurs, the more likely it is that it will be noticed.
- Perceptual salience – if all other conditions are the same, the more the input stands out in the input string the more probable that it will be noticed.
- Instruction (see Schmidt and Frota, 1986) – instruction must channel learners' attention to parts of input that they would overlook or ignore otherwise.
- Processing ability – There are likely to be individual learner differences in input processing. Good, quick processors tend to notice new forms more easily due to their better working memory qualities including attentional capacity or quicker analytic processes.
- Readiness to notice – It means if the learner has reached the necessary level in interlanguage development, and thereby they are ready or not to perceive the new information (and integrate it into their knowledge system).
- Task demands – Schmidt is convinced that the right kind of task set at the right level and demand may also promote noticing, and thus the whole language learning process.

Robinson (1995), in harmony with Schmidt's discussion of memory processing above, comments that it is in short-term (or working) memory that noticing takes place, since the "spotlight consciousness" (Skehan, 1998: 52) provided by short-term memory is triggered by different influences on noticing. Schmidt (1994) firmly believes that noticing can bring about really good results in language learning only if it is matched with consciousness.

2.2.3 The role of consciousness and noticing in SLA

Schmidt (1990) asserts that there are four aspects of consciousness involved in language learning: intention, attention, awareness, and control. He claims that when learners focus attention on a linguistic unit they do it with the conscious intention of attempting to

understand and memorise it. Schmidt calls consciousness as attention 'noticing'. He believes that noticing and its use of conscious attention is necessary for language learning to occur. Consciousness as awareness refers to explicit knowledge, and to learners' awareness of the knowledge already acquired by them, and consciousness as control expresses to what extent knowledge has been processed by the learner, i. e. to what extent they can dispose over the acquired knowledge. Schmidt contends that noticing does not automatically mean that the linguistic item noticed is also remembered and learnt, but that "... noticing is a necessary and sufficient condition for converting input into intake" (1990:129). Relying on Kihlstrom's (1984) views Schmidt (1990:136) concludes, "... if consciousness is indeed equivalent to the short-term store, this amounts to a claim that storage without conscious awareness is impossible".

After reviewing several empirical studies, Long (1983, 1988) and Ellis (1990) conclude that conscious learning contributes to successful L2 development. Taking this thought further Fotos (1993) states that, on the basis of these results, there must be an interface between learned and acquired knowledge. An earlier proposal of such an interface was put forward by Schmidt (1990) and Schmidt & Frota (1986), in the form of what Skehan (1998:48) calls "the crucial concept of noticing".

Rutherford & Sharwood Smith (1985) use the term consciousness raising in the sense of drawing learners' attention to the formal properties of language. Ellis (1994, 1997) contends that consciousness raising concerns explicit knowledge thanks to which learners may be able to notice particular linguistic features in the input that they are exposed to. "However, a key difference between noticing and consciousness raising is that noticing has supposed implications for language processing and the actual acquisition of linguistic features" (Cross, 2002).

Schmidt (2001) separates 'noticing' from 'metalinguistic awareness' assuming that attention and noticing have to do with the surface structure of the input utterances rather than with any abstract rules and principles learners become aware of in the structure of language. He uses the term 'noticing' in a restricted sense identifying it with such technical terms as 'apperception' (Gass, 1988), 'detection with selective attention' (Tomlin and Villa, 1994), and 'detection plus rehearsal in short term memory' (Robinson, 1995).

2.3 INFORMATION PROCESSING RESEARCH IN SLA

To describe information processing second language acquisition research uses a framework similar to information technology operating with terms such as input, central processing, and output.

2.3.1 The role of input and input processing in SLA

Input has been defined as "...the potentially processable language data which are made available by chance or by design, to the language learner" (Sharwood Smith 1993: 167). Within the research paradigm of input studies, "input" generally refers to "... what is available for going in" and "intake" "to what actually does go in" (Gass & Madden 1985: 3)

Krashen's (1982) Input Hypothesis proposes that the most important thing needed for second language acquisition is a great deal of comprehensible input. Krashen's (1981, 1982, 1985, and 1994) works have been influential in propounding this connection between comprehensible input and SLA. Ellis (1994) also states that target language input acts as the potential starting point for acquiring a second language. He, however, challenges Krashen's original theory stating that comprehensible input facilitates L2 acquisition but it will not guarantee that acquisition will take place. He admits, though, that L2 acquisition cannot be properly explained without taking input features into consideration (1994: 288).

Psychologists and language acquisition scholars following the ideas of cognitive psychology believe that the success of the acquisition and retention of L2 vocabulary depends on the way in which this information is processed (e.g. Craik & Lockhart, 1972; Ellis, 1994; Mondria & Wit-de-Boer, 1991; Schouten van Parreren, 1989; Watanabe 1997).

Laufer & Hilll (2000) question whether acquisition will happen through noticing alone. They claim that the learner needs to apply elaboration strategies for the noticed word to create a memory trace. In reading such elaboration strategy may be trying to infer word meaning from context, dictionary use, finding the word that fits the context best, or fitting the new word into the conceptual mesh of the already known words.

VanPatten (1996) proposes the following three basic principles for input processing: principle one states that

- learners process input for meaning before they process it for form
- learners process content words in the input before anything else
- learners tend to process lexical items before grammatical items in order to get semantic information
- learners tend to process more meaningful morphology before less or non-meaningful morphology

According to principle two, learners can process forms with non-significant meaning only after processing the informational or communicative content of the input. Principle three proposes the ‘first noun strategy’, which states that it is learners’ default strategy to consider the first noun phrase in the sentence as the agent in the sentence. “Learners will adopt other processing strategies for grammatical role assignments only after their developing system has incorporated other cues (case marking, acoustic stress)” (Van Patten, 1996, as cited in Skehan 1998:46-47).

Besides the importance of linguistic input, the significance of interaction is also emphasized in recent SLA research.

2.3.2 The role of linguistic interaction in SLA

The interactionist view of language learning asserts that the modified input learners are exposed to is a crucial element in the language acquisition process (Lightbown & Spada, 1993). It has been found that the process of interaction makes input more comprehensible. It was Long (1983) who named the discourse features witnessed in the interaction of native and nonnative speakers as negotiation. He suggested that interactive input negotiation facilitated comprehension more than the features of non-interactive discourse.

Pica (1994:497) describes interactional input modification as a process in which the “... listener requests message clarification and confirmation and a speaker follows up these requests, often through repeating, elaborating, or simplifying the original message”. In an attempt to justify these claims in an empirical study, Pica, Young & Doughty (1987) compared different conditions of input in a task where subjects had to understand instructions. It was found that the group who could ask for clarifications, and thus clear out potential misunderstandings, understood more instructions than did other groups with no clarification opportunities. One of the commonest ways of interactional input modification is

simplification, which can be further divided into restrictive and elaborative type simplification. **Restrictive simplification** in the field of lexical acquisition means using simpler or higher frequency words for more complicated or rarer ones. The use of **elaborative simplification** is based on enriching the input, which in vocabulary learning means rephrasing the input by using definitions, synonyms, etc.

2.3.3 Interactionist theories of SLA

Having realised the importance of interaction in language learning, researchers put forward various theories that endeavour to explain how a second language is acquired. It was Hatch (1978), who stressed the need to study the nature of the input L2 learners are exposed to together with the interactive features of discourse between native and nonnative speakers. The underlying ideas in these studies are that modified input and frequent interaction with native speakers promote comprehension (see also. Pica et al., 1987). Long (1981, 1985) proposes his interactional hypothesis, which claims that negotiated interaction can facilitate acquisition. Long's (1996:451-452) updated version of the interaction hypothesis states that "... negotiation of meaning ... facilitates acquisition because it connects input, internal learner capabilities, particularly selective attention, and output in productive ways". Negotiation means information restructuring and modification, which takes place with the aim of enabling learners to understand information that is beyond their level of competence (De la Fuente, 2002).

Cognitive accounts of the SLA process aim to explain and model the internal, mental processes. A most generally accepted interactionist cognitive model of second language acquisition is offered by Gass (1988) and Gass and Selinker (1994).

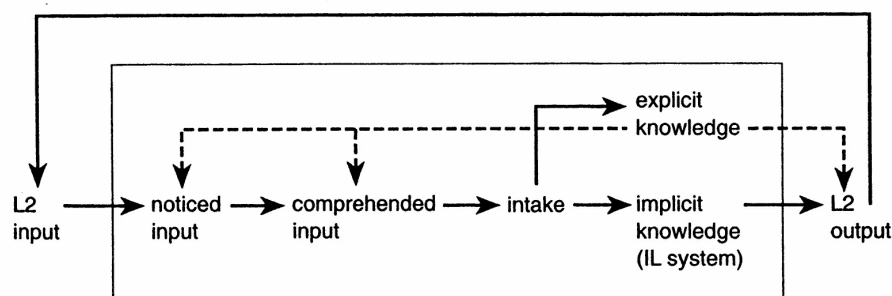


Figure 1. A consensus model of the cognitive processes in SLA (Ellis, 1994:347)

According to this model learners receive input in the form of target language words, some parts of which are not noticed by them for various reasons. It is only the apperceived (i. e. noticed) part of the input that is going to be processed further. Following from this Chapelle (1998) suggests that instructional materials should be designed in a way that they include features that instigate learners to notice important aspects of the linguistic input. At the next stage of the model a certain part of apperceived input becomes comprehended. Chapelle reminds, however, that comprehending the message can mean understanding only semantic aspects without taking syntactic features into consideration. She contends that the input that the learner was subjected to will turn into intake (and thus enrich the learner's linguistic knowledge system) only after a combination of semantic and syntactic processing. After integrating input into the learner's implicit or explicit knowledge system, the learner comes forward with their own output, which a) forces the learner to develop their interlanguage through using the L2 linguistic system; b) elicits further input from interlocutors. This further input may frequently include corrective feedback, which helps the learner test and reformulate their hypotheses about L2. Chapelle refers to Long (1996) who calls this process as **negotiation of meaning** believed to promote second language development.

Ellis (1994) states that the linguistic items noticed may or may not be understood. Some of the noticed features may contribute to input which is comprehended, and this may in turn lead to intake. In other words, noticed and comprehended input may add to the learner's already existing store of linguistic knowledge. It may increase knowledge about the language, or the learner's current state of interlanguage. He asserts that intake can only be used automatically after it has been successfully assimilated into the learner's existing system of knowledge. The intake process has been defined by Chaudron (1988:206) as "... a process which mediates between target language input and the learners' internalised set of rules". VanPatten (1990) differentiates between comprehension-based and processing-based approaches to input. The **comprehension-based approach** does not focus on form as its main aim is to extract meaning from the input, while the **processing-based approach** concentrates more on how to focus on the various cues, as well as on attention control during comprehension, VanPatten also calls for the importance of training language learners how to attend to form-meaning links by noticing the relevant cues in the utterances.

Hulstijn (2001) argues for an interactive approach to SLA in the heuristic, explorative sense. Such an approach should take into account the following factors:

- learning mode (implicit vs. explicit)
- input characteristics (frequency, saliency)
- preknowledge (L1 and L2 linguistic and metalinguistic)
- linguistic domain (below vs. above the lexical level)
- contrast between L1 and L2 (high vs. low)

Barcroft (2002) states that studies focusing on the interactional modifications happening when there is a communication problem in conversation demonstrate that interactional modifications can help to make input more comprehensible, which, in turn, assists in language learning.

Besides the quality of linguistic input and the availability of interaction there are other factors influencing the success of second language acquisition.. Memory processes, for example, have been in the centre of interest of cognitive psychology investigating factors facilitating or hindering the encoding, storing and retrieving of lexical information.

2.4 THE ROLE OF MEMORY IN LEXICAL ACQUISITION

Memory is the retention of, and ability to recall, information, personal experiences, and procedures. One of the most popular models of memory sees memory as a present act of consciousness, reconstructive of the past, stimulated by a retrieval cue (Schachter, 1996: 213). Learning cannot be imagined without memory processes as learning itself means retaining something of what was done in the past and use the retained knowledge to decide what to do or what is done in the present (Ibid.). It is hoped that we can optimise learning (both encoding and decoding information) by studying memory processes.

2.4.1 Models of human memory

Schachter (1996:207) asserts that there is no single model of how memory works. However, he claims that a good model for how memory works must be consistent with the subjective nature of consciousness and with what is known from scientific studies". There are

three basic memory models that are generally referred to in the literature: the Atkinson-Shiffrin Model, the Levels of Processing Model and Endel Tulving's model.

2.4.1.1 The Atkinson-Shiffrin Model

According to the Atkinson-Shiffrin Model (1968, 1971) there are three memory types: sensory memory, short-term memory and long-term memory.

a) Sensory memory

Sensory memory stores information in the brain for only a fraction of a second, just long enough for a little part of it to be apperceived for longer storage. Sensory memory refers to sensations that take place immediately after perception. The function of sensory memory is unknown, but it probably determines what will be transferred to the next phase of the memory process" (Lezak, 1988, as cited in Simpson, 1994: 76).

b) Short-term (working) memory

Short term memory keeps information in the brain for up to twenty-thirty seconds. It can hold approximately six to nine lexical items at a time, which may turn into long-term memory through rehearsal. In the case of more than seven information chunks, new items are likely to displace previously obtained information. Short-term memory is also referred to as working memory, which has a central component responsible for allocating a limited amount of attention which, and a component dealing with phonological and visual rehearsal (Gathercole & Baddeley, 1993). "In short-term memory, electrical impulses in neural committees cause no permanent change in either the biochemical organization or synaptic connections with groups" (Simpson, 1994: 76). Information in short-term memory can be transferred into long-term memory through maintenance rehearsal or elaborative rehearsal. **Elaborative rehearsal** provides a deeper semantic processing through organising information into categories, relationships, conceptual hierarchies, semantic networks, schemas and scripts, whereas **maintenance rehearsal**, which involves rote recycling of new information is less effective (Ibid).

According to Anderson (1990) working memory also contains the currently activated records from the long-term memory capable of interacting with newly encountered materials. There are various views about how working memory interacts with input, and how much of

the input is processed directly by long-term memory utilising contextual knowledge, but “... the importance of working memory under limited capacity conditions is indisputable” (Skehan, 1998: 45).

c) Long-term memory

Long-term memory, which is believed to have an unlimited storing capacity, is a form of memory where the information is stored longer than short-term memory. By most definitions the duration of short-term memory is somewhere between 30 to 60 seconds, and beyond this limit information can be retained by means of rehearsal and recycling. “Long-term memory involves permanent changes in the biochemical organization and synaptic connections of neural groups and may be represented by plastic changes in the brain” (Taylor, 1979, as cited in Simpson, 1994:76).

2.4.1.2 Levels of Processing Approach

Craik & Lockhart’s (1972) Levels of Processing Approach is based on the theory that there are 3 stages to memory: encoding, storage and retrieval.

a) Encoding information into memory

During encoding, which is the most shallow level of processing, a memory code is formed by apperceiving the information through the human senses. One of the key factors here is attention, i.e. focusing awareness on a narrowed range of stimuli. Another key factor is the quality of encoding information.

The levels of processing theory proposes that memory length depends on the **depth of processing**. Meaningful rather than superficial processing of information results in deeper processing, and therefore in better retention. The three types of encoding are

- structural encoding of something through its physical qualities, (e. g. case encoding by remembering capitalisation)
- phonemic encoding means memorising through sounds, and
- semantic encoding makes use of meaning in memorisation.

Empirical investigations demonstrated that semantic encoding provided better memory results than either structural or phonemic encoding (Craik & Lockhart, 1972).

Anderson (1990) notes that when information is committed to memory, elaboration with additional information may facilitate recall by adding additional retrieval paths. The more a learner manipulates a piece of information in the input the more elaborate the encoding will be. Elaborations can lead to better memory in at least two ways. First, they provide redundant retrieval routes for recall, and a second way in which elaboration aids memory is by helping individuals to infer what they can no longer actually remember. Both of these processes can be said to work because elaborations increase the redundancy with which information is encoded in memory. **Redundant elaboration** means that additional information is encoded in memory, which provides more paths for retrieving and bases for inferring the information that was to be remembered. Anderson asserts that a number of experiments illustrate that a more fully elaborated material results in better memory (e.g. Craik & Lockhart, 1972). These experiments prove that by increasing the depth of processing information through various manipulations will result in better memory. Depth of processing is best explained as the number of elaborations generated by the learner and consequently referred to as “**elaborateness of processing**” (Anderson 1990:183). Anderson claims that the most effective elaborations are subject-generated, as they “... reflect the idiosyncratic constraints of the particular subject’s knowledge” (Anderson 1990: 185).

Schachter (1996) firmly believes that most lost memories are lost because they were not elaborately encoded. He claims that our perception is also filtered by our interests and needs as a result of which some of the potential sense data will not be processed, and, as a result, much of the processed information is likely to be forgotten.

b) Storing information in memory

Storage is the ability to maintain information over time. Studies have shown that there is no significant correlation between the subjective feeling of certainty a person has about a memory and the memory being accurate (Loftus, 1979).

Long-term memory can be reflexive and declarative. **Reflexive memory** has an automatic quality independent of awareness, consciousness and conscious processes” (Kupfermann, 1991, as cited in Simpson, 1994:76). **Declarative memory** depends on conscious and cognitive processes: it involves processing existing pieces of information stored in the brain by reconstructing past events or episodes into a cognitive framework (Ibid.). Reflexive and declarative memories are not exclusive, for each builds on the other.

Learning for the most part, involves using both memory processes “... to produce biochemical alterations among neural groups” (Simpson, 1994:76).

c) Retrieving information from memory

Beck (1987) terms retrieval as the ability to get the encoded information back in a relevant context when required, by searching the memory. Only those pieces of information are likely to become part of the long-term memory that have developed strong traces through special attention or that are recalled for reexamination in a few seconds after perception. The strength of the first impression depends not only on the intensity of perception, but also on the person's feelings, thoughts, and the significance of the information to that person. Such significance is defined by the relationship of the new piece of information to other important or less important memories. The more vivid or unique the sense perception, and the more emotional reactions or interest it creates, the more intensely it is likely to imprint in the person's memory.

2.4.1.3 Tulving's Memory Model

Endel Tulving's (1986, 1993) model of human memory proposes three types of memory: semantic, episodic and procedural. Tulving (1986) argues that knowledge of the meanings of words and concepts is stored in a distinct memory system termed **semantic memory**. Knowledge of concepts and language seems less tied to specific contexts, more stable, and less prone to forgetting than episodic memory. In contrast to **episodic memory** (referring to things that have been seen, heard or done), which may be chronologically dated, semantic memory is not necessarily tied to the time when it was acquired. Memory deficits such as amnesia suggest that semantic and episodic memory are separate systems because amnesiacs mainly forget personal information such as their name and their family's faces, but retain general knowledge. **Procedural memory**, on the other hand, is apparent when retention is exhibited on a task that does not require intentional remembering.

Anderson (1990) gives account of an empirical research study in which subjects could not remember consciously that they had seen particular words but they were nonetheless helped in their perception of the word by the prior exposure. Anderson refers to such memory

as implicit (or procedural), as opposed to explicit (or declarative) memory, which we are conscious of and can declare.

2.4.2 Ways of enhancing memory skills

Sharifian (2002) notes that the major concern of language instruction is how to enhance learners' memory skills. Some of the most popular mnemonic strategies used for input enhancement and elaborate encoding are pegs, loci, first-letters, and keywords. Pegs are well-internalised items upon which the new words can be "hung". The method of loci involves connecting new information to parts (called drops) of a well-known, familiar location by associating them with the drops and retrieve them during a "mental sightseeing". The first-letter method involves making acronyms from the first letters of the words to be learned. Keywords link an L2 word with an L1 word that sounds alike in some way. The linkword method links words in both the first and second language to construct a picture in the mind (Williams & Burden, 1997:17)

Oxford (1990:38-43) offers a detailed classification of direct memory strategies, which she names "CARE" after the initials of the subgroups. She differentiates between four sets of such strategies:

- Creating mental linkages, which includes grouping, associating/elaborating, and placing new words into context;
- Applying images and sounds, which she further divides into using imagery, semantic mapping, using keywords and representing sounds in memory;
- Reviewing well, which implies structured reviewing; and
- Employing action, which she classifies into using physical response and sensation, and using mechanical techniques (pp. 38-43).

Referring to research results Oxford (1990:40) contends that despite the useful and powerful nature of such strategies, students "... rarely report using these strategies" in vocabulary learning.

Amer (2002) asserts that using semantic mapping and semantic fields is particularly useful in memorising new lexical units. The 'semantic field' theory suggests the lexical units in a language are best treated not in an isolated unstructured way, but rather grouped into interrelated networks. Amer states that the use of link-based semantic fields and semantic

maps is particularly useful in vocabulary learning. It was found that semantic grouping of vocabulary items proved to provide better long-term retention than list or contextual learning. Amer also claims that “... semantic interrelationships among words can not be acquired incidentally through reading. They need systematic instruction” (Amer, 2002).

Jones (1996) lists three main principles in connection with memory enhancement techniques:

- involving all the sensory modalities;
- providing interesting or useful information;
- linking new information to something stored in memory.

Jones especially emphasizes the importance of such associations (based on similarities and differences) in memorising new lexical items. Jones contends that information can be stored for quick recall by using “... well established pictures in the memory bank to link new information”. These pictures provide a storage area for new information and connect the word to be stored by triggering strong electrical impulses.

Anderson (1990:198-199) relates of an experiment in which the subjects using associative networks by organising words to be learned into meaning hierarchies showed “an enormous advantage” in retrieving words compared to the subjects using the same words in random combination.

Sharifian (2002) lists several factors that are likely to influence the formation of memories:

- *The generation effect*: learners remember completely or partially self-generated lexical items (e.g. semantic or categorial associates, synonyms, antonyms, or rhymes to the target words).
- *The isolation effect*: words to be learned are remembered better when the new item semantically stands out for its irrelevance to the other items in a semantically homogeneous set of words.
- *The time-of-the-day effect*: surface linguistic forms are recalled better in the morning, and long-term semantic features, which are mainly retained in long-term memory, are recalled better in the afternoon.
- *The serial-position effect*: words that are in the middle of a list are hardest to remember. The words at the end of the list are remembered more easily (recency effect), and those at the beginning of the list (primacy effect) are the easiest to recall.

- *The spacing effect*: spaced repetition yields better retention of lexical items than massed repetition.
- *The modality effect*: due to prosodic features, auditory presentation of target words provides much better retention than visual presentation. Dual modality presentation of target vocabulary has better retention results than single modality presentations.
- *The self-reference effect*: due to the idiosyncratic cognitive schema applied by each learner, words with reference to the self are more easily learned and remembered better.
- *The bizarreness effect*: words with bizarre, atypical referents are recalled more easily due to the learner's increased cognitive effort.
- *The encoding context effect*: thinking back to the original physical and emotional context in which the words were learned facilitates recall. Therefore, if L2 lexical items are learned and tested in the same or very similar context, learners' retention performance is likely to be significantly enhanced.
- *Processing difficulty effect*: although processing difficulty slows down comprehension, due to the enhanced cognitive effort involved in reprocessing the input, it improves the retention of these lexical items.

Sharifian summarises the educational implications of the above findings as follows:

In fact, learning is an umbrella term covering various aspects of perception, comprehension, storage, and retrieval. Cognitive and neurological research shows that these aspects of learning do not necessarily share all their sub-processes. For instance, while comprehension may require simplification and integrating of to-be-learnt materials with the already existing schemata, retention may be enhanced by presenting materials within a dissimilar context or by increasing the amount of cognitive load on the part of the learners. For learning to take place, after all, comprehended materials should be represented and retained in the long-term memory (2002).

In order to be able to find the best possible way of vocabulary acquisition, besides finding ways of enhancing memory skills we also need to know how the encoded words are stored in the mind.

2.5 THE MENTAL LEXICON

The way words are organised in the mind is referred to as the ‘mental lexicon’ (Aitchison, 1987). Activating and expanding second language learners’ mental lexicons is believed to be the key to success in second language vocabulary acquisition. Finding out about the structure and work of lexicon-internal associations is important because, as Anderson (1990) states, it is much easier to learn organised materials than randomly arranged pieces of information. However, as Harrington & Park (1997) point out, it is still unknown whether the explicit modelling of these links during the learning of novel lexical items can facilitate later recall of those items.

2.5.1 Storing vocabulary in the mental lexicon

Research shows that words in the mind are “... linked together in a gigantic multi-dimensional cobweb, in which every item is attached to scores of others” (Aitchison, 1987:82). From word association experiments used to show the organization of the mental lexicon, there have been some suggestions as to how words link together. According to Fraser (1999), the mental lexicon is phonologically arranged and accessed by two networks -- phonological and semantic. Channell (1988) also suggests that the L1 and L2 lexicons within the same speaker are clearly linked phonologically, semantically, and associationally. The question here is how exactly these lexical networks are organized. Aitchison (1987) points out that there are two types of links which seem to be particularly strong among native speakers of English: **paradigmatic links** (connections between co-ordinates) and **syntagmatic links** (collocational links). Aitchison also mentions two more links which are important, although these occur less often; they are **superordination** and **synonymy**.

Assadollahi, & Rockstroh (2005) explored neuromagnetic responses of the brain evoked by superordinate and subordinate semantic categories of written words. They found that features belonging to lexical entries are processed hierarchically. Processing subordinate semantic categories takes much longer (300-550 ms brain response time) than processing superordinate features (100-150 ms brain response time).

Sperber & Wilson (1998) note that, in principle, there is either an exhaustive or partial mapping between mental concepts and public words. In the case of partial mapping some concepts have no corresponding word. The mapping between words and concepts may be one-to-one, one-to-many, many-to-one, or a mixture of these. They warn, however, that in reality "... the idea that there is an exhaustive, one-to-one mapping between concepts and words is quite implausible".

It has been shown by research that a set of concepts that belong to the same semantic field in the mental lexicon there is one that stands out. It was found that this concept is generally identified, stored and retrieved more successfully than the others (Akhutina, 2003). These basic, source or primary concepts, which Rosch et al. (1976) call prototypes or generic terms, are most frequent and convenient, and therefore learnt by children earlier than more specific terms.

McCarthy (1990) suggests that there lies a big difference in word association among individuals. Further, not only does the mental lexicon vary from person to person, but also it is always changing. He demonstrates his point as follows:

The mental lexicon is never static: it is constantly receiving new input which has to be integrated into the existing store. Not only do new words come in, but information about existing words is added too. This is a more obvious phenomenon for the learner and the L2 lexicon, but it is also true of L1. The webs of meanings and associations constantly shift and re-adjust; new connections are woven, and old ones are strengthened (McCarthy, 1990:42).

Recent developments in cognitive psychology enabled researchers to provide some sort of a framework describing the mental processes involved in acquiring, storing and retrieving information. Long-term memory was conceived as storing information as interconnected networks rather than as isolated elements. Using the information in long-term memory (LTM) can facilitate the understanding and retention of new information through the provision of "... related information or schemas in which the new ideas can be organized" (O'Mally, Chamot, & Walker, 1987:289). When trying to integrate the new information into their knowledge system, learners try to find related information usually stored in schemas in their declarative LTM in order to be able construct new knowledge. At early stages of proficiency L2 learners tend to capitalize on their existing L1 knowledge

The meaning of a word resides in the so called mental lexicon. Most linguists agree that the mental lexicon contains information about the semantic, syntactic and phonological

properties of each lexical entry. However, they tend to differ about what information gets into the lexicon and how it is structured and processed (Elman, 2004).

The issue how grammatical features of a lexical item contribute to its processing and representation in the mental lexicon has been debated extensively in the last two decades.

Studying semantic associations Rosch (1978) found that learners consider certain words more basic than others, which made her create her Prototype Theory. Her findings also imply that learners do not usually treat words in the lexicon in isolation, but rather as a network in which the strengths of connections between the items vary systematically, which differs significantly from the organisation of the print dictionary. An interesting issue about storing words in the mental lexicon is whether inflexion affixes, which are controlled by syntax and derivational affixes in English words are stored separately, or together with the root form of the lexical unit in the mental lexicon. Butterworth's (1983) Full Listing Hypothesis, proposes that only new, unknown words are parsed morphologically, but in general words in the mental lexicon are stored morphologically preassembled. Katamba (1994) agrees with Hankamer (1989), who refuses the Full Listing Hypothesis stating that morphological parsing is often needed in English in spite of it being an isolating language. Butterworth's (1983) Full Listing Hypothesis maintains that words are stored in morphologically complete forms.

Taft & Foster's (1975) Prefix Stripping Model (extended to all inflectional suffixes by Stanners et al., 1979) of the mental lexicon, proposes that word roots and prefixes are stored separately, and first the prefixes are identified by morphological parsing, and then the word root is found in the mind. Some years later, in 1979, Taft put forward the Basic Orthographic Syllabic Structure (BOSS) model, which takes both orthographic and morphological factors into consideration. At about the same time, Stanners, Neiser, Hemon, & Hall (1979) proposed that inflections do not have separate memory representations from their base verbs, but irregular past tense words and derivatives do. Aitchison (1987) concludes from previous morphological processing experiments that prefixed words can be accessed by finding their stems. She also claims that irregular forms are fully listed, regular inflectional suffixes are listed separately and assembled during speech, but derivative forms are listed 'ready-made' with prefixes and suffixes. The significance of speakers' capability to separate affixes from the root is that it may help learners remember lexical units by linking up words with similar morphemic structures. Based on their observations on acquired dyslexic subjects, Caramazza,

Miceli, Silveri & Laudanna (1985) proposed that root morphemes are represented separately from affixes and function words.

Taft & Forster (1975) proposed the prelexical parsing hypothesis, according to which that prefixed words are accessed through analyzing their constituent morphemes, and the stem is accessed after affixed words have been stripped of their affixes. Taft (1979a) claimed that words with the same affixes are stored together, and in his other work He proposed the Basic Orthographic Syllabic Structure (BOSS) stating that the organization of the mental lexicon was based on the orthography of the words, which theory did not find many supporters. Stanners, Neiser, Hernon, and Hall (1979) claimed that inflexions are stored together with the root forms, but derivatives and irregular verb forms are stored separately. Based on the observation of dyslexic patients Caramazza, Miceli, Silveri, & Laudanna's (1985) proposed that root morphemes are stored and processed separately from affixes. Similarly, studying an aphasic person, Micely & Caramazza (1988) claimed that both inflexional and derivational affixes are processed independently of the base forms.

In his interaction activation model Taft (1994) discusses lexical recognition delays due to reasons of morphological origin, such as pseudoprefixation pseudoinflexation, and he points out that automatic prefix and suffix stripping hinders the speed and reliability of accessing lexical items. In Taft's (1994) parsed model of storage and access is based on single morphemes, each of which is listed separately in the lexicon.

Marsden-Wilson, Tyler, Waksler, & Older (1994) maintained that words are decomposed when there is a semantically transparent relationship between the root form and the affixed word. Hagiwara (1996) proposed that only regular prefixes are decomposed from the stem. Following Katamba's (1990) classification Vannest & Boland (1999) found that idiosyncratic structure changing (so called Level1) derivational affixes to be intact in the mental lexicon, whereas phonologically more neutral, and also more productive (so called Level 2) derivational affixes may be stored separated from the roots. Waksler (1999) found that there were some entries listed as whole words and others listed as individual morphemes, which support the dual-listing hypothesis.

There exist single- and dual-system models of memory representation. Single-system connectionist models argue that the processing and learning of both the lexical items and the grammatical rules take place through the activation of interconnected units of a single

system. The connections formed between these units depend on the frequency of exposure to a particular lexical item (Dell, 1986; Seidenberg & McClelland, 1989)

Tsai (1996) reports that exploring lexical organisation using repetition priming experiments found that morphologically related words are stored together in the mental lexicon, which shows some similarity between the print dictionary and the mental lexicon.

Following a neurocognitive perspective Ullman (2001) sets up a dual (declarative/procedural memory) framework that differentiates the mental lexicon and the mental grammar. The mental lexicon stores idiosyncratic information specific to a given word, which includes arbitrary pairings of sound and meaning, irregular but obligatory verb arguments, irregular word forms and also more complex, highly idiomatic, non-transparent phrases or sentence. Regularities governing the production and comprehension of complex lexical forms constitute the mental grammar. Ullman claims that the mental lexicon depends on declarative memory whereas the mental grammar depends on procedural memory adding that the two memory types are rooted in two different parts of the brain. Declarative memory, which is associative by nature, is involved in the learning of facts (semantic knowledge) and events (episodic knowledge) as well as sounds and word meanings (lexical knowledge).

The successful retrieval of a morphologically complex word form depends on the parallel activation of the declarative and procedural systems. The declarative system sends a continuous signal to the procedural memory, which, in the case of finding an irregular, idiosyncratic form blocks the operation of the procedural memory from finding a regular form for the lexical item in question. In dual system memory models regular forms are separated into stems and stored separately, whereas irregular forms are stored (and retrieved) in one piece. The single memory representation of irregular forms requires less mental effort than the real-time composition of stems and affixes in the case of regular forms, which accounts for weaker working memory performance for regular than irregular word forms (Ullman, 2001).

Measuring the initial stages of word processing Fiebach et al. (2002) found fMRI evidence to support dual-route models of visual word processing. Dual-route models claim that during word reading there is a fast route to the mental lexicon which quickly maps the witnessed orthographic features onto the stored word representations. Parallel with this, another slower, nonlexical pathway converts graphemes into phonological information. This latter route renders the reading aloud of pronounceable nonwords possible. Perfetti (1999) argues that both graphemic and phonemic information types take part in word identification.

For low-frequency words, however, graphemes may be converted to phonemes before the lexical item is identified. This was supported by their fMRI examination, where low-frequency words and nonwords brought about greater activation in the regions of the brain responsible for grapheme-to-phoneme conversion than their high-frequency counterparts.

Ullman (2004) also states that women tend to outperform men in remembering verbal information; women memorise complex forms in declarative memory, while men tend to use procedural memory and compose words from constituent elements (i.e. root and affixes). He also claims that, due to the attenuation of procedural memory as a result of reduced estrogen and raised testosterone levels, grammar is more difficult to learn after puberty than lexis.

Gaskell & Dumay's (2003) results show that the integration of new words into the mental lexicon is a lengthy process: while phonological information is learnt quickly, it takes a longer time for the lexical item to fully integrate. They claim that a new lexical entry is created on the basis of an episodic memory trace which is then further abstracted and consolidated to get integrated with existing knowledge. Church & Schachter's (1994) findings suggest that a single exposure to a new word results in a phonological trace. Church & Fisher's (1998) research results complement this by stating that such quick phonological encoding is typical of vocabulary acquisition from childhood through adulthood.

In a study aiming to prove that incidentally learned sublexical phonological knowledge can affect short term memory, Majerus, et al. (2004) found a link between phonological long term memory, and short term memory. They claim that STM depends on the temporary activation of LTM traces.

Contrary to Groot & Keijzer (2000), who concluded that vocabulary that is hard to learn is easy to forget, Schneider, Healy & Bourne (2002) found that hard conditions of learning may slow down the learning process, but the vocabulary learnt in this way shows less forgetting. Anderson (1990) further developed Craik & Lockhart's (1972) model of the elaborateness of processing hypothesizing that the more interconnections or associations are provided and when the target word is analysed more extensively and elaborately, the better the retention will be. The combination of contextual guessing and definitional information provided in a dictionary have proven more effective than either of them in isolation (Grace, 1998).

Chen & Leung (1989) examined three models of bilingual memory representation. The a) word-association and b) concept mediation models suggest a lexical level of representation

that stores the word forms and a conceptual level that stores word meanings. According to both models L1 and L2 words are located in separate lexicons, whereas concepts (believed to be stored in non-linguistic forms) are located in a single common system that both L1 and L2 share. The basic difference between the two models is that according to the word association model L2 words only gain access to the conceptual system in an indirect way, only through the mediation of L1. The concept-mediation model, by contrast, directly connects the L2 form to the shared representations in the conceptual system. Combining the two aforementioned models, the third, developmental model proposes that the word association model is valid for learners with relatively low knowledge of the L2, and the concept-mediation organization is suitable for learners with a higher level knowledge of the L2.

Nagy & Herman (1984) maintain that word learning is not about learning synonyms or definitions, but having to learn new labels for already known concepts, and fitting them into schemata. They firmly believe that the task of L2 instruction is to provide as rich and detailed information as possible to connect the new lexical item to already existing knowledge.

Crow (1986) also claims that the greatest problem for L2 learners is not the acquisition or redefinition of concepts, but rather learning the new labels attached to familiar concepts in L2. He warns that the still frequently used “memorizing word lists” rote learning technique is a most ineffective way of using one’s cognitive facilities. By having to study the meanings of decontextualized, discrete vocabulary items, learners face an enhanced challenge of integrating them into their appropriate contexts, which in turn hinders retrieval. According to Crow (1986) a genuinely receptive vocabulary task presupposes the knowledge of the semantic field that the word belongs to, and the at least sentence-level contextualization of the lexical item in question.

“In cognitive theory, nodes in declarative memory are based on meaning rather than on a direct replication of language-specific structures or word sequences” (O’Mally, Chamot, & Walker, 1987:292). It has been long debated whether the semantico-syntactic features (lemma) of a word and its morpho-phonological forms (word form) represent different levels. It has been found that semantic information was processed in the left inferior frontal areas of the brain whereas word form processing was reported in Broca’s area (Longoni et al., 2005).

2.5.2 Retrieving vocabulary from the mental lexicon

As to how lexical items are accessed in the mental lexicon Seidenberg (1995), proposes functional architecture-style models and connectionist models. These two basic models are quite different as to how lexical knowledge is represented and processed. The functional architecture-style models, which are based on the dictionary metaphor, propose that recognition of a word means total access of its entry in the mind in two stages (Levelt, 1993). Following this approach Aitchison (1987) offers the Spreading Activation Model according to which at first a very broad meaning area is approached activating a lot more words than actually necessary. This broad target semantic field is then narrowed down to the word that fits the given situation best. Connectionist models, on the other hand, disagree with the dictionary type mental lexicon, and propose that word knowledge is only partially activated (Seidenberg, 1995) and entries are accessed through a process of activation spreading along their interconnections. Different vocabulary entries in the mind “... require varying amounts of activation, so it will be easier to recall some words than others” (Paradis, 1997, as cited in Hulstijn 2001:260). Connectionist theories are supported by the empirical evidence that frequently used words seem to be more active. As they are always available, they are easier to recognise. “Numerous studies have shown lexical access and word retrieval to come about faster for high-frequency words than for low-frequency words” (Balota & Chumbley, 1984, 1985, as cited in Lotto & De Groot 1998:40).

Aitchison (1987) states that the rhythmic pattern of words as well as the sounds at the beginning and at the end of words are more deeply engraved in the mind, which phenomenon is called the ‘bathtub effect’. She speculates that words with a similar rhythmic pattern, a similar beginning and ending seem to be grouped together, which may aid their recall but it may also hinder or block it. Lotto & De Groot (1998) also suggest that, due to the similarity of form, cognates have a shared representation in the mental lexicon, whereas noncognates are represented separately from one another in the memory.

Besides the storage and retrieval mechanisms, some of the most important research issues in this field have been the factors affecting L2 vocabulary acquisition including the role of context and reading comprehension.

2.6 THEORIES OF VOCABULARY ACQUISITION

Since vocabulary has a central role in language, it is vitally important to the second language learner (Zimmerman, 1997). The importance of vocabulary knowledge in second language acquisition has been increasingly recognized (Rodriguez & Sadoski, 2000). During the last decades there has been a growing interest in second language vocabulary acquisition, and consequently a range of theories emerged in lexical semantics, the mental lexicon, or the ‘lexical approach’ in English teaching. Zahar, et al. (2001) note that a number of important publications investigating second language vocabulary acquisition, processing and storing have appeared recently, among which they cite Huckin, Haynes, & Coady (1993), Huckin & Coady (1997), Nation (1990), Schmitt & McCarthy (1997), Singleton (1999), Schmitt (2000), special issues of journals, (including *The Canadian Modern Language Review*, Harley, 1996; *Second Language Research*, Meara (1995), and *Studies in Second Language Acquisition*, Wesche & Paribakht (1999), or the VARGA website thanks to the efforts of Meara. They also remind the reader, however, that several basic questions about second language vocabulary acquisition have still remained unanswered, which has limited L2 vocabulary pedagogy (Singleton, 1997).

Waring (2002) reminds that modelling vocabulary development is a complex task due to the fact that it is a “multi-faceted phenomenon” that we know very little about. Even though there have been many theories of vocabulary acquisition, most researchers agree that vocabulary acquisition involves a continuum of development that the learner moves along progressing from receptive to productive vocabulary knowledge situated at the two ends of the continuum.

2.6.1 Factors affecting vocabulary acquisition

There has been extensive research concerning the various factors that may affect the success of vocabulary acquisition. Palmberg (1987) argues that growth in L2 vocabulary acquisition and advance in second language acquisition in general are governed by the same factors. He cites Levenston (1979:151), who names the following factors

- features of L2
- features of L1 (together with L3, L4, etc.)

- learner's characteristics (e. g. personality, motivation, attitudes and previous knowledge)
- features of the learning situation (especially input factors).

In psychological research there is a lively discussion taking place as to what factors influence the storage of words in the long-term memory and which can help strengthen our learning of vocabulary. Five factors in particular are named:

- Frequency
- Depth of cognitive processing
- The possibility of working with webs of associations
- Variation in the form of presentation
- Salient features in the word. (Zahar et al. 2001).

Hazenberg & Hulstijn (1996:159) suggest that syllabus designers should use such objective criteria as frequency (calculated from a representative 'valid' corpus), range, availability, and familiarity of the target vocabulary.

Lotto & De Groot (1998) investigated the roles of learning method, word frequency, and cognates status in vocabulary acquisition. They found that the adult beginning-level students of Italian performed better when using a bilingual word list, than when providing the target word and the picture of its referent. The results were better when the test tasks exactly replicated the study task than when they did not. It was also observed that high-frequency words and cognates were mastered more easily.

De Groot & Keijzer (2000:8) looked at the significance of word concreteness, cognate status, and word frequency in foreign-language vocabulary learning and forgetting when using the paired-associate learning method. They tested both receptive and productive skills and also found that

- word frequency had hardly any effect on performance;
- cognates and concrete words were easier to learn and remember than noncognates and abstract words;
- receptive tests yielded better results than their productive counterparts.

In their study assessing the effectiveness of monolingual, bilingual, and "bilingualised" dictionaries in the comprehension and production of new words Laufer & Hadar (1997) found

that learners using **bilingualized dictionaries** performed better than their peers on both receptive and productive tasks, irrespective of their proficiency levels. “This suggests that the combination of the monolingual information containing a definition and examples with a translation of the new word into the learner’s mother tongue tends to produce the best results” (Ibid.:195). Laufer & Hill (2000) also show that when both L1 and L2 are used, it leads to good retention, because in this way students attend to new information more carefully (notice, elaborate, process better) than when they look up the word only in one language. They state that “... retention is determined by the way in which new words are processed, whether the learning is intentional or incidental.” (Laufer & Hill, 2000;71).

Bogaards (2001) found that completely new single-word units are more difficult to learn and retain than multi-word units with the same meaning, but with a form that is composed of familiar words. Besides the long-term retention of transparent multi-word units with already familiar constituents also proved to be much better.

Craik & Tulving (1975) claim that vocabulary acquisition and long-term retention depend on the richness of encoding. According to N. Ellis (1994) and Hulstijn (1992) it is the amount of cognitive effort during the processing of unfamiliar words that matters. Many input-based studies of lexical L2 learning rest on the assumption that the readers' motivation to comprehend a text triggers the processing of unfamiliar lexical items. Ideally, this may then lead to further processing and integration of new words into the mental lexicon.

Need, along with search and evaluation, is a central component in the construct ‘involvement load’, upon which, Laufer & Hulstijn (2001) and Hulstijn & Laufer (2001) claim lexical acquisition and retention may depend. Involvement load is a construct that describes the motivational and cognitive dimensions of a task, specifically as it affects the processing of individual words. It is based on the belief that deeper and more elaborate processing of words will increase retention. Learners' need for words may focus attention on relevant information in future input or may encourage them to review previous input. Retention of words may be enhanced further when learners reformulate or elaborate the semantic information of a new word (Rott & Williams, 2003).

Laufer & Hill (2000) refer to Chun & Plass (1996, 1997); Hulstijn, Hollander, & Greidanus (1996); Knight (1994); Luppescu & Day (1993); Lyman Hager, Davis, Burnett, & Chennault (1993); Mondria (1993), whose investigations showed that L2 vocabulary acquisition depends on attention and the quality of information processing. Therefore, these

researchers argue that tasks that direct learners' attention to the target words (e. g. the use of dictionaries or glosses) will favourably influence both acquisition and retention of unknown vocabulary. De la Fuente (2002:96-97) also emphasizes the importance of paying attention and noticing the new material in the input in order to acquire new words. Negotiating input by repeating and restructuring forms, enables learners to notice new words and "... see them as a gap in their linguistic knowledge".

Henriksen (1999) notes that some words are salient in themselves, for example because they have a certain sound combination, stress pattern, or spelling. Some words appeal, perhaps, by 'sounding funny', or by conjuring up a particular visual image in the mind of the language learner. Such words are often remembered better.

The strategies students apply also considerably influence the effectiveness of lexical acquisition. Cohen (1987:44) suggests various ways of memorising new vocabulary:

- rote repetition: repeating the word and its meaning until it seems to have stuck;
- structure: analysing the word according to its root, affixes, and inflections as a way to understand its meaning;
- semantic strategies: thinking of synonyms so as to build a network of inter-linking concepts, clustering words by topic group or type of verb, or linking the word to the sentence in which it was found or to another sentence;
- the use of a mnemonic device in order to create a cognitive link between an unfamiliar foreign-language word and its translation by means of a cognitive mediator.

Cohen (1987:52) criticizes learning second-language words through L1 translation equivalents (see also. Meara, 1980) suggesting that in a number of cases (especially when there is no one-to-one translation equivalence between the source and the target language words), it would be more effective to learn the L2 word "... exclusively within its second-language context, without trying to link it to their first language".

Nation (2001) lists four major strategies which are, in order of importance, as follows:

- Guessing from context by using textual clues to infer the meaning of unknown words. Nation warns that learners need to know 95% - 98% of the words in a text to be able to guess correctly.

- Using word cards with the word on one side and its translation on the other. This is a very unfashionable activity, but there is overwhelming research evidence to show that it is a very efficient and effective learning strategy.
- Using word part analysis – breaking complex words into prefix, root and suffix and using the meaning of the parts to help remember the meaning of the whole word. Over 60% of the low frequency words in English come from French, Latin or Greek, which make use of word parts. A small number of very useful prefixes and suffixes occur in many English words.
- Using a dictionary to find the meaning of words and to get additional information about them, which provides relative independence from the teacher.

Among factors that influence L2 vocabulary acquisition, particular attention has been given to context and reading. These two factors are most important in foreign language education, as reading constitutes the most typical information type for language learners.

2.6.2 The role of context and reading comprehension in L2 vocabulary acquisition

Nagy & Herman (1987) claim that children between grades 3-12 in the US learn up to 3000 words a year. They argue that only a small proportion of that knowledge comes from formal vocabulary instruction, and the gain of a significantly larger number of words is due to reading. This suggests that traditional instructed vocabulary learning is “... much less effective in promoting vocabulary growth than simply getting students to spend time on silent reading of interesting books” (Bell, 1998).

Zahar et al. (2001) contend that one crucially important question has been whether functional L2 vocabulary can be learned

- exclusively through reading (see. Nagy, 1997)
 - as a result of direct instruction (see. Zimmerman, 1997)
 - through instructionally enhanced reading (see Hulstijn, Hollander & Greidanus, 1996).
- Some important questions are:
- how many times must the word occur in the text for it to be learned; and
 - what type of contextual support is needed to learn a new word?

Prince (1996:479) defines context is "...the L1 translation equivalent and the L2 sentence or text in which the word to be learned appears". Singleton (1999) feels strongly about the importance of context in lexical acquisition. He notes that context is necessary in defining lexical sense-relations and he also emphasizes the importance of contextual influence on meaning. He concludes that "...orientation to context is one of the lexicon's vital parts and ...any attempt to address the meanings of individual lexical entries in isolation from context is doomed to failure" (Singleton, 1999:36-37). Chun & Plass (1997) also claim that there must be a causal relationship between vocabulary knowledge and reading comprehension, as the level of text processing depends on the success of word-level processing.

There have been a number of research results published recently on the role of reading and context L2 vocabulary acquisition (see e.g. Prince, 1996:479). In general it was found that getting students to notice unknown lexical items through turning their attention to them by dictionary use or the application of marginal glosses, text-based incidental vocabulary acquisition during the reading process may be largely improved. Hulstijn (1992) provides experimental support for the Levels of Processing hypothesis of vocabulary acquisition whereby inferred word meanings are retained better than those given to the reader through the use of marginal glosses.

Schouten-van Parreren (1985, as cited in Mondria & Wit-de Boer 1991) advocates that words should be presented in texts, because, due to the many-sided relationships in the language material they provide a great number of reference points for the retention of new words, as the language material itself shows all sorts of relationships. According to Schouten-van Parren (as cited in Mondria & Wit-de Boer 1991:250-51). the use of bilingual word-lists should be rejected for several reasons:

- Words learned from a list are easily mixed up.
- Due to the lack of cognitive foothold words learned from a list are easily forgotten.
- Due to system separation words known in the list may not be known outside of it.
- The meaning(s) learned in a list may often be applied inappropriately.
- Not feeling the urge to infer meanings of the target words may reduce learner motivation.

Prince (1996) reports an experiment examining the relative advantages and disadvantages of context learning and translation learning. Results reveal that in terms of

quantity the winner is translation learning, but they also show that (especially weaker) learners "... are unable to use the gained knowledge appropriately in L2 contexts" (Prince, 1996:478).

A further issue is whether the context provided for vocabulary acquisition should be authentic or specifically adapted. Groot (2000) argues against completely authentic texts as they are generally not produced to illustrate the meaning or usage of certain words, but their intention is to convey information to native speakers who are already familiar with these words. Such texts are not applicable to teaching new words for the following reasons:

Due to the relatively low frequency of the words, target words are likely to occur rarely in authentic texts. In authentic language use the clues to the unknown word meaning may be not in its immediate context but often in its wider contexts, maybe outside the passage read by the learners. Most importantly authentic texts usually contain far too many other unknown words for incidental vocabulary learning to take place. "Contextual deduction and, in its wake, incidental acquisition of an unknown word is only possible if the context is well understood and clearly illustrates its meaning" (Groot, 2000:63). Otherwise so much attention and working memory capacity will be taken up by processing additional problematic information that "... higher reading processes, which are essential for understanding the context (such as recognition of suprasentential links and discourse markers), are seriously impeded" (Ibid.).

Groot summarises his views on using authentic contexts for second language vocabulary learning in the following way:

A thorough understanding of the context is essential for deducing the meaning of an unknown word. For any context to be well understood a dense coverage is required. This means the reader must have "foreknowledge" of most other words in the particular context, which in turn presupposes a large vocabulary. ... a learner can only pick up new words from authentic contexts if s/he already has a large vocabulary (Horst, Cobb, & Meara, 1998). The above arguments may serve to illustrate the principle that in the limited time available in an L2 teaching context such a large vocabulary cannot be incidentally acquired by dint of sheer exposure to authentic L2 material. (Groot, 2000:64).

Chen & Apeh (1980) found that advanced learners showed better performance in recalling target vocabulary when the recall task involved L2 contexts. They conclude that "... context only provides a useful basis once learners have reached a level where they are not over-stimulated by an L2 context" (Chen & Apeh, 1980, as cited in Prince 1996:481).

As an alternative to the natural acquisition of words through reading, Nation & Waring (1997) suggest direct vocabulary instruction as a complementary activity, and Hulstijn et al. (1996) propose instructionally enhanced reading. Zahar, et al. (Zahar, et al., 2001) argue that “... some form of explicit instruction will be needed to get many students over the 3000-word threshold where they have some chance of reading texts independently and beginning to acquire any significant amount of vocabulary on their own”.

Mondria & Wit-de Boer’s (1991:249) study investigated “(1) which contextual factors influence the guessability of words, (2) how these factors influence receptive retention (after guessing and memorising) , and (3) what is the relationship between correctly or incorrectly guessing and retention (after a learning stage)” One of the main conclusions of this study is that correctly guessing a word does not lead to improved retention (after a learning stage) as compared with guessing a word incorrectly.

As Hulstijn (1992) points out, the question is not whether learning should take place in context, rather what this contextualised learning should be like in order to be most beneficial and effective. In order to achieve maximum effectiveness, vocabulary learning tasks would need to include some form of elaborative processing. Without this, the resulting representation would suffice for implicit recognition, but not for explicit recall (Prince 1996).

Prince (1996) notes that research on L2 vocabulary acquisition has failed to clearly demonstrate the advantage of learning in context over translation learning. He cites Seibert’s (1930) results, who found that using learning lists of paired associates was consistently more effective than learning them in context. Contrary to Seibert, Pickering (1982, as cited in Prince 1996:478-79) found that contextual vocabulary learning was a little more advantageous. Prince, however, notes, “Despite the benefits of contextual presentation, it appears that effective learning of words requires a stage in which the word is in fact isolated from its context and submitted to elaborative processing.” (Prince 1996:489).

Another contentious issue has been whether incidental or intentional learning is more effective.

2.7 THE ROLE OF INCIDENTAL AND INTENTIONAL LEARNING IN SECOND LANGUAGE VOCABULARY ACQUISITION

Whether the incidental, instructed or enhanced form of L2 learning is most effective has been an important issue for researchers (Doughty, 2001). In incidental learning students focus primarily on meaning and in the meantime unintentionally attend to formal features as well, through which they also acquire new vocabulary. Instructed learning means that students are first taught target forms plus the rules that govern their behaviour through metalinguistic explanation. Some sort of combination of these two forms of instruction is enhanced learning when students process texts for meaning, during which their attention is attracted to target word forms by making their forms salient through highlighting them in the text and providing their explanations in annotations. Doughty (2001) contends that according to recent research findings instructed conditions provide a faster rate when studying simple grammatical rules as well as pragmatic or lexical explanations, but for more complex information it is in enhanced conditions that suit best, as under such conditions learners' attention is guided to form, while processing the information for meaning.

Besides the above mentioned L2 learning modes Hulstijn (1992), Hulstijn, Hollander & Greidanus (1996) also introduce the category of intentional learning. They maintain that both incidental and intentional approaches exist in second language vocabulary learning. They define incidental learning as "... the accidental learning of information without the intention of remembering that information" (1996:327, as cited in Koren, 1999). According to Huckin & Coady's (1999:185) definition of incidental vocabulary acquisition, it is "... the learning of new words as a by-product of a meaning-focused communicative activity, such as reading, listening, and interaction. It occurs through multiple exposures to a word in different contexts". Incidental vocabulary acquisition can take place through extensive reading, communicative interactions, and through exposure to natural input sources. According to Laufer & Hill's (2000:58) definition "... incidental vocabulary is learnt as a by-product of another activity, such as reading or communication, without the learner's conscious decision, or intention to learn the words".

Relying on Eysenck (1982:198), Hulstijn (2001:268) asserts that in operational terms incidental learning can be distinguished from intentional learning "... by the use of prelearning

instructions that either do, or do not, forewarn subjects about the existence of a subsequent retention test". Subjects in the incidental experimental design condition perform a certain task using the stimulus material without being given any instructions to learn and they are given an unexpected retention test afterwards. Subjects under the intentional learning conditions are forewarned that they will be tested on the basis of the stimulus material. Hulstijn relates that early experiments on incidental learning aimed to prove that incidental learning existed, and that intentional learning was more effective than the incidental learning mode. In recent studies participants have been instructed to process the stimulus material presented to them from a certain aspect, but they are tested afterwards unexpectedly on another aspect of the stimulus material that they have not been told to learn. In this way "... subjects are their own controls, serving both under intentional and incidental conditions of learning, being exposed to two categories of stimuli, while expecting to be tested on only one of these" (Hulstijn, 2001:268).

Koren (1999) defines intentional vocabulary learning simply as "... intended learning of vocabulary. All other activities that deal with vocabulary are categorized as incidental learning". Koren claims that it is the presence or lack of conscious effort that makes a difference between intentional and incidental learning. She explains the notion of intentional vocabulary learning through the example of preparing for a vocabulary test. In such preparation students usually try to memorise the target word meanings by investing as much energy and attention as they find to be adequate for satisfactory test results. She contends that incidental vocabulary learning "just happens" without involving a conscious effort. "In other words, the number of new words learnt incidentally is relatively small compared to the number of words that can be learnt intentionally" (Koren, 1999).

Comparing the phenomenon to Krashen's acquisition-learning dichotomy Groot (2000) holds that the incidental and intentional learning approaches are sometimes difficult to differentiate due to the overlapping between them. Instead of applying the narrow definition of incidental learning according to which it means excluding any conscious attention to the words being learned (see Singleton 1999:274), Anderson, (1990) uses intentional learning and defines it as "... any learning activity the learner undertakes with the intention of gaining new knowledge. As such it differs from incidental learning where there is no such intention" (as cited in Groot, 2000:62).

Sometimes for L2 teachers it is difficult to decide if they should encourage their students to learn words intentionally, or even by heart. Hulstijn (2001) suggests that teachers should simply make sure that they present the vocabulary to be taught in context, and students will pick them up incidentally as some sort of a "... by-product of being exposed to large amounts of L2 input in reading and listening tasks", in a gradually incrementing process (Hulstijn, 2001:258). Hulstijn, Hollander, & Greidanus (1996) solve this dilemma by claiming that words learnt intentionally through reading are better retained than words learnt incidentally.

Referring to De Bot, Paribakht & Wesche (1997), and Nagy & Herman (1987) Groot (2000) maintains that in L1 most words are acquired incidentally, little by little, as the L1 learner comes across the words frequently and in a wide range of contexts. This accumulated knowledge then assists the acquisition of new, unknown words. Under the conditions of instructed L2 learning it is impossible to copy the L1 learning process due to the less intensive nature of exposure to new words. He contends that the incidental acquisition of some very frequently occurring words is possible, but it is most unlikely with less frequent words whose number in the language is considerably higher (Groot, 2000:63).

Similarly, Hulstijn (2001) cites R. Ellis, 1994; Hatch & Brown, 1995; Nagy & Herman, 1987; Nation, 1990; Schmidt, 1994 to support his view that in L1 and L2 vocabulary acquisition researchers generally claim "(a) that most vocabulary items are acquired incidentally, that is, as a by-product of the learner being engaged in a listening, reading, speaking or writing activity, and (b) that few words are acquired by an act of 'intentional' learning, as in the learning of a bilingual vocabulary list" (Hulstijn, 2001:266).

Based on her qualitative research results Schouten-van Parreren (1989:79) proposes that the sequence of incidental vocabulary acquisition consists of three stages:

- guessing the meaning of the unknown word
- verifying the guess (e. g., in a dictionary) and
- analysing the word form.

This theory has also been supported by Hulstijn's (1992, 1993) quantitative research findings.

Laufer & Hill (2000) remind that since there is ever-growing evidence in recent SLA research that attention to form (i. e. noticing) is crucial to second language learning (see Fotos, 1993; Robinson, 1995; Schmidt, 1990, 1993) one is inclined to believe that incidental learning is also unattended learning. Laufer & Hill (2000:58) stress that, even though it may

sound paradoxical, "... incidental vocabulary learning is no exception to the attention requirement".

Based on the findings of Hyde & Jenkins' (1973) experiment on vocabulary retention, Anderson draws the following conclusion about the role of intention in vocabulary learning:

Whether a person intends to learn or not really does not matter (see Postman, 1964, for a review). What matters is how the person processes the material during its presentation. If the individual engages in incidental mental activities when not intending as when intending to learn, he or she gets identical memory performance in both conditions. People typically show better memory when they intend to learn because they are likely to engage in activities more conducive to good memory, such as rehearsal and elaborative processing. The small advantage of intentional subjects in the Jenkins and Hyde experiment may reflect some small variation in processing. Experiments that take great care to control processing find that intention to learn or amount of motivation to learn has no effect (see Nelson, 1976).

Craik & Tulving (1973) emphasize that the richness of semantic encoding (also referred to in the literature as 'depth of processing', 'encoding specificity', 'distinctiveness of encoding', 'degree of elaboration', 'cognitive effort', or 'degree of richness') is of vital importance for retention. Cognitive psychologists have unanimously claimed that "... memory performance is determined far more by the nature of the processing activities engaged in by the learner than it is by the intention to learn per se" (Eysenck, 1982:203). This means that the more thoroughly information about the word (pronunciation, orthography, grammatical category, meaning and semantic relations to other words) is processed, the better the new lexical unit will be remembered Hulstijn (2001:270) argues that this claim is valid "... not only for intentional but also for incidental learning. Thus, incidental learning will be more successful with more than with less elaborate processing". Laufer & Hill (2000) also assert that if words are properly attended to they will be remembered in intentional or incidental learning conditions. Therefore incidental learning is a conscious process, and thus it cannot be considered unattended learning.

Huckin & Coady (1999) argue that the amount of attention and thereby the amount of learning is influenced by context, attention type, and task demands. They claim that for successful incidental learning through inferencing to take place learners need to recognise at least 3000 word families, and be able to apply a variety of local and global processing strategies. Huckin & Coady (1999) draw up the advantages and disadvantages of incidental

vocabulary acquisition. Among the advantages they mention its contextualised nature, which, unlike paired associates lists and tasks, provides the learner with information about the word's meaning and gives guidance as to its use. Incidental learning involves the simultaneous practice of reading and vocabulary acquisition in a more personalised way, as the learner is free to choose the materials they wish to use. It allows a parallel rather than a serial process of lexical development as "... presentation, consolidation and lexical/semantic-development occur at the same time" (Huckin & Coady, 1999:182).

Koren (1999) in her study tests the retention of a) words learned through inference and b) words glossed in a text in an interactive program for practicing academic reading skills. The results show that the inferred words were remembered much better than the glossed words. This study confirms theories that the retention of inferred words is higher than the retention of words where meaning is given, but it also shows that incidental vocabulary learning is not particularly efficient.

As for the disadvantages of incidental learning, Huckin & Coady (1999) state that it is not suitable for learning basic, core vocabulary, learners have no control over the learning material, and consequently learning may not always take place, and finally that false inferencing may induce the incorrect comprehension of vocabulary.

2.7.1 Conditions of successful incidental vocabulary learning

Watanabe (1997:288) claims that "... although incidental learning of vocabulary through context is possible, it is not always efficient". Hulstijn, Hollander & Greidanus (1996) list several reasons for this inefficient learning. These reasons stem from:

- The readers' false belief that they know the words.
- The readers' decision to ignore the words.
- The readers' ignorance of the connection between the form of a new word and the meaning contained in the context.
- The readers' inability to infer a word from context.
- The non-recurrence of new words (i. e. a single encounter of the words)

Rott (1999) investigated the effect of exposure frequency on incidental vocabulary acquisition and retention through reading. She measured the productive and receptive acquisition and retention of unfamiliar target words during reading after two, four, or six times of exposure. Rott found that as few as only two encounters with unfamiliar words during reading influenced learners' vocabulary gain significantly. Curiously, four exposures produced a fairly similar word gain as two exposure frequency, and six exposures resulted in a significantly higher rate of vocabulary acquisition. The results concerning retention proved to be rather mixed. Only half of the participants presented a significant rate of productive retention of target vocabulary. Receptive long-term knowledge proved to be much superior, as three out of four treatment groups were able to retain the newly-learned words after a four week period.

It has been shown that making particular words salient through marking has a positive effect on vocabulary acquisition (see Brett, 1998). Hypertext annotations were also found to influence incidental vocabulary acquisition favourably (see Hulstijn, 1992), and the number of glosses consulted were found to be in direct proportion to vocabulary knowledge.

Investigating factors that promote incidental vocabulary acquisition Hulstijn (2001) proposes the construct of **task-induced involvement**, which has two main constituents. Hulstijn suggests that input processing depends on both affective and cognitive factors. The affective component includes motivation and the need to acquire that particular piece of information, while the cognitive component incorporates attention to (noticing of) input as well as the elaboration of processing. It was found that preparatory attention together with self-directed orienting vastly improved encoding. Hulstijn's construct is partly based on Craik & Lockhart's (1972) Depth of Processing Hypothesis, which asserts that more elaborate processing will lead to better retention. Elaborate processing involves paying careful attention to the word's pronunciation, orthography, grammatical category, meaning and its semantic relations.

N. Ellis (1997:135) reminds that "... inferring the meaning of new words is neither an automatic nor an implicit process. It involves conscious application of strategies for searching for information, hypothesis formation and testing.". He contends that words are more likely to be remembered when their meaning is guessed from context, i.e. when learners make a greater mental effort in the study process. N. Ellis states that there are a lot of unsolved issues in this respect including:

- the type and size of vocabulary needed for accurate guessing
- the degree of exposure to a word needed for successful acquisition.
- the efficacy of different word guessing strategies
- the value of teaching explicit guessing strategies
- the influence of different kinds of reading texts
- the effect of input modification
- the problem with incidental learning
- describing learners' inferencing behaviour (p.136).

As most of the above views and research results distinctly show, an important precondition of successful incidental vocabulary learning is reading or having the target words in context.

2.7.2 The role of context in incidental vocabulary learning - Reading comprehension and incidental vocabulary learning

Singleton (1999) states that apart from the first few thousand basic words second language acquisition occurs mainly through extensive reading. De Ridder (2002) also observes that a lot of second-language experts (e.g. Krashen, 1989; Hulstijn et al., 1996; Nation, 1990) consider reading as an excellent means of acquiring new vocabulary incidentally. The main aim of the interaction with the learning material is not vocabulary acquisition, rather comprehending the particular text. During reading, learners apply guessing, reconstruction strategies to access the meaning of unfamiliar lexical units from the context. However, the extremely large number of unknown words or the learner's scarce cultural, global or professional knowledge may block the guesswork and reconstruction of meaning from context. Ellis, Tanaka, & Yamazaki (1994), Hulstijn (1992), and Knight (1994) (as cited in De Ridder, 2002) suggest that such situations may be effectively alleviated through the use of dictionaries and traditional or electronic marginal glosses, which facilitate the rate of comprehension. Referring to research evidence, De Ridder (2002) contends that the success of incidental vocabulary learning very much depends on the quality of the reading task. She relates that in her experiment, "... the specific reading task led to significantly less incidental

vocabulary learning, which is more than probably due to the time pressure and the specific orientation towards text comprehension” (De Ridder, 2002).

Hulstijn, Hollander, & Greidanus (1996) give account of an experiment in which advanced students of French read a French short story in one of three reading conditions. One group had access to marginal glosses with L1 equivalents of the new words, another group had the opportunity to use a Dutch-French bilingual dictionary, and the third group acted as control. After the reading session the recall of the 16 words that occurred once or three times in the text was tested. The results confirmed the hypothesis that the frequency of target word occurrence enhances incidental vocabulary acquisition when the meanings of unknown words are provided to learners either in the form of electronic glosses or the possibility of traditional dictionary lookups. The repeated appearance of new, unknown words was also proved to strengthen the form-meaning connections in the reader’s mental lexicon. It was observed that when the learner was provided with no cognitive scaffolding in the form of a dictionary or annotations, readers tended to ignore the words they did not know, or they may have inferred their meanings incorrectly from the context. This, in turn, is likely to reduce the beneficial frequency of occurrence effect (Ghadirian, 2002).

Carroll, Davies & Richman (1971) assert that about 80% of the tokens in any English text are likely to be among the 2000 most frequent English word families. Nation (1990) points out that a reader familiar with 80% of the tokens in a text is still not able to understand the text properly. Liu & Nation’s (1985) and Laufer’s (1989) studies show that about 95% of words must be known for the satisfactory comprehension of the text and for inferring words from context correctly.

Hulstijn’s (1992) and Schouten-van Parreren’s (1989) findings suggest that in incidental L2 vocabulary acquisition the incessant interaction between lexical unit, contextual meaning, and the purpose of reading, presuppose both formal and semantico-pragmatic processing (Singleton, 1999:160).

Schouten-van Parreren (1989) found that the amount of attention paid to a particular unknown word depends on the reader’s informational needs. Incidental learning is limited, the number of words per text learnt in this way is modest; and that during reading comprehension learners make an effort to derive the meaning of unknown words from the available context and formal clues, which improve the chances that these words are retained.

The quantitative studies of Day et al. (1991); Dupuy & Krashen (1993); Pitts et al. (1989) with intermediate learners demonstrated a small but significant word gain for the group of subjects who could pick up the unknown words from context through reading. Unfortunately, however, the studies used no pretest-post-test design to make sure that participants had not known the words to be learned. Besides only the receptive acquisition of words was tested in a multiple-choice immediate post-test, and no delayed post-test was applied to measure long term retention of the target words. Day and colleagues (1991) were sceptical about long-term retention of words encountered in only one text.

While trying to assess the effectiveness of enhancement techniques in incidental vocabulary acquisition Hulstijn et al. (1996) and Knight (1994) shed light on certain variables that influence word gain. Hulstijn et al. (1996) revealed significant word gain one hour after the reading, and Knight (1994) noticed similar positive receptive and productive word knowledge two weeks after the reading session, which was accounted for with the intensive interaction between the text and the learner due to enhancement techniques and the meaning-focused nature of the assignment.

Rott (1999:592-593) summarises the major factors that influence the result of inferencing in four points:

- learners' knowledge about the linguistic properties of an unknown word
- context properties in which the unknown word appears
- the approach taken by the language learner to infer meaning
- cognitive processes that influence L2 readers' awareness of and attention to unfamiliar words.

Rott (1999:593) notices that recent vocabulary studies aimed at improving incidental vocabulary acquisition in various ways: a) through dictionary use (Hulstijn et al., 1996; Knight, 1994; Luppescu & Day, 1993); b) through the use of interactive glosses (Hulstijn, 1992; Hulstijn et al., 1996; Watanabe, 1997), or c) introducing postreading vocabulary activities (Paribakht & Wesche, 1997; Zimmerman, 1997). Rott concludes that even though these studies provided no conclusive evidence, they proved the importance of input enhancement in effective incidental vocabulary acquisition through reading.

Paribakht & Wesche's (1993, 1997) studies, which indicate that, 1. Reading followed by comprehension exercises plus more reading, and 2. Reading followed by comprehension

exercises plus some more related exercises provide considerable vocabulary gains, with significantly much better results in the second experimental condition. Paribakht & Wesche's conclusion is that "... contextualized instruction can improve on incidental learning and that vocabulary instruction based on reading texts appears to recommend itself as a pedagogical procedure" (as cited in Singleton 1999:161).

Groot (2000) argues that the incidental acquisition of vocabulary is only possible up to a point, because of their low occurrence in the L2 reading material and the relatively short time for the acquisition. The words to be learned may be presented in isolation or in context. Presentation in bilingual word lists seems an attractive shortcut because it takes less time than contextual presentation and yields excellent short term results. Long term retention, however, is often disappointing so contextual presentation seems advisable. Groot proposes that the two key issues in effective vocabulary acquisition are "... selecting the relevant vocabulary (which and how many words) and creating optimal conditions for the acquisition process" (Groot, 2000).

Huckin & Coady (1999) note that the reading texts that are personally interesting to learners are more useful for incidental learning than others. They also maintain that input modification in the form of interactive electronic glossing potentially difficult words, is generally effective. In order to avoid the problems of "... imprecision, misrecognition, and interference with the reading process" learners must possess a "... well-developed core vocabulary, a stock of good reading strategies, and some prior familiarity with the subject matter" (Huckin & Coady, 1999:191-192).

2.8 THE POTENTIAL OF HYPERTEXT AND HYPERMEDIA IN SECOND LANGUAGE VOCABULARY ACQUISITION

Since the early days of computer assisted language learning (CALL), developing vocabulary knowledge has been in the center of interest (Jung, 1988). A large number of early, first generation programs were simple word games. The programs were limited in the type of input, which the computer tested through character matching, due to which usually only one correct answer was accepted without offering any alternatives. Such programs did not involve the learner in processing the linguistic material for meaning, they were limited to the manipulation of linguistic form (Goodfellow, 1995). Thanks to the development of

information and communication technologies, as well as the refinement of CALL methodology, more recently there has been a second generation of programs around allowing the learner for greater control in the learning process. Second generation programs make use of a range of such tools and information sources as e.g. on-line dictionaries, thesauri, encyclopedias, concordancers, etc., thus allowing for language learning in a more meaningful way (Harrington & Park, 1997).

One of the relatively new technologies applied in CALL is the use of hypertext and hypermedia. Although hypertext has been around for more than fifty years, it became generally familiar only through the wide-spread use of the World Wide Web. It was the concept of hypertext that led to the invention of the World Wide Web, which is basically just an enormous amount of information content linked by hypertext links.

2.8.1 Hypertext/hypermedia in language learning

The history of hypertext begins in 1945 when President Roosevelt's science advisor during World War II, Dr Vannevar Bush, put forward the idea of Memex in an article entitled "As We May Think" published in the Atlantic Monthly. In the article, Bush (1945) outlines a device capable of storing textual and graphical pieces of information linked to one another. The idea behind Bush's Memex was trying to imitate the human mind, which does not function linearly but by association. Frequently followed trails get stronger, rare ones fade away, which may also account for memory phenomena. Bush was aware of the fact that the work of the mental processes in the human mind could not be copied and produced artificially, but he stated that we should learn from them. The term hypertext itself was coined by Ted Nelson dealing with hyperbolic space in geometry (Pfaffenberger, 1997:34).

Hypertext is non-sequential text organised to allow readers access to nonlinear information. The basic units of information in hypertext are nodes which are connected by (hyper)links (Son, 1998:115). Delany & Landow (1994:3) define hypertext as "...the use of the computer to transcend the linear and fixed qualities of the linear text. Unlike the static form of the book, a hypertext can be composed, and read, non-sequentially, it is a variable structure, composed of blocks of text ... and the electronic links that join them." In the general sense, hypertext is an information medium that links verbal and nonverbal information. Hypermedia extends the notion of text in hypertext by adding other kinds of data, such as sound,

animation, some kind of visual information. Hypertext and hypermedia are often used interchangeably (Ibid.).

Landow (1997) underscores the importance of Bush's (1945) original idea that the human mind works by association rather than in a linear way, and while traditional printed text does not allow for this factor, hypertext can imitate this process. Landow points out that although hypertext is not tangible like printed materials, it allows the reader to participate in learning more actively by having to filter the good information from the bad, linking information together at their will, or even adding their own marginal glosses. In this way, the reader becomes a producer of the text rather than its consumer (Landow, 1997). Slatin (1990) claims that linkages in hypertext stimulate the connections in the reader's or learner's mind. "Perhaps the greatest value of hypertext is its ability to link enormous quantities of material that, in a conventional text environment would be kept separate, ... so that things which someone perceives as being related do in fact become related." (Slatin, 1990:881).

Hypermedia is the combination of hypertext and multimedia. It implies managing information in multimedia format while users may choose their own non-linear paths through text, graphics, audio and video in the available databases (Son, 1998:116). "Multimedia can be defined as the computer-delivered combination of a large range of communications elements – text, sound, graphics, pictures, photographs, animation and moving video" (Brett, 1998).

The theoretical foundations of hypertext and multimedia are significantly different because while learning theories were fitted to multimedia in order to match the intact educational philosophies, hypertext was created by modelling the cognitive learning theories and attempting to mimic human processes and patterns (Crews). Hypertext technologies offer numerous advantages for studying a second language. However, they also have some features that may cause problems or difficulties during the study process.

2.8.1.1 Advantages of hypertext/hypermedia-supported language learning environments

The most basic advantage of hypertext technologies is that learners involved in hypertext-based instruction can have control over learning activities. Hypertext-based systems therefore are learning systems rather than teaching systems. Learners can choose a route through the learning material, and thus take basic responsibility for the learning process. The

non-linear structure of the hypertext may stimulate processes of integration and contextualisation in a way not achievable by linear presentation techniques (McBride & Seago, 1999:118). Since human perception is multimodal, we use a combination of physical senses to receive information. Hypermedia applications combining text, still and moving images, together with sound, at least to a certain extent is capable of imitating such multimodal perception in an authentic and contextualised way. Such environment also “... seems to cater to learners with different learning styles, knowledge levels, and motivations” (Soo & Ngeow, 1998).

The value and effect of the multimedia elements in hypermedia language learning environments is explained by Mayer’s (1997) generative theory of multimedia learning, which utilises both Wittrock’s (1987) generative theory and Paivio’s (1981) dual-coding theory. In vocabulary learning Mayer’s multimedia extension of Wittrock’s generative theory assumes that L2 learners possess separate L1 and L2 verbal systems with a common imagery system. It suggests that translating words via simultaneous verbal and visual presentations will link the two verbal systems, and have an additional beneficial effect on the L2 verbal system.

Paivio’s (1971) dual-coding theory proposes that memory and cognition are served by a system for verbal information, and another separate one for nonverbal information. Paivio & Begg (1981) assume that although the two sensory modalities can function separately, they are basically interconnected (i. e. representations in one system can activate those in the other), which affects memorisation favourably.

Chun & Plass (1997) present a multimedia extension of Paivio’s (1971) ‘dual coding theory’, in which they emphasize the significance of the simultaneous presentation of visual and verbal material for the following reasons:

- the more detailed the encoding, the more retrieval routes they offer to the material to be learned
- in the two systems potentially more information can be stored than just in one.
- learners can choose to use the information from the storage system that suits their individual characteristics and learning styles (verbal and spatial abilities, visualizer/verbalizer preferences), which individualisation optimises the learning process.

Sengupta (1996) summarizes the advantages of hypertext over teaching from a book as follows:

- Hypertext enables multiple scannings (quick reading of different texts that are linked together).
- Users are given many choices (between reading some or all of the linked texts and in the order of reading the texts).
- Users are offered a richly interactive environment (in which they can respond to tasks and questions and get immediate feedback).
- Hypertext also enables progress at the learner's pace /no pressure on the reader to finish tasks together with everybody/.

Although hypermedia can offer several advantages, the application of this technology to language learning is not without problems. The following passage will deal with the most frequently occurring difficulties that learners are most likely to encounter when using hypertext/hypermedia technologies.

2.8.1.2 Limitations of hypertext/hypermedia-supported language learning environments

One of the most frequently mentioned problems in connection with the use of hypertext is the disorientation problem. This means that readers accustomed to finding their way through conventional books with the aid of tables of contents, indexes and footnotes, might get lost in hyperspace. Not being sure where they are in relation to other parts of the hypertext network may result in confusion and/or not being able to find information that they know is available somewhere in the system. This problem may be solved by arranging for well-visible navigational tools indicating the available documents, the route of their possible access (i. e. the links between them) and the history of paths taken (McBride & Seago, 1999:118).

Besides disorientation, the problem of information overload is also often spoken of, meaning that in hypertext users are presented with so much information that it may cause mental strain to process the available data (Bevilacqua, 1989).

Another criticism is that such a system promotes effective learning in so far as the users are engaged in actively making their own connections and integrations at the conceptual level. This implies the importance of strong student motivation (McBride & Seago, 1999).

Chun & Plass (1996) found that information delivered in different presentation modes and perceived through the same sensory channel may compete for perceptual resources and then obstruct learning. Another example of poor multimedia design is when audio simply repeats text, which results in media overload. Hartley (2000) suggests that narration should replace the text, which instructional design was proven to yield much better results.

If the media elements are integrated inappropriately or illogically, the learner may get confused, which may hinder or even block instructional objectives. Soo & Ngeow (1998), Hartley (2000) state that poor multimedia design can cause difficulties for the learner. Irrelevant, inappropriate animation, for instance, may cause distraction. They suggest, for example, that the use of animation should be restricted to conveying spatial or procedural information.

LeLoup & Ponterio (1998) mention an additional problem with Internet-based multimedia that images, sounds, and especially videos need large files that may take a long time to download. They assert that the slowed-down interaction and time waste caused by the waiting period may create an uncomfortable impression and thereby decrease learner motivation. Fortunately, however, with the rapid development of information and communication technologies (much faster computer processors, computers with large memory and storage capacity, faster transmission of data thanks to broadband fiber-optic connections, etc.) this problem seems to be losing its validity.

2.8.1.3 Principles of effective hypermedia design for language learning

Based on Gass' (1988) interactionist model of SLA Chapelle (1998b) puts forward seven hypotheses for developing multimedia CALL emphasizing the importance of input interaction and output. Approaching these hypotheses from the aspect of input and interaction relevant to the present paper (while realising that the output aspect may be not any less important for the success of the language acquisition process), her input and interaction-related hypotheses may be summarised as follows:

The first design principle that Chapelle proposes is that the linguistic characteristics of target language input need to be made salient (see Sharwood Smith, 1991). Going beyond

Krashen's (1982) Input Theory she explains the importance of this with the current theory according to which only the noticed part of target language input may influence language development (see Schmidt & Frota, 1986). Doughty's (1991) experimental research results showed that making input salient through highlighting prompted learners to notice certain syntactic forms, which influenced their acquisition favourably. Relying on the studies of Robinson (1995) and Schmidt (1990), Chapelle concludes that the depth of noticing is in close relation with consciousness, memory, and task demands.

Another design principle put forward by Chapelle (1998) is that learners should be assisted in understanding semantic and syntactic aspects of linguistic input, a possible form of which is engaging in interaction with the software program. This principle is again in line with Gass' general cognitive interactionist theory of SLA proposing that only the comprehended subset of the apperceived part of the processable second language data may potentially be turned into intake and thereby integrated into the learner's knowledge system (see Sharwood Smith, 1993). However, the potentially useful input is likely to contain linguistic forms unknown to the learner and thus cause them problems. To help the learner overcome this comprehension problem the program must provide help in the form of input modifications initiated by the user. Larsen-Freeman & Long (1991) offer such features of input modification as simplification, elaboration, or added redundancy. Chapelle suggests that as computer provides input and 'participates' in interaction, in L2 tasks it should be looked upon as an interlocutor of some kind. "The metaphorical perspective of the computer as a participant provides a means for extending the hypotheses outlined above to CALL" (Chapelle, 1998:22). Such negotiation of meaning (see Long, 1996) is necessary whenever communication breakdowns occur in order to comprehend input content. Larsen-Freeman and Long (1991:144) summarize this view of interactional modifications as follows:

Modification of the interactional structure of conversation or of written discourse during reading. . . is a [good] candidate for a necessary (not sufficient) condition for acquisition. The role it plays in negotiation for meaning helps to make input comprehensible while still containing unknown linguistic elements, and, hence, potential intake for acquisition.

In Godwin-Jones's (1994) view effective hypertext applications for language learning should be student-centred and have open, non-prescriptive, flexible pathways that allow the learner to choose from an extensive set of learning materials. Such applications should use multimedia glosses so as to provide a variety of starting points for learners with different

learning styles from which they can have access to authentic comprehensible input. Interactive glosses in hypertext applications should offer immediate, non-linear help through providing access to meaning, transcripts and cultural or linguistic notes. Instead of using closed and restrictive stand-alone hypertext programs that provide a limited set of links and materials, Godwin-Jones (Ibid) proposes that the application of networked hypertext is preferable. Networked hypertext/hypermedia systems as the World Wide Web (WWW) are non-restrictive and expansive by nature, and offer a wide variety of materials, (including student-made materials, and links), which further facilitate individualised instruction.

2.8.1.4 Learners' epistemic beliefs and learning with hypertext

Learners' general assumptions about the nature of learning and knowledge may determine the type of cognitive resources a student mobilizes in order to carry out a learning activity. Such epistemic beliefs in turn will also influence the outcome of the learning process (Schoenfeld, 1983, as cited in Brett, 1997). Brett (1997) also refers to Jacobson's (1990) and Jacobson & Spiro's (1995) studies, who found that students preferring rote memorisation, preorganised and prespecified materials did not produce good study results and were not so good at applying their knowledge in a nonlinearly organised and accessed hypertext environment. Jacobson & Spiro accounted for this phenomenon with the enhanced intellectual effort that the new environment requires of learners with relatively simple epistemic beliefs. In contrast, learners with more complex preferences and epistemic beliefs about learning tend to prefer creativity and active knowledge construction. Such learners who conceived conceptual knowledge structure more as web-like and multidimensional were found to perform much better when working in a hypertext learning environment. Based on these results Jacobson et al. (1996) conclude that "... the effect of studying with conceptually-indexed nonlinear materials in hypertext environments may be different across students with different epistemic beliefs"(as cited in Brett, 1997).

2.8.2 Vocabulary learning with hypertext/hypermedia cognitive learning support environments

The L1 natural word acquisition process is a gradual process through repeated exposures to the words in a wide range of contexts. Groot (2000) expresses a view that due to

the lack of sufficient time for exposure to new words this cannot be replicated in L2 vocabulary learning. Consequently, due to the more superficial exposure, the processing of the new lexical units will be shallower. This, in turn, will hinder the creation of a sufficient number of associations and links with other words for solid storage and efficient retrieval. As a solution to this dilemma Groot suggests creating a conducive hypermedia environment that maximally facilitates the learning of new words by striking a balance between the two contradictory demands of profoundness and strict time limits. Since hypertext/hypermedia is non-linear by nature, it can serve as a very good **constructivist tool** to complement traditional vocabulary instruction. There has been an increasing amount of research into exploring the possibility of its application in second language education mainly demonstrating that the use of hypertext technology results in improved learning outcomes. It is hoped that since hypertext is a semantic network, knowledge could be represented in the hypertext system expecting that learners will come to think in similar ways (Jonassen, 1993).

The interactionist view of language processing relies heavily on Piaget's (1952, 1979) theory of accommodation, which posits that children construct meaning by assimilating information into their existing schemata as well as by accommodating existing schemata to new knowledge by dynamically interacting with the learning media. A consequence of the application of constructivist learning theory is that "... the learning medium must create the situation where the learner has the freedom to exercise judgement about what is to be learned at what price" (Eklund, 1995). Jonassen (1992) suggests that, since the hypertext model of learning is based on schemas, such systems are especially useful in facilitating learning. Schema theory defines learning as the accumulation and organisation of knowledge structures, which are a representation of the organisation of ideas in the semantic memory. Each knowledge structure consists of an object and a set of attributes linking it to other knowledge structures. In the process of learning, new structures and links are gained by adding information to existing structures, or by altering existing structures through restructuring. "Our knowledge exists in a semantic memory which is a network of interrelated concepts" (Eklund, 1995).

2.8.2.1 Hypertext and the mental lexicon

Words in the mind are usually referred to as the 'mental lexicon'. The success of acquiring a second language is deemed to depend on expanding and activating learners' L2 mental lexicons. Comparing the mental lexicon to a computer McCarthy (1990:35) offers the computer metaphor suggesting "... split-second processing ability, complex storing with myriad cross-referencing, and virtually instant recall". Since computers were created imitating the human brain, they may serve as a useful tool for representing the mental lexicon and capable to expand the learners' own mental lexicons (Umamoto, 1997).

Hypertext also tries to emulate the structure of the brain where information is stored on the basis of connectivity of webs of related information. The brain keeps establishing links between bits of information, observing existing connections and making new ones. According to Burton, Moore & Holmes' (1995) definition hypermedia is an interactive instructional system with various associative links which allow the learner to navigate in a nonlinear fashion. It is believed that students learn by assimilating information into their schemas through restructuring their network of knowledge. This process involves the integration of new nodes of information, the creation of new links, and the deletion of old nodes of information (Jonassen, 1993). Umamoto (1997) suggests setting up the 'My Mental Lexicon' (MML) vocabulary teaching system, in which students can create their own hypertext pages based on the structure of the mental lexicon where the relationships between the pages are those of superordination, co-ordination, as well as idiomatic or non-idiomatic collocational relationships. By using semantic maps MML helps students visualize the associative relationship between the new words and the ones already acquired. The system makes use of multimedia technology, which facilitates the comprehension of new word meanings.

Chanier & Shelva (1998) also claim that building easily interpretable lexical networks allows learners to have a much better understanding of the meaning of a word than the use of a bilingual alphabetical list. This way of visual moving is much closer to the structure of the mental lexicon because of the semantic associations between concepts are mor visible.

2.8.2.2 The impact of hypertext/hypermedia on vocabulary acquisition

During the past twenty years there have been several research studies investigating the role and effectiveness of hypertext learning environments in the acquisition of second language vocabulary. The great majority of these studies, however, have concentrated on the beneficial effect of multimodal presentation. Rather than examining the effect of linguistic features as conveyed by hypertext, most of the research concentrated on hypermedia, i.e. on the effects of the simultaneous application of text, sound, still and moving images. The passage below will focus mainly on some of the studies that compare the effects of target word salience on L2 vocabulary learning as a result of various modes of hypermedia annotation.

Brown (1993) evaluated the effects of word frequency and saliency on the basis of a language learning program on a videodisc. She found a relationship between the general frequency index of words learned and the effectiveness of learning, although this could not be said for the specific frequency of words in the videodisc program. In relation to word saliency, Brown found that the visual priming of the words that were later presented in a written form yielded better retention results.

Lyman-Hager et al. (1993) investigated the impact of a multimedia program on vocabulary acquisition through studying a group of students who read a computerised excerpt from a story, and another made up of participants who read the story from a traditional printed text. Both groups could use glosses with identical textual definitions, with the difference that the computer group was exposed to multimedia annotations, while the other group could use annotations in a conventional book with glosses bearing definitions identical to those available to the computer group. Participants wrote a recall protocol right after reading the story, and one week later they were asked to do a vocabulary test. The results showed that students working with multimedia annotations could remember the newly learned vocabulary items better after a week than those students who used the traditional paper book format annotations.

Liu & Reed (1995) investigated if the effect of hypermedia assisted instruction could enhance vocabulary learning among non-native English speakers. The participants (age range from 18-41 years old) were all learners of English from various countries with no prior

experience with hypermedia. Effectiveness of the hypermedia assisted instruction was demonstrated via all participants having significantly increased achievement scores from pre-treatment to post-treatment. Additionally, an increased appropriate use of vocabulary and computer-use attitude emerged.

Chun & Plass (1996) examined the effectiveness of annotations with different media types for vocabulary acquisition in the hypermedia program entitled 'Cyberbuch'. They measured how well vocabulary could be learned incidentally when participants were given the task of reading comprehension. They also wanted to know the relationship between the look-up behaviour of learners and their performance on production (translation) and recognition (multiple-choice) vocabulary tests. The rate of incidental vocabulary learning was higher than expected (approximately 25% accuracy in production tests and 75% in recognition tests). There was no substantial difference between immediate and delayed post-tests results. Chun and Plass attributed successful short term recall to the possible beneficial effect of hypermedia. As far as the effectiveness of the annotation types is concerned words annotated with text + pictures were much better remembered than only textual information. This finding "supports previous studies revealing that visual imagery aids in the learning of foreign words" (Chun & Plass, 1996:194). They suggest that further studies should investigate single annotation types.

Kost, Foss, & Lenzini (1999) conducted a study in which they compared the effects of pictorial and textual glosses on incidental vocabulary growth for L2 students. Participants read a passage under one of three glossing conditions: textual gloss alone, pictorial gloss alone, and text combined with pictures and afterwards they were tested both for production and recognition. It was found that the students using the combination of text and picture achieved the best results in both tests. On the basis of the findings the researchers concluded that different representations require different degrees of cognitive effort, and that making use of both visual and verbal representations provide a "stronger bond" than using only words.

In his study Al-Seghayer (2001) examined printed text definition with a still picture, and printed text definition with video annotation modes to determine which delivery mode was more effective in vocabulary acquisition. The behaviour of thirty people was examined in a within-subject design under three conditions: printed text definition alone, printed text definition with still images, and printed text definition with video clips. The efficacy of each mode was measured by a recognition and a production vocabulary test right after reading the

English narrative, which was complemented by an interview and a questionnaire. As a result, video clips were found to be more effective than still pictures, which was accounted for by the fact that video is better at building mental images, and creating curiosity through the combination of modalities (Al-Seghayer, 2001).

On the basis of the available literature on hypermedia annotations Al-Seghayer concludes that computerized glossing has a favourable effect on both L2 vocabulary acquisition and reading comprehension. “The influence appears to stem from the availability of different types of information, the absence of interruptions during reading, the generation of causal inferences, and the construction of a situation model” (Al-Segayer, 2001).

As the above results almost unanimously show, the use of hypermedia applications yields better vocabulary acquisition results. Besides being attractive to the learners, the multimodal presentation of input appears to activate learners’ encoding and retrieval mechanisms, and thus it facilitates the acquisition of L2 vocabulary. Beyond the multimodal presentation of information, computers have some other features that can be profitably utilized in vocabulary learning. The most important of these features is interactivity.

2.8.3 Modified interaction in hypertext/hypermedia-based computer assisted L2 vocabulary learning

One of the greatest strengths of computer-based language learning and reference materials is their “ability” to interact with learners working on their own. Learning with interactive hypermedia materials, however, presupposes active learner control, thanks to which the learning process will become significantly individualised. Learners are free to choose from the available hypermedia-based resources including learning materials, reference sources, etc., and progress at their own pace and along the route selected. (Brett, 1998). Also, if necessary, learners can engage in individualised negotiated clarification of meaning and linguistic phenomena by exploiting available multimedia resources, where and when their own comprehension breaks down (Brett, 1998; Chanier & Shelva, 1998).

Simpson (1994) also emphasizes the advantages of interactivity claiming that the high level interactivity provided by hypermedia tools actively engages the brain. Learners can interact with the environment and manipulate it. Actively engaging the brain through interacting and manipulating the environment is likely to result in better enhanced learning

quality. “Thus, the interactive nature of these systems may better match neurophysiological processes leading to increased memory and learning” (Simpson, 1994:79).

Chapelle (1998:27) suggests that besides making linguistic input salient, computerised learning environments also need to offer learners opportunities for linguistic input modifications in the form of repetition, simplification through restatements, non-verbal cues, reference materials, and change of input mode, etc.

Chapelle (1998) proposes is that learners should be provided with help in comprehending semantic and syntactic aspects of linguistic input. Input can be useful and problematic for the L2 learner because it contains linguistic forms that the learner does not know. As a consequence, the learner needs help to understand both semantic and syntactic facets of input. This help, sometimes referred to as “modification” of the input, can consist of such features as simplification, elaboration, or added redundancy (Larsen-Freeman & Long, 1991). Similarly, Brett (1998) posits that language learning is a two-step process of noticing followed by meaning negotiation. He claims that in effective designs multimedia first promotes noticing, then users must negotiate meaning by taking some kind of action such as accessing additional information or completing tasks.

Chapelle (2001:70) states that modified interaction occurs in case of an interruption of meaning making due to a comprehension or production breakdown. “The modification refers to the interruption that disturbs the unproblematic flow in meaning making. In CALL materials, opportunities for interruption are often built in through interactive sequences and help options”. She contends that in a computerised reading situation normal interaction means receiving input and requesting more input by scrolling down the page. When the reader cannot understand or remember something the normal interaction sequence is interrupted by the learner clicking on glosses for grammatical or semantic clarification or by scrolling back to reinforce or verify memories of certain information. “When the learner modifies a strict linear pattern in moving through the text to go back beyond what is shown on the screen, there is evidence for modified interaction“ (Chapelle, 2001:76).

Chapelle (2001) in an attempt to prove the favourable effect of interactional input modification lists several studies: Lyman-Hager et al., 1993; Chun & Plass, 1996; Lomicka, 1998; Hegelheimer, 1998; Laufer & Hill, 2000, who all investigated the extent to which various forms of on-line ‘vocabulary help’ facilitated L2 learners’ reading comprehension and

vocabulary retention. Taking everything into account, the findings suggest that learners do benefit from interactional modification in the form of hypermedia glosses.

As the above research results show, the interactive nature of computers has proved to be beneficial for foreign language learning in general and in L2 vocabulary acquisition in particular. It is worth further investigating how the quality and appropriate use of hypertext glosses can influence the effectiveness of hypertext computer technologies in vocabulary acquisition .

2.8.4 The value and effect of input enhancement through electronic glossing

The impact of glossing individual vocabulary items as a way of interactional input modification has recently been in research focus. Davis (1989), for instance, contends that hypertext glossing offers two basic advantages. One of them is that the information in the annotations is invisible, therefore it does not interrupt the reading process. The other one is that readers control the amount of information available in the gloss as they wish. Jacobs (1994) speaks of computerized glossing as an effective means promoting both L2 vocabulary acquisition and research. Through the use of glosses learners can get help with unknown vocabulary items, and researchers can study the information obtained with the help of a tracking device about individual learners' reading strategies and study behaviors. Davis (1989) points out that computer aided hypermedia glossing can provide much more than the "traditional" glosses (definitions, translations, and grammatical notes). Hypermedia-annotated texts render it possible for the readers to approach the target passage they read more globally, rather than linearly. More global text comprehension can be achieved through the provision of multimedia annotations including images, sounds, cultural, historical and geographical references, etc. (Ibid.).

In a study Roby (1991) found that subjects using both a dictionary and glosses read the text in significantly less time than those who used only a dictionary. Roby found no difference between the two treatment groups when measuring comprehension, and that subjects using computers looked up significantly more words than subjects in the paper conditions. "Qualitative data from a post-experimental questionnaire indicated that subjects in the computer treatments were more satisfied with the semantic support available to them than were subjects in the paper conditions" (Roby, 1999).

Godwin-Jones (1994) is convinced that the provision of a large set of comprehension annotations offers a very rich language input system. Chanier and Shelva (1998) also state that by augmenting input with a variety of learning support resources, (e.g.; on-line dictionaries, subtitles, and comprehension tasks, etc.) learners possess the necessary resources to make non-comprehensible input comprehensible.

Researchers have been trying to find out as much as possible about the effect of applying a variety of glosses in various modalities. The gloss types that have been investigated include printed text, graphics, video, and sound. Researchers such as Chun & Plass (1996); Davis & Lyman-Hager (1997); Lyman-Hager, Davis, Burnett, & Chennault (1993), Martinez-Lage (1997) have all been trying to identify which gloss types facilitate vocabulary acquisition and retention the most (Al-Seghayer, 2001).

As pointed out by Davis & Lyman-Hager (1997), computerized glosses are appealing, because the computer's capacity allows for a more complex, many-sided and interesting glossing than a printed format does. "Furthermore, a computerized gloss does not interrupt the reading process because the glossed item is invisible until the reader clicks on the target word." (Son, 2001:31).

In Martinez-Lage's (1997) view the value of multimedia annotations can be attributed to several factors. They provide immediate access to the available information in textual, audio, and visual formats. Readers, who, thanks to the programs' interactive nature, are actively involved in the reading process, can access the desired information without seriously having to interrupt or disturb the reading process, unlike when looking up words in a dictionary. The visual information in multimedia annotations that complement the written word form help readers to "... confirm or reject hypotheses made about the meaning of a word" (Martinez-Lage, 1997:150).

In a qualitative study investigating the effect of multiple-choice glosses and periodic second language text reconstruction on lexical acquisition Rott & Williams (2003) asked L2 readers of German to retell the content of four reading passages with four unknown target words in each text. Half of the participants were aided by multiple-choice glosses for the target words. Among other results Rott and Williams found that multiple encounters with the glossed words assisted learners to understand the words better, glosses prompted learners to look for concrete meaning and form-meaning mapping.

On the whole, research conducted by Brett (1997, 1998); Chun & Plass (1996, 1997); Hulstijn, Hollander, & Greidanus (1996); Lomicka (1998) on the effectiveness of annotations on text comprehension and vocabulary learning found them to be beneficial to several aspects of language learning (De Ridder, 2003). Based on the findings of input-based research (Davis, 1989; Jacobs, 1994; Watanabe, 1997; Jacobs, Dufon & Fong, 1994; Pak, 1986), Rott & Williams (2003) also affirm that glosses, in general, have been shown to aid or at least not interfere with text comprehension. However, they also add that the use of glosses containing merely L1 meaning have resulted in mixed findings in vocabulary learning and retention research.

Hulstijn (1992) puts forward the '**mental effort**' hypothesis, which claims that "... inferring requires mental effort and the greater the mental effort, the better a learner's recall and retention of information acquired through that effort". On the basis of this hypothesis, Hulstijn (1992); Laufer & Hulstijn (2001), Nation & Coady (1988) claim that inferred meanings are more likely to be remembered than meanings provided by glosses. They also admit, however, that in order to be able to infer word meanings from context correctly, learners must be familiar with 95% of the words in a given text. As a compromise, Hulstijn (1992) proposes multiple-choice glossing, which unites the advantages of both inferring and glosses. **Multiple-choice glossing** means the provision of several gloss options that the learner can choose from. Hulstijn argues that this approach provides sufficient context offering the possibility for inferences, and also requires attention as well as mental effort that generates a deeper processing level (see also Craik & Tulving, 1975; Jacoby et al., 1979), which in turn facilitates word recall and retention. Rott and Williams (2003) propose that this effort also involves two more components of involvement load (Laufer & Hulstijn, 2001), namely a certain degree of search and evaluation. During the use of multiple-choice glosses, learners first consult gloss options search for meaning. After evaluating the different meanings they decide which one is most suitable for the target word context. "Thus, the use of multiple-choice glosses may increase the chances of establishing form-meaning connections as compared to single L1 glosses or normal unenhanced reading, potentially leading to lexical acquisition and retention" (Rott & Williams, 2003).

As can be seen from the opinions and studies described so far, most researchers have agreed on the general usefulness of hypertext glosses for vocabulary acquisition and retention. They acknowledge that software programs need to provide the learner with support in the

form of dictionary definitions, etc. in order to help learners over the problematic parts of reading. However, there has been some concern that the use of glosses may lead to excessive clicking (Roby, 1999), which may result in superficial, short-term learning. This problem raises the issue whether hyperlinks in programs should be highlighted or invisible (see De Ridder, 2002). Highlighting hyperlinks and therefore making them very visible helps noticing, i.e. it guides learners' attention to the potentially problematic target word forms. However, as mentioned above, it may also encourage learners to click excessively, which could lead to a more temporary retention as a result of processing the particular lexical units more shallowly. It is hypothesized that existing but invisible hyperglosses, on the other hand, may incite learners to use annotations more rationally and circumspectly, and rely on inferencing from the context more heavily. This enhances mental effort and allows for deeper processing, which is likely to result in firmer acquisition and longer retention (Al-Segayer, 2001).

Davis & Lyman-Hager (1997) conducted a study with forty-two intermediate level students of French reading a glossed excerpt, in which they examined both students' performance and attitudes. Although the participants' attitudes towards hypertext annotations were quite positive, no evidence was found for the relationship between comprehension and computer use. The participants' positive attitudes towards computerised annotations were accounted for by the researchers with three factors:

- the provision of coherent understanding of the reading passage without too many disruptions by having to use a conventional paper dictionary
- participants could solve meaning difficulties independently without having to apply social cognitive strategies
- hypertext annotations contained more ample and complex materials than traditional dictionary entries (Davis & Lyman-Hager, 1997)

Lyman-Hager et al. (1993), who studied the interrelation of vocabulary acquisition and student glossing choices for intermediate level students studying French concluded that students working with the hypermedia-based glosses were able to retain target words better than those reading a non-computerized text with the same annotations in traditional paper format. Immediately after reading the text, the subjects were asked to perform a written record protocol and one week later, a delayed vocabulary quiz of the target words in the story was

conducted. Davis & Lyman-Hager (1997) found that out of the various types of glosses available students tended to consult mainly the English (i. e. the L1) definitions.

Hulstijn, Hollander, & Greidanus (1996) investigated the impact of marginal glosses, dictionary use, and the reoccurrence of unknown words on incidental vocabulary learning. Advanced students of French read a slightly adapted text under one of three conditions: marginal glosses, dictionary use and control. In the conditions where participants could use marginal glosses or dictionaries, incidental vocabulary learning was found to be higher (Lomicka, 1998).

Lomicka (1998) examined the influence of multimedia annotations on the level of comprehension by studying twelve college students of French, who read a text under one of three conditions: full glossing, limited glossing, or no glossing. The program also included a tracker component that recorded the number and the type of glosses consulted as well as the length of each consultation time. The data gained in this way clearly "... indicate an increase in the number of causal inferences generated for students who had access to full glossing. Computerized reading with full glossing may promote a deeper level of text comprehension" (Lomicka, 1998:41).

Assessing the effects of an electronic glossary on reading comprehension of authentic texts Leffa (1992) found that a computer-based electronic glossary was more efficient than a traditional bilingual dictionary. Beginning level students understood 38% more of the passages in 50% less time.

Aust et al's (1993) comparative study of hyper-reference and conventional paper dictionary use, on the other hand, shows no significant differences in comprehension. By hyper-reference they meant "... an electronic reference that offers immediate access to supportive information with a clear and direct return path to the target information" (Aust et al. 1993:64). They examined consultation frequency, study time, efficiency, and comprehension. Their results indicate that hyper-reference users consulted over twice as many definitions as participants using conventional dictionaries (Son, 2001:32).

Koren (1999) investigates the effect of glossaries on vocabulary acquisition. By using glossaries the appropriate meaning is readily available without having to a) look it up in a dictionary b) choose the suitable meaning out of several possible ones. However, in Hulstijn's (1992) opinion, the impact of glossary use on the retention of new lexical items is doubtful. In his mental effort hypothesis he proposes that the retention of an inferred word meaning will

be higher than the retention of a given word meaning. Another problem raised by Koren (1999) in connection with glosses is that they have to be 'tailor made' i. e. prepared by the teacher or program developer for each text whereas traditional dictionary look-ups require no special preparation of any kind. What is more, students permanently depending on glossaries in order to be able to read a text will not easily become independent readers. "In this light a glossary can be a means or a stage in the learning process, but the skilled use of the dictionary as well as good inferring skills should be the next step" (Koren, 1999).

In their study Laufer & Hilll (2000) investigated the relationship between learners' look-up behaviour and how well words looked up were remembered incidentally. The hypertext annotations included explanation in English, L1 equivalents, sound, root, and some other information. After a pre-test the university level EFL students were asked to understand the text in order to be able to take a comprehension test after reading it. After reading the text, participants were given an unexpected vocabulary test of the words that had proved to be unknown to the students in the pre-test. "Results suggest that different people have different lookup preferences and that the use of multiple dictionary information seems to reinforce retention" (Laufer & Hilll, 2000:58).

At the same time Chapelle emphasizes that the research in this field has been so varied both in terms of the issues investigated and the research methods applied that it is extremely difficult to summarise the accumulated body of research. She mentions research topics ranging from effects on reading comprehension, preferences for certain gloss types (e. g., L1, L2, text, audio, image) to influences on vocabulary learning investigated using think-aloud protocols, experimental within- group designs and interaction analysis. Chapelle also expresses that much work still needs to be done in this area. Although the issue of interactional modifications with on-line linguistic input can immensely improve CALL, more research is needed to clarify the relationship between the use of glosses and acquisition of vocabulary through online interactional modifications (Chapelle, 2001).

Rott (2005) points out that in spite of numerous investigations into the effect of reading materials with L1 or L2 glosses (e.g., Hulstijn, 1992; Hulstijn, 1993; Hulstijn, Hollander, & Greidanus, 1996; Hulstijn & Trompetter, 1998; Jacobs, Dufon & Fong, 1994; Ko, 1995; Laufer & Hulstijn, 2001; Watanabe, 1997), there have been inconclusive findings concerning the long-term retention of words. Studies proved the beneficial effect of L1 glosses (e.g. Ko, 1995; Hulstijn et al., 1996), and, as a rule, showed superior word gain when

measured immediately or one hour after the treatment (e. g. Jacobs et al., 1994; Hulstijn et al., 1996; Watanabe, 1997), but the same good retention results were not measured in two, three or four weeks' time. Hulstijn & Trompetter (1998) and Laufer & Hulstijn (2001) found that students engaged in an output task (writing a composition), outperformed those who used a text enhanced with glosses in a vocabulary retention task Rott (2005) claims that the results of these mostly quantitative studies have often been interpreted speculatively, because they did not elicit and account for subjects' word processing behavior. Rott urges further qualitative investigations to gain better insights into the motivational and cognitive factors that play an important role in the retention of words.

2.9 THE ROLE OF FORM AND MEANING IN L2 VOCABULARY ACQUISITION

2.9.1 Introduction

Having concluded that the implementation of hypertext glosses can promote vocabulary acquisition in general, as a next question it should be examined what kind of gloss content helps most. Is it meaning-focused or form-focused linguistic gloss content that is more advantageous for the purposes of vocabulary acquisition? To find out about this is also one of the main issues investigated in the current paper.

It has been shown that form and meaning compete (VanPatten, 1990). Whether attention paid to word form or word meaning is more important for successful L2 vocabulary acquisition has been a topic of ongoing debate for researchers. Should form-focused instruction be practised, which develops explicit knowledge, or we should aim at meaning-focused instruction that results in implicit knowledge? In studying new vocabulary is it the meaning- or the form-oriented learner-reader orientation that yields both better immediate acquisition and long term retention of the new lexical items? N. Ellis (1994a, 1994b, 1994c, 1995, as cited in Singleton, 1999:152) claims that there is a complete dissociation between the semantic and the formal aspects of vocabulary acquisition. Focus on form or meaning refers to the allocation of attentional resources. Because of limited processing capacity, learners can often only focus on either meaning or form. (Hegelheimer & Chapelle, 2000; Van Patten, 1989). The construct for input to become intake through noticing is called 'focus on form'. When communication breaks down in an otherwise meaning-focused activity, students' attention shifts from meaning to linguistic form. (Long, 1991). Ellis (1995) states that the

acquisition of semantic aspects of words involves conscious, explicit learning, whereas the acquisition of formal aspects of a word is basically implicit and unconscious in nature. The question is whether it is processing materials in a more meaningful way (top-down) or processing them in a more elaborate way (bottom-up) that facilitates memory processes more significantly.

2.9.2 Form-meaning relations in input processing

Comprehending new lexical items in written texts or speech is a necessary prerequisite of acquiring them. Therefore understanding how formal and semantic elements in input are processed may be of great importance in vocabulary acquisition. Concerning the quality of input processing there are some researchers who swear by the processing of form, others side with the importance of meaning, and yet others hold a more balanced position stating that the problem is more complex. The following three sections of the thesis are going to elaborate on each of these approaches.

2.9.2.1 Dominance of form in input processing

Some researchers firmly believe that it is the elaborateness of processing that really matters in memory performance. Slamecka & Graf (1978) found that retention was improved when learners had to generate rhymes like 'save-cave' rather than read them. Similarly, Nelson (1979) found that it is phonemic rather than semantic processing that will improve memory. Apparently, the process of generating rhymes leaves deep traces behind in the learner's memory.

Jorgensen (1990) found that L2 learners, at the early stages of development, appeared to be more dependent on phonological links on the basis of sound similarity. Jorgensen concluded that phonological and orthographic surface forms of the word played a particularly significant role in L2 learning and use.

Laufer (1998) also reports evidence produced in crosslinguistic picture naming and translation studies for the significance of phonological form in L2 lexical learning. It is especially true for beginning L2 learners who tend to use the L1 surface form in order to access underlying conceptual knowledge. Referring to Ellis & Beaton (1993), Laufer (1998)

points out that similarities in phonological form also prove to be an important error predictor in paired associate learning studies where L2 learners appeared to be less sensitive to word-level phonological information than L1 controls in induced error studies.

Hulstijn (2001) contends that beginning L2 learners tend to link the second language word form to a corresponding L1 word form, which means that words in the second language are treated as some kind of “... phonological or orthographic extensions of L1 lexical entries”. This is how Henning (1973, as cited in Hulstijn, 2001:260-261) accounts for the phenomenon that beginners mix up phonologically similar words more frequently and semantically similar words less often as compared to advanced learners. At a later stage of development they link the L2 words to their conceptual meaning.

Bogaards (2001) conducted two experimental studies in which he examined how different types of lexical units are learned. In the first study, completely new lexical units were compared with multiword vocabulary items that were made up of forms already familiar to the learners. In the second experiment, different types of new senses of familiar forms were compared. Both studies underscored the importance of knowledge of form, rather than that of previously learned meaning, for the learning of new meanings for familiar forms.

2.9.2.2 Dominance of meaning in input processing

VanPatten (1990) proposes that in input processing the main dilemma is to decide whether form or meaning has a priority over the other. He claims that in processing a second language it is meaning that will have priority, which means that much fewer processing resources are left that can be applied to formal features. He reasons that if it is so, then meaning-oriented tasks interfering least with processing will lead to better understanding. Based on a comprehension study VanPatten (1990) shows that the limited nature of processing capacity puts constraints on what can be extracted from input in real time. This means that the otherwise useful formal linguistic features are not likely to be attended to, which may hinder that learners can detect the differences between their interlanguage forms and the target forms. VanPatten claims that there is a potentially inverse relationship between processing for form and meaning when the overall cognitive demands are sufficiently high. He declares the following input processing principles (P = principle):

- P1 Learners process input for meaning before they process it for form

- P1(a) Learners process content words in the input before anything else.
- P1(b) Learners prefer processing lexical items to grammatical items (e.g. morphological markings) for semantic information
- P1(c) Learners prefer processing "more meaningful" morphology before "less or non-meaningful morphology"
- P2 For learners to process form that is not meaningful, they must be able to process informational or communicative content at no (or little) cost to attention (VanPatten, 1990:14-15)

On the basis of experimental results Skehan (1998) also concludes that in natural input processing focus on form is only of secondary importance, but formal aspects of input can be made noticeable by instructional intervention. Therefore, the pedagogic challenge is to create activities for L2 learners which are both meaningful and provide an opportunity to focus on particular formal features as well.

Craik & Lockhart (1972) argue that the long term retention of some new information depends on the shallowness or depth of processing. On the basis of experimental evidence where semantic processing resulted in better long term retention they claimed that processing the phonological or orthographical form takes place at a rather shallow level, whereas the meaning requires a much deeper level of processing (as cited in Hulstijn, 2001:269). Examining the effects of semantic elaboration versus structural elaboration on memory for new words in a second language Barcroft's (1993) research also found that input could be made more comprehensible through the negotiation of meaning.

As could be seen, although there are researchers who are in favour of the dominance of form in input processing, while others emphasize the dominance of meaning over form. There are yet other scholars who claim that form and meaning should be handled in unison, since learning new vocabulary is about strengthening form-meaning connections in the target language.

2.9.2.3 Complex approach to the importance of form and meaning in input processing

Other researchers took a more complex approach to the problem of the importance of form or meaning in lexical processing. Godwin-Jones (1994) emphasizes the significance of

both form and meaning: “Second language learners tend to learn new lexica through phonological similarity as well as through semantic association. Co-textual relations (collocations, clichés) could be included as well”.

Singleton (1999) firmly believes that the respective form and meaning have similar roles in lexical acquisition and processing in L1 and L2. He also emphasizes the importance of formal attributes in the early stages of dealing with new lexical items. Referring to the studies of Baddeley et al. (1988), Ellis & Beaton (1995); Papagno et al. (1991); Service & Craik (1993), and Service & Kohonen (1995), Singleton concludes that the phonological factor is not characteristic of the L2 mental lexicon “... but is prominent in the early stages of dealing with particular lexical items in both L1 and L2 – not, though, ...to the exclusion of meaning-oriented operations” (Singleton, 1999:151). Singleton highlights the significance of semantic associations in lexical processing “...these (1) clearly inform the apprehension of new lexical items – even in the early stages of these process, (2) are a significant organizing element in the mental lexicon, and (3) are a factor in lexical access” (Ibid.:273). He concludes that ignoring either form or meaning in lexical research and concentrating only one of them is a reductionist attitude through which no real picture of the lexical processing can be formed (Ibid.)

De la Fuente (2002) also holds the view that being able to decode meaning without paying substantial attention to the form of a new word may mean that sufficient cognitive resources have not been deployed to adequately process the word that, in turn, may lead to intake or further processing, and consequently the potential for acquiring the word will be lessened. A summary of recent findings is that more complex L2 information may be learned best in enhanced conditions, where attention is guided to form while processing for meaning.

2.9.3 Formal and semantic intralexical and intralingual factors, crosslinguistic interaction affecting L2 lexical acquisition

The word to be learned may also inherently carry difficulty factors that make the learner’s life difficult. By nature these difficulty factors can be intralexical and intralingual factors, or affected by cross-lexical interaction between the source and the target languages.

2.9.3.1 The role of intralingual factors in L2 vocabulary acquisition

The ease or difficulty of memorization and retention of various words can be attributed to several linguistic factors. Clark (1993:241) investigating primarily first language acquisition, claims that from an early age children "... build up semantic fields, adding further terms to each domain as they elaborate their vocabulary". She names conventionality, contrast, transparency, simplicity and productivity as the most important principles of lexical acquisition. The principle of contrast means that for children each different form they encounter indicates a different meaning, while conventionality means that they use forms conventional in their language community. Carter & McCarthy (1988) state that word difficulty may result from its relations to other words, either in L2 and L1, polysemy, whether the word is learned productively or receptively, the associations the word forms in the learner, pronounceability and the nature of context in which the word is found.

Rodgers' (1969) subjects found nouns and adjectives easier to learn than verbs and adverbs. Phillips' (1981) subjects had more problems learning verbs or adjectives than learning nouns. N. Ellis & Beaton (1995) explain this phenomenon by the better imageability of some parts of speech (especially nouns) and this in turn explains why they are acquired more easily. Laufer, on the other hand, does not attribute potential processing difficulty to specific grammatical categories. .

Laufer (1997) also lists several intralexical factors that affect the learning of unknown words in a second language. These include both formal and semantic difficulties. To formal difficulty factors belong pronounceability, orthography, morphological complexity, word length, grammatical category (syntax). Learners tend to avoid words that they find difficult to pronounce (Levenston, 1979), which may also affect comprehension. Referring to Gibson & Levin's (1975) experiments in which participants could perceive the pseudo words they found them easier to pronounce more accurately, Laufer concludes that, in the absence of meaning, pronounceability facilitates word perception and hence the acquirability of new lexical items. Laufer is reluctant to directly attribute difficulty in lexical acquisition to word length. With regard to morphological complexity she mentions derivational complexity (Benoussan & Laufer, 1984; Laufer & Benoussan, 1982) stating that learners show a tendency to mistake morpheme combinations for similar usages and combinations. Examining semantic-pragmatic

intralexical factors that cause difficulty in lexical processing and acquisition Laufer lists "... specificity of meaning, multiple meaning, metaphorical meaning, connotational and stylistic nuances, and synonymy" (as cited in Singleton, 1999:143). Based on the intralexical difficulty studies discussed above, Singleton concludes that there is no convincing evidence that the L2 mental lexicon is basically form-driven. Laufer (1993) also agrees that most problems in vocabulary acquisition are meaning related, which implies that processing new words in the L2 mental lexicon involves the processing of semantic rather than formal features. Sonaiya (1991:274) also refers to the primary task in vocabulary acquisition as the "... continuous refining of meaning and readjustment of boundaries between lexical items that have already been acquired and subsequent items that are encountered". Let us examine in detail how the various intralexical features of L2 vocabulary can affect memorization and retrieval.

Pronounceability

Phonological difficulties may be related to phonemes, and their combinations as well as suprasegmental features (Laufer, 1997). The phonological features of the learner's mother tongue determine what is considered difficult in the L2. The word's phonotactic regularity, and familiarity with the word's phonological features affect learning and remembering the word. Words that are perceived easier to pronounce are more easily memorized and retained. Learners tend to avoid phonologically difficult words, and the weakening of unstressed vowels may also cause difficulties. (Laufer, 1997). This phenomenon may act as a difficulty factor when the acquisition of novel words takes place through an oral-aural channel, therefore it will not interfere in the receptive acquisition of written words.

Orthography

When learning a novel word the learner must recognize its orthographic pattern (or the sound pattern), which may involve matching grapheme-phoneme correspondences so as to integrate the new item into the phonological system of the auditory input lexicon (Smitt & McCarthy, 1997). Taylor (1992) maintains that when elementary learners encounter a new word they mainly concentrate on how it sounds, rather than on its meaning. They certainly aim to understand meaning, but they tend to encode a new lexical item into their mental lexicon on the basis of its sounding and spelling. More proficient students also use other, more sophisticated strategies (Taylor, 1992). The more sound and script correspond in an L2 word, the more easily it can be learned. If learners can easily guess which letter combinations

represent which sounds it facilitates memorization. English spelling, however, provides next to no clues as to how a word is pronounced. Words with sound-script incongruence may be responsible for learning problems (Laufer, 1997).

Word length

There is inconclusive research evidence whether longer words are more difficult, Coles (1982) found that long words produced more errors and were not so well learned in written word recognition tasks. Word length, however, can be counterbalanced by morphological transparency. Words in which learners encounter familiar morphemes are likely to give less comprehension and memorization problems. Psychological research provides evidence that even though longer words usually take longer to identify, sometimes shorter words can be more puzzling. In English, short Anglo-Saxon words are more frequent than longer Latin words. Word length can be calculated in different ways and it is difficult to separate length from other factors affecting vocabulary learning (Hulme et al., 1991).

Morphology

Referring to first language acquisition Clark (1993) states that children prefer using transparent lexical units, i. e. familiar word roots and affixes. As a rule, productive and simple word forms are transparent, which, however, does not mean that all semantically transparent words are simple or productive in form (Clark 1993). Nation (2001) also claims that words will be easy to learn if they consist of known stems and affixes and it depends on how regularly they fit together. Kelly (1991) found that Greco-Latin roots help learners guess or predict the meaning of unknown words, assist them in learning their spelling, and the etymology helps them memorize and retain their meanings. Hill (1996) also found that the effectiveness of vocabulary learning could be enhanced by increasing learners' awareness about unknown lexical items, i.e. by encouraging students to identify any familiar parts (roots or affixes) that they might recognize from other words they knew. The morphological transparency of an L2 lexical item depends on both the inflectional and the derivational complexity of the word. Inflections, which do not change meaning or part of speech of stem, typically indicate syntactic or semantic relations between different words in a sentence. The inflectional complexity of a word depends on the markedness of endings to indicate various grammatical functions. Plural, gender, and case, for instance, may cause learning difficulties due to the number of different forms. Derivational or lexical markers, which change the meaning or part of speech of a word, typically indicate semantic relations within the word

(Hatch & Brown, 1995). Morphological transparency also makes it easier for learners to decompose derived words, and thus it facilitates word perception and learning. Similarly to inflectional affixes, regular meanings of derivational affixes make vocabulary learners' lives easier. An exception to this is 'deceptive transparency' when interpreting parts of words as meaningful morphemes learners assume that the sum meaning of these parts will form the meaning of the whole word (Laufer 1997).

Grammatical – syntactic features

Word formation in isolation from the rest of the grammatical information would make little sense. Clark (1993) states that the principles of transparency and familiarity apply to syntax as well. For instance constructions with more familiar words are more transparent, and therefore they are more easily accessible. Concerning simplicity, full forms (as opposed to contracted ones) and overtly marked constructions (e.g. relative constructions with 'that' rather than its zero form) are more easily acquired. Also constructions that are more productive can be more easily acquired than more constrained, idiomatic ones (Clark, 1993). According to Landau & Gleitman's (1985) syntactic bootstrapping behavior hypothesis the meaning of a word is determined by its syntactic behaviour. The word's syntactic behaviour in a phrase and in a sentence is often predictable. Syntactic patterns, verb arguments, positional analysis of word class, grammatical word class information all shed light on the grammatical role of the word to be learned in context.

Certain grammatical categories are thought to be easier to learn than others. Nouns were found to be the easiest, and adverbs the most difficult to learn with verbs and adjectives in between (Phillips, 1981). Singleton (1999) states that on the basis of available research evidence it is difficult to say which parts of speech in the target language are more difficult to learn than the others. Rogers (1969) found that nouns and adjectives were easier to learn than adverbs or verbs. Phillips' (1981) research shows that students have fewer difficulties with nouns than with adjectives or verbs. Allen & Vallette (1981) propose that adverbial phrases are particularly problematic. N. Ellis & Beaton (1995) point out that some nouns are easier to learn because they are more imageable.

Collocations

Relying on the findings of the COBUILD project Sinclair (1991) suggests that texts are primarily analyzed idiomatically. Collocations, lexical phrases, formulas, idioms are

essential in both L1 and L2. Besides knowing a whole network of associations between the word to be learned and other words in the target language, knowing collocations also means knowing which other words it can occur with in a sentence (Taylor, 1992). Nation (2001:317) defines collocations as "... any generally accepted grouping of words into phrases and clauses", and from the point of view of learning he defines collocations as "...items that frequently occur together and have some degree of semantic unpredictability". Nation (2001) maintains that collocations are processed as a unit, rather than by its constituent words. There has been a long debate whether formulaic chunking or rule-based processing takes place when learning vocabulary in an L2. Referring to the available research evidence Nation (2001) claims that high frequency items are learned (and stored separately) as formulaic chunks, whereas low-frequency items are recreated by rules whenever they are needed. Nation also maintains that the longer the collocations are the less frequently they are used. The receptive learnability of a collocation depends on how predictable its form and meaning are, i.e. to what extent the meaning of the whole collocation can be guessed from the meaning of its constituents. The less opaque a collocation is semantically and the less unique it is in its meaning, the less learning burden it represents for the students.(Nation, 2001). Laufer (1997) also stresses that idiomatic expressions are more difficult to comprehend and learn than nonidiomatic ones.

Semantic features: synformity, polysemy, sense relations, specificity, register restrictions, connotations

Concrete words are easiest to learn Allen & Vallete (1972). Laufer (1997) claims that concreteness by itself does not result in ease in learning, and concrete words may also be difficult if they have other features causing difficulty. Lyons (1977) claims that parts of speech have a language-independent semantic core. The closer to this core a word is, the easier it is to learn. There is research evidence that words denoting "... concrete, tangible, physical objects are learned more successfully than other types of nouns" (Hatch & Brown, 1995:220). Ilson (1983) identified etyma and cognates, the morphological analysis of the words' constituent structure including word formation, and analyzing the development of metaphorical structures as the most important etymological information that can help students learn new vocabulary.

Similar forms with different meanings, partial or semantic overlap, metaphorical meanings, different connotations are likely to induce difficulty (Hatch & Brown 1995). Mixing up similarly sounding and or looking L2 word forms (synforms) present a problem in reading comprehension. Students experience acoustic form interference. Hatch & Brown (1995) believe that they are reading a familiar form. The more different meanings a particular word has (i.e. the more polysemy is present) the more difficulty they can mean for students. Learners are often confused by encountering a known word in a new, unfamiliar context or with a new unfamiliar function (Taylor, 1992). The words under study did not possess such features, so neither synformity nor polysemy could present a difficulty that could result in the ineffective memorization or retention of certain lexical items. Blum & Levenston (1978) report that learners tend to use general terms (superordinates) in cases where L1 speakers use more specific terms (co-hyponyms). Register-neutral terms tend to be generalisable to a wide variety of contexts and thus are preferred by learners to register-specific ones (Laufer, 1997). The extra dimension given to the word's literal meaning (i.e. its connotational meaning) is often culture-specific, which, together with culture-dependent register differences may also cause problems for learners in acquiring them.

Frequency

Clark (1993), referring to Schwartz & Terrel's (1983) study also claims that children tend to learn words presented more frequently. She states that this category involves both token and type frequency, and type-based frequency in word formation, taking the productivity of a certain affix (often dependent on its frequency). The likelihood of encountering a word in speech or in print may also affect the ease or difficulty with which students can learn it.

2.9.3.2 The role of formal and semantic cross-linguistic interaction in L2 vocabulary acquisition

Referring to previous research results Singleton (1999) postulates the inevitability of consulting the L1 lexicon in the learning and use of L2 lexis. Both the formal and the semantic dimensions of lexical acquisition and processing are affected by consulting the source language. However, the possibly different syntactic behaviour of the learner's first language and the second language studied, as well as the different mappings between meaning

and the syntactic structures in the two languages may cause difficulties. Learners tend to rely on the L1 syntactic behaviour of the target word when trying to form a hypothesis about its meaning, which may be misleading (*ibid.*). The formal resemblance of an L2 word to an L1 word may have not only formal but also semantic consequences for the language learner. They may not only pronounce or write the L2 under the influence of the resembling L1 word, but they are also likely to try and link it to the L1 word semantically. Moreover, they may even store the L2 word as a variant or dependency of the L1 item.

There are lexical items in the target language which look or/and sound similarly in the mother tongue. “The learning burden of the written form of words will be strongly affected by first and second language parallels, by the regularity of the second language writing system, and by the learners’ knowledge of the spoken form of the second language vocabulary” (Nation, 2001:45). In an L2 one form can have many meanings and one meaning can be expressed by many forms (Laufer, 1997). Laufer (1991) in her categorization of lexical correspondences suggests that similarity to L1 form and meaning, semantic overlap between L1 and L2 semantic grids, and connotation similarity are facilitating factors in L2 vocabulary learning. Carter & McCarthy (1988) also note that international loan words with close cognates are easier to memorize. Hatch & Brown (1995) state that finding cognates in the target language usually makes learners happy as the familiarity with the lexical item makes their life easy. Hatch & Brown point out, however, that false cognates that sound the same, but they mean different things.

In the Lemma Mediation Hypothesis Jiang (2004) proposes that L1 semantic specifications (i.e. lemmas) subserve the processing of L2 forms even for advanced, highly fluent bilinguals. Jiang spotted a strong priming effect for items with only one L1 translation equivalents, and insignificantly weak priming effect for items with distinct L1 equivalents. These results provide support for the view that L2 lexical entries contain L1 semantic specifications (lemmas), and that the processing of L2 forms is mediated by L1 semantic content.

Laufer & Hill’s (2000) study shows that using both L1 and L2 leads to good retention, because in this way students attend to new information more carefully (notice, elaborate, process better) than when they look up the word only in one language. Their results prove that retention is determined by the way of processing new words both under intentional and incidental learning conditions.

According to Ellis (1994:52) words may be forgotten after the first encounter quite easily, however, "... explicit, deep, elaborative processing concerning semantic and conceptual/ imaginal representations prevents this". The favourable effect of L1 + L2 lookup may also be explained by the richness of semantic encoding or by the longer span of attention that multiple items of information require, or by both (Laufer & Hill, 2000).

Studying native speakers and advanced learners of English Hulstijn & Tangelder (1991, 1993) found that more interference was caused by meaning similarity than form similarity. They also noticed that this meaning-generated interference was not true for intermediate learners of English, which phenomenon they explained with the extent of integration of English words into the lexicons of the learners. MacWhinney et al. (2001) declares that, at the beginning of the study, the formal structure of L2 relies on the structure of L1, as the L2 system has no separate conceptual structure. The learner aims to build a separate system of L2 representations by increasing the direct connection between the new L2 forms and conceptual representations. By building direct links between sound and meaning in L2, and by restructuring underlying concepts, the learner increases the automaticity of lexical access in L2, which functions as a protection against L1 interference. Lyman-Hager & Davis (1993:62) report that their participants felt "... the key factor in understanding the passage was accessing word meanings in their native language".

2.9.4 Form-meaning mapping in L2 vocabulary acquisition

When learning a second language students must map meaning onto new linguistic forms, which is a considerable task. They must deal with ambiguity and work out which meaning, or meanings, go with which form, they must identify the semantic fields of L2 and the conceptual domains they cover. They must learn such sense relations as inclusion, overlap or incompatibility. They need to recognize the inflected and derived forms of words and hence be able to identify parts of words including the inflexions used for affixation and derivation. "They must also learn how the semantic and morphological properties of words are linked to their syntactic properties. In short, acquiring the lexicon is a formidable task" (Clark, 1993:14). Such lexical processing is necessary in order to be able to utilize the conceptual knowledge needed for understanding. The semantic knowledge required for language understanding is "... accessed through phonological tagging of the language that is

heard, and facility with the phonological code of the L2 will be the basis for keeping up with the speed of the spoken language” (Magiste, 1985:140).

Clark (1993) considers the mapping of meanings onto forms as one of the most difficult problems in second language vocabulary acquisition. During this process learners must identify possible meanings, isolate possible forms, and then map these meanings onto the relevant forms. In identifying potential meanings they utilize both their conceptual categories and the input they are exposed to. In this way they get possible word forms and some clues to the meanings (syntactic and morphological characteristics of a word form, and usage patterns) of those word forms. When mapping meanings onto forms learners rely on conventionality and contrast, which pragmatic principles regulate the relations between established words and innovations in the lexicon both for adults and children. Clark also underlines the importance of two additional principles that are important for children to analyse word structure: transparency of meaning, and simplicity of form. As a consequence of these principles some kind of regularization takes place, therefore words that have similar meanings as well as similar structures should be easier to learn than words that have similar meanings but different structures. She claims that such regular meaning-form correspondences set up paradigms in the organisation of the mental lexicon. “Words that share elements of meaning but not form with members of a paradigm are liable to be regularized by children. For instance, ‘bicycler’ often replaces ‘bicyclist’, and ‘cooker’ replaces ‘cook’ in young children’s speech“ (Clark, 1993:15). The third principle Clark mentions is productivity stating that more-productive forms should be learned before less-productive ones. She argues that the factors responsible for “... when and how children build up a repertoire of word-formation devices for extending their vocabulary“ are transparency, simplicity, and productivity, together with conventionality and contrast (Clark, 1993:16).

Verhallen & Schoonen (1998) remind us that there is far more to the acquisition of new lexical items than just ‘learning words’, i. e. attaching new meanings to new forms. In first language acquisition Aitchison (1987:170) distinguishes three related tasks which are also relevant for the foreign language learner:

- labeling, which means attaching a label to a particular object,
- packaging, i. e. learning the exact extension of the meaning relationship and
- network building, i. e. fitting all words together in a semantic network.

Bogaards (2001:327) summarizes what learning of a new L2 lexical unit implies as follows:

- Learning an unknown form and a new meaning
- Learning a new meaning for an already known form
- Learning a new meaning for a combination of already known forms (compounds and idiomatic expressions)
- Learning semantic relations between lexical units in terms of synonymy, antonymy, hyponymy, meronymy, and so forth (see Cruse, 1986)
- Learning morphological relations between lexical units – for example, learning that gracefulness is related to the lexical unit grace in the sense of charm, not in that of mercy.
- Learning correct uses of lexical units at the level of grammar.
- Learning the usual collocations.
- Learning the appropriate use at the levels of pragmatics and discourse.

2.9.5 Form and meaning in the L2 mental lexicon

Unlike in print dictionaries, words in the mental lexicon are not stored in separate compartments. Instead they coexist in an elaborate network of associations. Using a word activates this network of associations in the mind. Besides being associated with meanings, words are also associated with each other (Tsai, 1996). Research shows that words in the mind are “... linked together in a gigantic multi-dimensional cobweb, in which every item is attached to scores of others” (Aitchison, 1987:82). Knowledge of the structure of the lexicon is important in vocabulary learning since it is easier to learn organised material than random pieces of information (Anderson, 1990). This form-referent matching is the main characteristic of vocabulary knowledge, however it is not the only organising principle of lexical knowledge in the mind of the user. In the mental lexicon words are connected to other words through form- and meaning-based links. Form-based links include words with the same or very similar sound patterns or the same orthographic representations. Meaning-based links cover such attributes as shared (conceptual) category membership, syntactic category membership, semantic associations such as antonymy, synonymy, etc., as well as words frequently appearing together, for instance collocations and clichés. Besides, crosslinguistic links between L1 and L2 words and concepts also play a very important role in lexical processing. Consequently, knowing a word means activating a network of multiple links with

the help of which the accurate and appropriate meaning of a word can be identified (Harrington & Park, 1997)

Singleton (1999) poses two basic questions about the functions of form and meaning in the mental lexicon. One of the questions is if form and meaning in the L2 function in the same way as in the L1? He answers this question affirmatively stating that in most cases they do. The other question he asks whether the L2 mental lexicon develops and functions independently of the L1? The answer to this question is that although the two lexical systems are separate, they are closely interconnected at the conceptual level.

One claim concerning the respective roles of form and meaning in the acquisition and processing of L2 vocabulary has been that the L2 mental lexicon is based on phonological (i. e. formal) rather than semantic features. According to this claim in a second language the links between words is predominantly phonological, even though in native languages these connections are based primarily on meaning (Laufer, 1989). Singleton (1999), however, asserts that the above claim has not been supported by adequate research evidence. The data in support of the above theory come from Meara's (1983, 1984) Birkbeck Vocabulary Project word-association tests, which revealed that the L2 mental lexicon is significantly different from the L1 speaker's mental lexicon.

Södermann's (1989, 1993) research seems to reinforce what Ard & Gass (1987:249) refer to as "...an increasing importance of semantically based factors in lexical organization as learners increase in proficiency". However, Södermann (1989) also notes that even the most proficient learners still use a large amount of syntagmatic and clang responses, whereas the least proficient group in the experiment gave a lot of paradigmatic responses in the association study.

Hulstijn & Tangelder (1991, 1993) explain native speakers' and advanced L2 learners' susceptibility to semantic interference and their relative indifference to form-based interference by the fact that acquiring the semantic characteristics of a new lexical item takes much longer than acquiring its formal features. Thus Hulstijn & Tangelder view semantic integration as the more challenging component of lexical acquisition, and conclude that the learner will need to rely heavily on formal cues until semantic integration has not taken place properly.

Based on a word association task study, Meara (1978) claims that the L2 mental lexicon is organised primarily on a phonological basis. In his study he found that while native

speakers gave semantically guided paradigmatic or syntagmatic responses, L2 learners tended to give clang associates, i. e. their responses were based mainly on phonological similarity. This result brought him to the conclusion that phonological organization is relatively more important in the L2 lexicon. Meara's phonological view, however, is often criticized referring to methodological shortcomings and the failure to replicate the Birkbeck test. Kroll & Sholl (1992) assert that beginning L2 learners use the L1 forms in order to access conceptual knowledge whereas advanced L2 learners and native speakers access this knowledge directly.

According to Fraser (1995), the mental lexicon is phonologically arranged and accessed by two networks – phonological and semantic. Channell (1988) also suggests that the L1 and L2 lexicons within the same speaker are clearly linked, phonologically, semantically, and associationally.

Accepting Meara (1984)'s assumption, it seems reasonable that the mental lexicon consists of two basic parts: a phonological and orthographical code to identify the form of a word, and a semantic entry that specifies its meaning. It can be assumed that people who have these two types of knowledge will be able to use the language adequately. Yet most often learners do not possess such complete knowledge. Words are often stored in L2 learners' mental lexicon only in a fragmented way. Sometimes learners cannot remember the word even though they feel they know it. They remember half of the word, the number of syllables, the beginning and the ending characters, just the beginning or just the ending of the word. Levenston (1979:154) named this tip-of-the-tongue phenomenon of partially remembering words "threshold vocabulary".

Examining L1 and L2 research results Channell (1990:29) expresses that "... evidence that the L2 user's mental lexicon of a given learner resembles the L1 user's mental lexicon is sparse". Meara (1983, 1984) drawing on the results of Birkbeck Vocabulary Project, claims that there is a great difference between the L2 learner's and the native speaker's mental lexicons (Wolter, 2001:42). Channell (1990) agrees, however, that words in an L1 and L2 mental lexicon are strongly linked and the structure of the L2 mental lexicon of even very advanced L2 learners is influenced by the L1 mental lexicon. Wolter also holds that although phonological connections in the L2 mental lexicon are used more frequently than semantic ones for moderately well known words, with greater understanding of words semantic connections (syntagmatic links) become predominant. "This does not mean, however, that paradigmatic connections are not also important in the L2 mental lexicon" (Wolter, 2001:66).

Kroll & Curley (1988, as cited in Prince 1996:479) provide experimental evidence that in the initial stages of learning, "... new words are strongly linked to their L1 equivalents, and a shift occurs after about 30 months of study, such that a network of links within the L2 begins to become effective". One form of processing is to pay attention to the orthographic and phonological form of the word, by, for example, repeating it aloud (Ellis, N. & Beaton, 1993). Another form of processing is to consciously associate the new word with words already known. During the retrieval of newly learned words learners rely on all the semantic and associative links that supply the meaning of the word to be learned (Prince 1996).

Following Levelt (1989) Chanier & Shelva (1998) declare that there are two kinds of relations between lexical entries, intrinsic and associative. The intrinsic relations are obtained from linguistic characteristics including semantic features (synonymy, hyponymy, antonymy etc.), morphological, phonological, and also graphemic features of a lexical unit. The associative relations are based on words frequently co-occurring in language use. Based on previous experimental evidence Chanier & Shelva (1998) also consider semantic relations that induce tight relations among units as most important, both in intrinsic relations (hyponyms, synonyms, and co-hyponyms), and in associative relations, which rely on encyclopedic knowledge and knowledge of the world. The claim that the mental lexicon is in movement all the time. New contexts may change word associations, some links are strengthened on repeated exposure to words, new relations are added on meeting new words. This is the reason why Aitchison (1987) doubts that it would be possible to identify the rather idiosyncratic links and pathways in the mental lexicon even when observed synchronically, let alone taking the time factor into consideration during its continuous development.

2.9.6 The role of hypertext links in strengthening form-meaning mappings in the mental lexicon

Harrington & Park (1997) contend that there have been several lexical CALL programs with links incorporated. In these hypertext programs users are provided the opportunity to exploit a range of semantic and lexical links within the program and have access to other reference materials in hypertext setting. The availability of multiple links in a computational environment enables the learner to "... encode the L2 word to be learned in a

cognitively richer mode than possible in a discreet item-to-meaning mapping in CALL programs that are used in traditional L2 vocabulary instruction” (Harrington & Park, 1997).

This associative capacity of a hypertext system renders it possible to link any linguistic unit to any other. The use of associative semantic networks, similarly to the work of human memory, allows the integration of new lexical information by restructuring prior knowledge. “Hypertext systems are thus seen to ‘stimulate processes of integration and contextualisation in a way not achievable by linear techniques” (Mayes et al. 1990:2).

De Ridder (2003) emphasises the usefulness of learners making hypertext documents. In spite of the fact that hypertext is only a pseudo-L2 mental lexicon, the process of making hypertext documents is beneficial for vocabulary learning. While building a homepage or a hyperdocument learners come across new L2 words and phrases several times. Building hyperdocuments intermediates between the L1 and L2 mental lexicons by pushing students to search for and create links using both their own L1 and L2 mental lexicons. ”In this way, the process of making hypertext of the learners should have the effect of storing the lexical items more firmly in their minds”(De Ridder, 2003).

Harrington & Park (1997) report Svenconis & Kerst’s (1994) investigation in which they compared the effect of presenting lexical information through semantic links and unstructured presentations in a lexical CALL study. Target words were either organised into a semantic map or presented as unstructured word lists, both with and without the words read aloud. Learners studied four different types of word sets: semantically organised lists with sound, semantically organised lists without sounds, unstructured word lists with sound, and unstructured word lists without sound. The results supported the effectiveness of semantic links. It was proven that links facilitated vocabulary learning in the sound plus semantic information condition. However, semantic links presented on their own yielded poorer performance than in the case of unstructured word lists presented with sound. Curiously, no difference in performance was found between the semantic and unstructured word lists. Harrington & Park (1997) conclude that in order to try and find out the organisation of links in lexical acquisition and development, one has to “... approach link knowledge as a network comprised of multiple link types. The effect of specific links (e. g. semantic, phonological, collocation) cannot be understood in isolation alone”(Ibid.).

Harrington & Park (1997) state that, due to the complex nature of the lexical internal links, a set of links is unlikely to function in isolation. Therefore it is essential to examine

how form-based links interact with other types of links. For this purpose they compare and contrast meaning-based links with the form-based links. They hoped that the comparison of these two link types would be highly informative, and provide a basis for the detailed analysis of the link-based model.

There is evidence that the organisation, or at least the importance in real time processing, of specific link types changes as the learner becomes more proficient in the L2. Form-based processing appears to be relatively more important for the beginning learner, who spends more time processing language from the “bottom-up”. This has important implications for the design of beginning CALL programs. Novice learners are bound up in the orthographic and phonological aspects of vocabulary, and an explicit attempt to develop the links may allow a more rapid development of early L2 vocabulary knowledge. For more advanced learners, the links can be used as a tool for the learner to explore and develop their own networks of lexical knowledge (Levy, 1997).

Lomicka (1998) found that even though participants in one experimental condition group had access to six different types of informational glosses, there was a strong preference for the traditional definitional glosses. Neither pronunciation glosses nor annotations with grammatical information seemed to affect comprehension. The low number of consulting glosses with pictures indicated that participants did not appear to understand the relevance of such glosses (Lomicka, 1998).

Although the role of links in organising the mental lexicon is evident, it has yet to be demonstrated that systematically teaching these links will actually affect the development of vocabulary knowledge in the L2 learner. We still have only a tentative grasp on how these links affect the learning process, and research in this area is needed. (Harrington & Park, 1997). Harrington & Park (1997) mention CALL program developers (Goodfellow & Laurillard, 1994; Harrington, 1994) who tried to incorporate form- and meaning-centered lexicon-internal links into their software programs designed to develop students’ L2 vocabulary knowledge.

The study described in the second part of this work intends to investigate the effectiveness of such form- and meaning-focused hypertext components in L2 vocabulary acquisition compared with a traditional paper-based learning technique, in both incidental and intentional learning conditions.

Chapter 3: Description of the Research

Hypermedia technologies can promote noticing by channelling learners' attention to the lexical items made salient by underlying or applying a different colour in the text, which explains why the application of computer technologies is believed to be useful for the purposes of vocabulary learning in the current research. In the current research it was decided that L2 vocabulary acquisition would be promoted through elaborative simplification in the form of rich linguistic hypertext gloss content. Beyond drawing learners' attention to the target lexical items by making them noticeable hypermedia computer technologies can also provide interactivity (see Sims, 1997). Computer programs can provide authentic linguistic input, which can be later interactionally modified by the learner's requests for help and/or clarification, explanation, corrective feedback, etc. In the current study the learners could interact with the computer and ask for additional pieces of information about the target words by activating the hyperlinks and consulting the relevant gloss content. In the current research the depth of processing (and thereby an expected better retention) is expected to come about by providing redundant elaboration of the target vocabulary in the electronic glosses. Following the principles of constructionist learning theory (see e.g. Jonassen, 1994) the hypertext glosses in the computer program include a multitude of related phonetic, structural and semantic information, which facilitate the memorization of the new lexical items by linking them into the mesh of L2 words and structures already known by the learner. Since there are no multimedia elements applied in the current study, which was designed to be predominantly text-based, the strength of first impression was hoped to be achieved by selecting texts that might raise learners' interest. The individual differences (person's feelings, thoughts, the significance of the information provided to the person, personal general and linguistic knowledge and memories) were not taken into consideration in this study mainly for feasibility reasons. As such individual factors may decisively influence the success or failure of vocabulary memorization and retention, this can be considered as one of the limitations of the present research. In order to enhance the episodic memory of the subjects in our experiment, both the tutorial and the testing sessions were organized at the same time (invariably in the mornings) and on the same locations. Based on the above findings, in order to try and achieve the best possible memory results in the present experiment the researcher

tried to create various mental linkages (see Oxford, 1990) in the treatment groups. The hypermedia glosses provided the widest possible selection of related information. In the meaning-focused glosses, besides providing the definitions in L2 together with common collocations and other examples of use, the target words were also organized in such sense relations as synonymy, antonymy, hyponymy, etc. In the form-focused electronic annotations, next to the phonemic transcription of the new words, their inflected and derived forms were also provided along with their Hungarian equivalents. On the basis of the above (although often contradictory to each other) findings on the structure and processing mechanism of the mental lexico it was decided that in the present experiment form-focused hypermedia glosses would also include the commonest derivational forms of the target words, and that the inflections used with the target words would be clearly indicated as a separate from the stem units. Based on this finding on the beneficial use of bilingualised dictionary entries, it was decided that in the current study the meaning-focused glosses should include both the L2 definitions and the L1 equivalents. As we could see the results on the factors affecting the success of vocabulary acquisition provide a rather complex and varied picture. Among others they include input features, learner characteristics, features of the L1 and L2, the learning strategies applied, etc. By providing a complex, comprehensive gloss content available via input made salient by hypertext links it was hoped that the vocabulary acquisition process of the treatment groups could be affected favourably. To achieve the best possible result in vocabulary learning, the test tasks in the current experiment also exactly replicated the study tasks. Since one of the aims of the present research was to investigate the effectiveness of incidental (as compared with intentional) vocabulary acquisition, it seems logical to study the role of reading and context, through which incidental vocabulary acquisition usually happens. On the evidence of the overwhelming majority of the findings in this chapter in favour of context in lexical acquisition it was decided that all groups in the experiment would be provided with a text-based (with slightly adapted texts) vocabulary learning condition, thus hoping to get improved word acquisition and retention results. To enhance the effectiveness of the vocabulary acquisition, in the current study the words to be learned were presented with in context with as interesting and appealing for the participating students subject matters as possible. Following the above design principles, the computer program applied in the current study was designed and made in such a way that it would promote learning in the most effective possible way. Target vocabulary input was made salient (easily noticeable) through

hypermedia links, and by activating these links (i.e. by interacting with the computer) participants could find and consult a wealth of phonological, grammatical, syntactic and semantic information within the hypermedia glosses to help them comprehend and internalize the target vocabulary items. Taking the above views and findings into consideration (as well as the results of the survey conducted by the researcher himself, cf. Sankó, forthcoming) it was decided that both form-focused and meaning-focused glosses would contain L1 equivalents, as it was hoped that including these would lead to better L2 vocabulary acquisition and retention.

3.1 RESEARCH QUESTIONS AND HYPOTHESES

The main part of the study aimed to measure the potentially different effects of form-focused and meaning-focused input enhancement in the form of hypertext glosses compared to a traditional paper-based no-enhancement treatment through achievement tests. The effects of the three input types (i.e. input enhanced through form-focused, meaning-focused hypertext annotations and non-enhanced input) mentioned above were measured under two conditions (incidental vs. intentional learning) with the same participants. Immediate knowledge gain (acquisition) was measured right after the tutorial sessions, whereas delayed knowledge (retention) of the target words was measured 3 weeks afterwards.

In short, the study had a double focus investigating both a) the effect of interactional input modification through form- and meaning-focused computerised hypertext annotations on L2 vocabulary acquisition and retention, and b) the effect of incidental and intentional learning on L2 vocabulary acquisition and retention when using form- and meaning-focused computerised hypertext annotations. The research questions (RQ) of the study were as follows:

3.1.1 Research questions

Research focus A

RQ: Does interactionally modified input made salient through computer-based hypertext annotations yield better L2 vocabulary acquisition and retention results among intermediate EFL learners than the application of a traditional paper-based text with a bilingual paired-associates vocabulary list to assist learners?

Research focus B

RQ: Is there a difference between the acquisition and long-term retention achievement of the aforementioned intermediate EFL students when they acquire new L2 lexical units incidentally or intentionally?

3.1.2 Hypotheses

The following hypotheses (H) were formulated:

Research focus A

H0: Learners exposed to hypertextually enhanced interactional input modifications in the two experimental groups will attain the same level of L2 vocabulary acquisition and retention as learners subjected to non-negotiated input in traditional paper format in the control group.

H1: Subjects exposed to input during negotiated interaction through link-based hypertext presentation will attain higher levels of L2 vocabulary acquisition and retention than learners subjected to non-negotiated input.

H2: Participants subjected to meaning-focused hypertext input enhancement will outperform learners exposed to form-focused hypertext enhancement in L2 vocabulary acquisition and retention.

Research focus B

H0: Students learning target vocabulary intentionally will attain the same levels of L2 vocabulary acquisition and retention as students acquiring the same vocabulary incidentally.

H1: Students learning target vocabulary intentionally will attain higher levels of L2 vocabulary acquisition and retention than students acquiring the same vocabulary incidentally.

H2 Although in general better vocabulary acquisition and retention results will be achieved in the intentional learning condition than in the incidental condition, the application of form- and meaning-focused hypertext glosses will decrease this difference. This means that in spite of the superiority of test results in the intentional learning condition over those in the incidental condition in general, it is hypothesized that the difference between the attainment of the subjects in the control group in the intentional condition and that of the subjects in the treatment groups (either form- or meaning-focused) will not be significant.

Besides the above mentioned main issues, the study aimed to examine learners' attitudes to and perceptions of hypertextually-enhanced computer-based language learning, as well as to investigate their vocabulary learning strategies in a hypertext environment.

3.2 RESEARCH DESIGN

In order to measure the effects of input enhancement and interactional input modification through computer-based hypertext glosses on vocabulary acquisition, a seven-week cross-sectional study was designed using both quantitative and qualitative research methods.

The design of the current study in part draws on Hulstijn, Hollander, and Greidanus' (1996); Harrington & Park's (1997), Lomicka (1998); Koren's (1999); and Laufer & Hill's (2000) works, however, strictly speaking none of the above can be considered as a base-line study for the present experiment. Considering the complex nature of the study described above a mixed research design was applied. A between-groups experimental design was used to measure the potential effects of form- and meaning-focused hypertext annotations compared to the application of traditional paper-based printed text format. The achievement and behaviour of students were studied in three different groups (i.e. a group working with form-focused hypertext annotations, another group exposed to meaning-focused hypertext glosses, and a third one working with hard copies of the same text complemented only by a bilingual glossary of the target words). The research had a balanced design with forty subjects in each group studied.

To measure the difference in outcome between incidental and intentional vocabulary learning a within-groups repeated-measures design was applied. This means that the same 3 groups involved in the experimental situation described above were studied both in incidental and intentional learning conditions. This was organised by giving these groups two different texts with as similar linguistic characteristics as possible, each text on a separate occasion. Besides studying the potential differences between the form- and meaning-focused enhancement and the no-enhancement conditions, on the first occasion (and with text 1) the effects of incidental learning and on the second occasion (and with text 2) the effects of intentional learning were also measured. In order to measure the effects of the above conditions on the acquisition and retention of L2 lexical units both the between-groups and

the within-groups designs were mixed with a repeated-measures testing battery including an immediate post-test right at the end of the study session., and a delayed post-test three weeks later.

The following experimental conditions were included in the study:

- **Experimental condition 1:** incidental vocabulary learning - printed text with a list of the target vocabulary and its L1 equivalents (control group)
- **Experimental condition 2:** incidental vocabulary learning - computer-based hypertext with form-focused annotations on the target words
- **Experimental condition 3:** incidental vocabulary learning - computer-based hypertext with meaning-focused annotations on the target words
- **Experimental condition 4:** intentional vocabulary learning – printed text with a list of the target vocabulary and its L1 equivalents (control group)
- **Experimental condition 5:** intentional vocabulary learning - computer-based hypertext with form-focused annotations on the target words
- **Experimental condition 6:** intentional vocabulary learning - computer-based hypertext with meaning-focused annotations on the target words

For a comprehensive description of the experiments see Table 1. below.

Table 1. The comprehensive research design box for the study

	<i>Form-focused Enhancement</i>		<i>Meaning-focused enhancement</i>		<i>Zero enhancement</i>	
<i>Incidental vocabulary learning</i>	Immediate post-test	Delayed post-test	Immediate post-test	Delayed post-test	Immediate post-test	Delayed post-test
<i>Intentional vocabulary Learning</i>	Immediate post-test	Delayed post-test	Immediate post-test	Delayed post-test	Immediate post-test	Delayed post-test

The independent variables

1) Concerning research focus A the independent variables consisted of:

- The form-focused computer-based hypermedia enhancement instructional treatment methods
- The meaning-focused computer-based hypertext enhancement instructional treatment methods
- The no enhancement condition instructional treatment methods

2) Concerning research focus B the independent variables consisted of:

- The incidental learning treatment method
- The intentional learning treatment method

The dependent variables

In both the first and the second research focuses the dependent variables consisted of:

- The results of an immediate vocabulary achievement post-test (taken right after the treatment session) to measure the acquisition of the stimulus words, and
- The results of a delayed vocabulary achievement post-test (taken 3 weeks after the treatment session) to measure the retention of the stimulus words

Besides the main research design described above, the subjects' study behaviour, as well as their attitudes and beliefs were also investigated using both quantitative and qualitative methods.

A questionnaire aimed to shed light on the participants' attitudes to computer-based vocabulary acquisition using hypertext/hypermedia annotations. It included such aspects as the ease of use and the perceived usefulness, effectiveness of such hypertext programs, the perceived importance of interaction with the computer and input salience through highlighting, the best/most useful gloss content types, as well as the strong and weak points of the program they used. The learners were also asked whether they had ever learnt English words incidentally (that is as some kind of a "by-product") while they were trying to track down some specific information of non-linguistic nature on the World Wide Web. In case of

affirmative answers they were asked how many of the words learnt in this way they could still remember.

In order to make sure that the subjects really consulted the hypertext annotations, and therefore their vocabulary learning achievement could be attributed to the use of hypertext annotations, as well as to follow their learning strategies through their clicking behaviour, a tracking device was attached to the computer program, which followed and logged the subjects moves in the program.

3.3 METHOD

3.3.1 Subjects

Including the people who took part in the preselection and piloting of the texts and target words to be used in the experiment, a total of 200 students and 8 teachers participated in the study. All the subjects were 14-17 year old secondary school students with an average English learning experience of 5 years. They all belonged to intermediate level EFL classes from 4 different secondary schools located in Debrecen. Based on the evidence of several written and oral tests the students' teachers chose groups with students getting on to the B2 level according to the Common European Framework of Reference (Council of Europe, 2001). All students had had an average of 300 lessons institutionalized English learning experience. Most of them were about to take the Hungarian Intermediate State Language Exam, but hardly any of them had taken it before the time of the experiment. Of the 200 students 61 participated only in the pre-selection of the stimuli words and in the piloting of the tests. Thus the number of students who participated in the actual experiment was 139.

The selection of the students participating in the experiment was based on the following criteria:

Secondary (rather than primary) school students were chosen partly because of their relative cognitive maturity and because the most important part of instructed second language acquisition takes place in secondary schools, mainly due to the learners' favourable age characteristics in accordance with Piaget's (1952, 1979) model of cognitive development.

One of the selection criteria was students' proficiency level. The study focuses on intermediate or near intermediate level students. Research studies concerning the mental

lexicon (see Singleton, 1999) show that at early stages of language acquisition (beginner, elementary) learners predominantly rely on formal features of the lexical units to be acquired whereas at later, more advanced stages (upper-intermediate, advanced) their main support is mainly meaning-centered. Thus, studying intermediate students whether they would perform better using meaning- or form-focused help in the course of their vocabulary learning promised to be an interesting and challenging problem.

Selection of participants was carried out with the help of the students' teachers. Based on the placement tests taken when students enter school, the number of classes per week taught, as well as the results of progress and achievement tests the teachers involved chose some classes after carefully studying the target texts the students were to be exposed to. This, however, was only a preliminary filter of subject selection, followed by a secondary filter of much greater importance, where the final subjects were chosen on the basis of their performance on a self-report vocabulary pre-test.

Due to feasibility reasons subjects participating in the actual experiment belonged to 10 intact classes of intermediate English from 3 secondary schools. The students in these classes were then randomly assigned to one of three experimental treatment groups, each using a different treatment method (form-focused hypertext, meaning-focused hypertext or no-enhancement control). To enhance the external validity of the study, a relatively big number of students were selected for the experiment. In this regard Hatch & Lazaraton (1991:164) state the following, "If there are no very extreme scores and you have 30 or more observations, you may have a normal distribution". Consequently, a total of 139 students from 3 secondary schools were exposed to the various experimental conditions.

Of the 139 students who completed the study, however, several had to be eliminated from the final dataset due to various reasons. These reasons were as follows:

- All students completed a self-report vocabulary test (see Read, 2000:165-167) to ascertain their prior knowledge level. Students who claimed to know the meaning of a nonsense word, or knew more than 1 of the 26 would-be stimulus words (3.84% of all the target words) were eliminated from the final calculations.
- The experiment itself consisted of two study sessions (held on separate days) each followed by an immediate post-test and a delayed post-test session three weeks after the last treatment. Participants who missed any one of these three occasions were not considered in the analyses.

- Students who were present in all study and testing sessions but failed to adequately identify themselves (forgot to write their names or some other signs of identification chosen in order to keep their anonymity) in the log or on the tests in any one of the three sessions, also had to be excluded from the final set of data.

Thus, out of all the available and eligible participants a final pool of 120 students was randomly selected for analysis with 40 students in each experimental treatment group, which rendered it possible to apply a balanced study design. Answering the questions of a preliminary questionnaire (see Appendix B, p. 239) all the subjects to be exposed to computer-based treatment reported that they were already familiar with a computer environment and knew how to use the World Wide Web.

3.3.2 Materials

3.3.2.1 Computer program

To try and influence the word acquisition process by means of enhanced and interactive exposure to the selected L2 words a small-scale hypertext-based computer program was created (find CD in Appendix M, p. 239). The program was uploaded onto the World Wide Web to make it accessible for the subjects in the computer labs of their own schools.

3.3.2.1.1 Software: overview of content and organization

The interactive hypermedia computer program used in this study was designed by the researcher to enhance L2 vocabulary acquisition by providing readers with the necessary annotational input enhancement of target words via hypermedia links. To achieve this the software used in the experiment was made in the form of hypertextually annotated web pages which were then uploaded to a university server.

As the mixed research design of the study included both a between-group and a within-group repeated-measures component, four versions of the program were prepared: one for the incidental and another for the intentional learning condition, each of which had a form-

centered and a meaning-centered version. In all four cases the program functioned basically in the same way, the difference being only in the texts and naturally in the contents of the belonging hypertext annotations. For the incidental learning condition, the text entitled “Pirates” (see Appendix C/1, p. 239) and for the intentional condition the text “Pickpockets” (see Appendix C/2, p. 239) were chosen randomly from a pool of texts pre-selected in the piloting phase by a group of 35 intermediate students of English who did not participate in the experiment, and who also attended a different secondary school from those participating in the actual study.

In each text thirteen words were annotated (see Appendices D/1, p. 239 and D/2, p. 239) and all annotated words were printed in a colour different from the rest of the text. The remaining words in the text were not explained in any way. If they happened to be unknown, students were encouraged to infer their meanings from the context of the whole text provided. Students could look up a gloss by clicking on the word in the text located in the upper frame, which caused the glosses to appear in the bottom frame of the screen. While reading the story, students could look up any of the annotated words as many times as they wished within the time limits of the study session. The duration of each lookup was not limited by the program either. The computer program provided students who were reading a narrative English text with annotations for target words in two modalities – text and sound – all of which were intended to aid in the understanding and learning of unknown words. The program was written in an HTML editor called MS Frontpage 5.0 and then uploaded onto the Internet web server of the Department of English Language Learning and Teaching in the University of Debrecen.

3.3.2.1.2 Screen design principles

In order to achieve the best possible vocabulary learning results screen layout design principles were also considered. Each webpage had a so called frame structure with two connected frames. The screen was divided into two parts by a horizontal line. The top part (2/3 of the screen) was used for the text, the bottom part (1/3 of the screen) was used for the glosses. By changing the position of the horizontal line separating screen contents through clicking and dragging students could see a bigger part of the text or the content of the current annotation according to their current needs and likes. By lowering this line they could see

more of the text, and conversely, by raising it more of the gloss content became visible. Instructions of navigation were also displayed in this latter part, at the bottom of the screen (see Appendix E, p. 239). Such division of the screen was designed to enable learners to view the context of the word while studying the related information in the hypertext annotation in the bottom part. It was hoped that by being able to study both the text (i. e. the context) and the gloss content of a particular word simultaneously, learners would comprehend the text more easily and thereby learn the new target words more effectively.

In order to maintain the students' interest (and also for esthetic reasons) different colours were assigned to the top and the bottom part of the screen. For the incidental condition the background colour of the upper part of the screen was blue while the lower one was white. For the intentional learning condition the background colour of the top part of the screen was yellow and that of the bottom part was white. In all four conditions the texts appeared fully justified in a black Times New Roman font, 12 points. The line length varied flexibly depending on the distributional capacities of the screens used by the learners. This may be important as line length may influence the reading rate. De Ridder (2002) refers to Grabinger and Osman-Jouchoux (1996), who propose a line length of 60 characters, while Dyson & Kipping (1998) find that reading rate can be increased by using a greater number of characters per line.

3.3.2.1.3 Multimodal presentation of information

The principle purpose of the research was to measure predominantly the potential effect of visually- and interactionally- enhanced **linguistic features** on vocabulary acquisition. Therefore the study intentionally focused on the effects of text-only phenomena and consequently used only hypertext trying to avoid multimedia elements. Nevertheless, it was decided that form-focused annotations would also incorporate an audio component, in which a native speaker pronounced each word on request. The compromise of including the audio component was decided upon, because psycholinguistic research on the L2 mental lexicon (see Singleton, 1999) shows that L2 learners in the earlier stages of their studies tend to rely on phonological phenomena heavily. Formal glosses of the software also included the phonological transcriptions of the target words. It was hoped that the potential for learning

could be considerably increased through enabling learners to see the phonemic transcriptions of the new words as well as to hear them pronounced.

3.3.2.1.4 Hypertext/ hypermedia glosses

An essential feature of the study was the application of hypertextually linked annotations instead of the traditionally applied linear text. On the basis of the studies discussed in the literature review (e.g. Chun and Plass, 1996; Al-Seghayer, 2001; Liu and Reed, 1995, etc.) it was believed that through the application of hypertext and hypermedia glosses learners could have easy access to a wealth of related information. The rich textual (and audio) information found in the annotations was hoped to speed up the learning as students would not have to interrupt the reading and thus the vocabulary study process by needing to consult monolingual or/and bilingual paper dictionaries. It was also hoped that the ultimate achievement would be better than under traditional vocabulary learning circumstances due to cognitive scaffolding, i. e. the opportunity to activate prior knowledge and link new information to it more easily.

Eventually there were two texts selected for the experiment, each of which had 13 salient hyperlinked words in it. To each text belonged a set of form-centred and a set of meaning-centered annotations, but, for each treatment group only either form-centered or meaning-centered annotations were available. Under both incidental and intentional learning conditions two versions of the program were used. With the text being identical, in one version the dictionary information provided in the relevant glosses was form-focused, while in the other version of the program, it was meaning-focused.

In form-focused hypermedia annotations the following types of information were presented (see illustration in Appendix F/1, p. 239):

- the basic morphological characteristics of the word including such features as word class, countability, plural form, past tense and past participle forms; (taken from the Cambridge Advanced Learner's Dictionary Online and the Wordnet Database;
- an audio file with the word pronounced by a native speaker;
- the basic Hungarian equivalent(s) of the selected target word taken from the SZTAKI online dictionary;

- The IPA phonemic transcription of the word as used in the Cambridge Advanced Learner's Dictionary Online

In meaning-focused hypermedia annotations the following types of information were presented (see Appendix F/2 p. 239):

- The basic meaning(s) of the word presented in an English monolingual dictionary definition(s), which were taken from the Cambridge Advanced Learner's Dictionary Online and the Wordnet Database
- Various sense relations of the word such as synonyms, antonyms, hypernyms, and troponyms etc., as given in the Wordnet Database and the Cambridge Advanced Learner's Dictionary Online. Naturally, the sense relations provided always depended on the semantic structure of the word in question.
- Besides the denotative meaning explained in English the Hungarian equivalent(s) was (were) also provided as the researcher thought that intermediate students might feel frustrated without learning the equivalents of the target words in their mother tongue as well.
- Some contextualized examples of how a particular word was used were also provided.

It was hoped that the application of the above form- and meaning-focused electronic resources would enhance the potential for acquiring L2 vocabulary, and both experimental groups with hypertext lexical enhancement would outperform the control group, whose members worked with traditional paper-based texts without any additional information except for a bilingual glossary of the target words and their phonemic transcriptions (see Appendices K/1, p. 239 and K/2, p. 239).

3.3.2.1.5 Tracking device and log files

A tracking device was constructed to complement the program with the aim of following the users' vocabulary learning behaviour. As one of the main aims of the thesis was to prove that if input was made salient through the use of hypertext glosses, it was assumed that learners would attend to such input. It was also thought that after negotiating this input with the interlocutor (which, in our case, was the computer) students' L2 vocabulary

acquisition would be improved, thanks to their exposure to the information content in the phonologically, morphologically or semantically modified input in the gloss content.

In this case interactional input modification would take the form of providing plentiful reference materials through which learners can hook the new information to be acquired into the knowledge system they already possess. In case of such a computer environment interactional input modification takes place when learners interrupt their normal reading process of the narrative text, and consult a hypertext/ hypermedia annotation in hope of further information and the clarification of their beliefs and doubts about the meaning of a particular word (Chapelle, 1999). This may also be referred to as some sort of a hypothesis testing process as learners may infer the meaning of a particular word on the basis of the contextual clues provided in the text and check their hypotheses against the information found in the glosses linked to the highlighted words.

It was therefore essential to prove that participants really did attend to the salient parts of the input. I had to make sure that all the participants really consulted all (or at least the overwhelming majority of) the hypertext glosses created to facilitate their learning process in order to be able to conclude that their achievement was probably due the facilitative effect of these annotations.

As all the schools participating in the computerized component of the experiment used proxy servers and protected their work-stations in the computer labs from outside intruders with reliable firewalls, it was impossible to track learner behaviour by attaching an online statistical program located on the Internet to school servers. This problem was solved by providing each participant with an individual web address. In every treatment session each learner was given a slip of paper with an individual WWW address where they could get hold of the program/web page to be used in that session. On the same slip they were asked to write their names or the pseudonyms they chose to use. By using these codes each user could reach the same text located in the same directory of the server, but as each of them used a different document name they were easily identifiable by the tracking system. Technically this was achieved by creating an index or basic version of each document and linking randomly generated directory identification user codes to the code of the basic index document. The web address of each text version used included either the letter “f” in case of the form-focused condition, and “m” in the meaning-focused condition (for examples see Appendix G, p 239).

Through setting the server that hosted the texts to be used in hypertext format to log each and every case when these hypertext documents were accessed it documented the time (date, hour, minute, second) when the user logged on to a page, when they logged off it and all their clicking behaviour in between. Besides being able to determine if all the glosses were consulted, the tracker device rendered it possible to tell how many times a particular gloss was consulted by a particular student. This could be achieved through deactivating the cache memory function in the Microsoft Explorer web browser (which software was used in all the participating secondary schools) on each workstation used in the labs. Consequently, whenever the users activated a hyperlink, the required information in the gloss was downloaded directly from the server rather than the cache memory of the workstation, and recorded by the tracker as a separate piece of information.

Each time a participant chose to consult a gloss by clicking on the hyperlinked word, the tracker device registered the click in a log file. In this way it was possible to tell the learners' study behaviour including the length of time a particular annotation was consulted, how many and what types of glosses students activated, which information types they preferred to use and which were the ones that they tended to avoid. Some other features in the program were also designed in a specific way to enable to researcher to observe and follow students' computerised study behaviour. One such feature is hidden in the structure of the annotations used in the program. Within meaning-focused glosses the Hungarian equivalent(s) could only be read if the student clicked on this link within the main gloss. In form-focused glosses the phonemic transcription, the audio file of the word's pronunciation and the Hungarian equivalent(s) were also available only in the form of such further hyperlinks.

It was particularly interesting, for instance, to measure how soon after opening a gloss the learner would look up the Hungarian equivalent of the word in question linearly located as last in the glosses, or whether they would be interested in the phonological transcription of the word. It was foreseen as a typical behaviour/ learning strategy of Hungarian learners to go for the Hungarian equivalent as soon as possible, and a tendency to avoid phonological transcriptions was also predicted.

3.3.2.2 Selection of texts and stimulus words

In order to carry out the study it was necessary to find two texts that the participants could learn new words from. The texts had to be of the level: not too easy or not too difficult with challenging new vocabulary provided as roughly tuned input for intermediate learners of English.

The narrative passages entitled *Pirates* (see Appendix C/1, p. 239) and *Pickpockets* (see Appendix C/2, p.239) were chosen from two intermediate EFL readers (Curry, 1978, 1979). The texts come from an authentic American textbook that has been graded for students of intermediate proficiency level.

3.3.2.2.1 Validating the selection of the texts used in the experiment for lexical complexity

In order to verify the suitability of the vocabulary of the text (and thus enhance the internal validity of the study), the target texts were analyzed with concordance (Concordance 3.0 by Watt, 2002) and lexical profiling software (EDICT Word Frequency Text Profiler). The purpose of this profiling analysis was to assess the suitability of the texts for participants of intermediate proficiency level.

By using a word frequency text profiler it was hoped that showing the distribution of the words in the texts to be applied in the study would partly verify the selection of these texts. The texts were analysed by contrasting their words with a) the most frequent 2000 word list, b) with the next three thousand i.e. the 2000-5000 most frequent word list built with Concapp for Windows from the Brown corpus comprising 1, 015,945 words with 47,198 unique words reflecting general non-academic English as it is used in newspapers, magazines and books.

The lexical composition of text 1, entitled *Pirates* (used in the study to measure incidental vocabulary acquisition) showed that 65,82% of the words were among the 2000 most frequently used word frequency range, and 13.45% of them belonged to the 2000-5000 frequency range. The total number of words not listed in either of the above lists was rather high: 57 (20.73%). However, 13 of these (22.80%) were repetitions of previously mentioned

words, and 12 (21.05%) of the off-list words were proper names requiring no significant processing effort from the students. Considering that 79.27% of all words in the text are relatively frequently used, it can be suggested that, from this point of view, the text is suitable for students on intermediate proficiency level of English. The summary of the lexical composition of text 1 is shown in Table 2 below.

Table 2. Lexical profile of stimulus text 1 (Pirates)

	<i>Instances</i>	<i>Frequency</i>
Total number of words parsed in the text	275	100%
Words in the 2000 Most Frequent List	181	65.82%
Words in the 2000-5000 Most Frequent List	37	13.45%
Total number of words not in either list	57	20.73%

Table 3 below shows the lexical composition of text 2 entitled Pickpockets (used in the study to measure intentional vocabulary learning). 72.34% of the total number of words in the text are taken from the first 2000 most frequent words, 7.45% belong to the next 3000 most frequent words and 20.21% of them are not listed in either list. Here again the actual number of off-list words is 36 only instead of 57, as the rest are repetitions and a three-word acronym. These word distribution data of text 2 render it appropriate for the great majority of intermediate students.

Table 3. Lexical profile of text 2 (Pickpockets)

	<i>Instances</i>	<i>Frequency</i>
Total number of words parsed in the text	282	100%
Words in the 2000 Most Frequent List	204	72.34%
Words in the 2000-5000 Most Frequent List	21	7.45%
Total number of words not in either list	57	20.21%

Syntactic complexity of the texts

In order to analyse the syntactic complexity of the two selected texts the program Concordance 3.0 was used. For a summary of syntactic complexity of the two texts see Table 4. (p. 118).

The length of both texts was approximately identical, with 275 words in the first text and 282 words in the second. Text one was broken into 7 paragraphs, and there were 5 paragraphs in text two. The paragraphs were relatively short in both texts: their length ranged between 2-5 sentences. There were 16 sentences in text one, while text two consisted of 21 sentences. The mean length of the sentences in passage one was 17.25 words, and in passage two it was 13.42. The percentage of simple sentences in text one was 68.75%, while in text two it was only 33.33%. Text one included 171 different types with the type/token ratio of 1.61. The second text had 164 types, and had a type/token ratio of 1.71. Judging by these data, the passages used in the study show a considerable similarity to each other, which makes it possible to use them in the experiment. Also, by their complexity, both texts appear suitable for intermediate EFL learners as they do not have too long or too complex sentences that would cause unsurmountable linguistic difficulty for students on this level.

Table 4. Syntactic characteristics of the texts used in the study

	<i>Text 1</i>	<i>Text 2</i>
<i>Characters</i>	1,352	1,437
<i>Tokens</i>	275	282
<i>Types</i>	171	164
<i>Type/token ratio</i>	1.61	1.71
<i>Paragraphs</i>	7	5
<i>Paragraph length (in sentences)</i>	2-5	2-5
<i>Simple sentences (in%)</i>	68.75	33.33
<i>Sentences/text</i>	16	21
<i>Mean sentence length (in words)</i>	17.25	13.42

Laufer (1992, 1997) claimed that the lexical threshold for text comprehension is about 3000 word families and that successful word inferencing from context occurs only when between 95% and 98% of the words in a text are familiar to the reader.

The two texts were also analysed as to their readability and lexical density using 'Textalyser' online text analyser computer program. Concerning readability, the Gunning-Fog index of text 1 (Pirates) was 10.68, and that of text 2 (Pickpockets) was 9.46. The figures

show that the two texts are very similar as far as their ease of reading is concerned. These figures shown on a scale of 20 (where Fog index 20 means a very difficult text) indicate that the two texts are neither too easy nor too difficult.

The lexical density ($= \text{types} / \text{tokens} \times 100$) of text 1 (Pirates) is 62.18% and that of text 2 (Pickpockets) is 58.15%, which again shows that the two texts are quite similar. However, (considering that 60-70% indicates relatively high density), it also shows that both texts are relatively dense lexically, which may adversely affect the vocabulary learning process.

Piloting texts

The texts in the program were assumed to be interesting for Hungarian teenage students of English. To make sure whether they really would be found interesting, several texts were offered to 61 students in the pilot phase, who, judging merely by the criterion of interest, narrowed down the range of eligible texts to four. As all four of these texts proved to be suitable after a linguistic analysis, the two passages (see Appendix C1, C2, pp. 239, 239) that were eventually used in the experiment were chosen by the 8 experienced English teachers who taught the participants of the study. By making sure that the texts were going to be potentially of interest to the students it could also be verified that text difficulty was not well above or below students' proficiency level. The teachers of the students participating in the experiment also informed the researcher that the students involved were not likely to be familiar with the target words as they had not learned them words in their previous classes. (Naturally, the presence or lack of such familiarity was also strictly double-checked in the case of each potential participant in a pre-test session).

3.3.2.2.2 Validating the selection of final stimuli words

In order to select a body of words relevant to intermediate level language classes, before the study 61 intermediate students of English who did not participate in the experiment were asked to pilot the final texts for unknown words. They were asked to underline each and every word in the two texts that they were unfamiliar with.

Based on the summarised results of this piloting a preliminary list of 50 words was put together. The great majority of the words on this list were assumed to be unknown to the

subjects of the study. In order to make sure which words the students really knew, a self-report pre-test (see Read, 2000:65-67) was conducted with the 139 participants of the actual study. The test (see Appendix A, p. 248.), whose detailed description can be read in 3.2.2.3.1, consisted of the preselected 50 words plus 12 made up "non-words". Students were asked to think carefully, and to tick only the words they knew.

Consequently, from these 50 preselected words 26 words (13 words/text) were eventually chosen in this way, with all the words unknown to the students asked. Thus the number of new (glossed) target words per text equals approximately 4.6% of the total number of words in each text. As De la Fuente (2002:88) notes, "... in the existing literature there is no consensus on how many unknown words a text may contain in order not to disturb the global comprehension level or the learning of vocabulary: West (1941) speaks of 2%, whereas for instance Holley (1973) refers to 7%". Eight experienced secondary school teachers of English (those teaching the students in the research population) were also presented with these texts and were requested to verify that the words in question had not been taught to their students.

Even though the first and utmost important criterion of selecting the target vocabulary was that they should be unknown to the participants of the study, the selection of target words were also analyzed with an online concordancer (Concordance 3.0) and lexical profiling software (EDICT Word Frequency Text Profiler). This additional analysis was thought to be necessary because various word features (frequency, visual complexity, grammatical category, semantic features) may influence the memorization of target vocabulary (see Laufer, 1997).

Regarding grammatical category, the selected words in the two passages showed a certain amount of mismatch, which may have unfavourably affected the internal validity of the study. The 13 words in the first passage (Pirates), used to measure incidental vocabulary acquisition, were composed of 9 nouns (denoting mainly concrete referents), 3 verbs and 1 adjective, whereas the other text (Pickpockets), used to measure intentional vocabulary learning, had a different composition in this respect: 6 (mainly concrete) nouns, 1 verb, 3 adjectives and 3 adverbs. Such mismatch can be explained by the way target vocabulary was selected. As the first step of the pre-selection process students selected the texts, and afterwards they picked the words from the preselected texts that were unknown to them. As a final stage the would-be participants of the actual experiment indicated which of the words

preselected in this way they did not know. When choosing target words in the two final texts, there were obvious constraints on making the two texts applied completely alike. Besides, making absolutely sure that the participants did not know the potential target words was considered much more important for the success of the experiment. The slight difference found between the words of the two texts could not possibly influence the results of the first research focus, i. e. looking for a difference in vocabulary learning achievement between learning conditions using enhanced and non-enhanced input. The differences in grammatical category, however, might have affected the internal validity of the results concerning the second main research focus of the study, which aimed to find out about differences between the effectiveness of incidental and intentional learning conditions, because the different parts of speech may be of different difficulty to learn. Ellis & Beaton (1993), and N. Ellis (1994) claim for instance that nouns are the easiest to learn, as they can evoke meaningful images, whereas verbs and adverbs are the most difficult to learn.

This part of the design looks rather unbalanced. Nevertheless, it was considered much more important to choose words that were surely unknown to all the subjects in the research population even if other parameters did not match one hundred percent. For feasibility reasons it was judged to be a necessary compromise for conducting the study.

Considering their other characteristics, the words of the two passages proved to be quite similar. As for visual complexity, for instance, the words of passage one ranged from 1-12 characters, those of passage two ranged from 1-13 characters in length. The mean length of words in text one is 4.8 characters whereas in text two it is 5.0 characters. The mean length of the selected words in the two texts together is 6.5 characters, with a mean value of 7.6 characters in passage two and 6.2 characters in passage one. This may be important as literature suggests that the learnability of a word decreases after four syllables (Ellis & Beaton, 1993).

In passage one (Pirates) out of the selected 13 words only 1 word (7.69%) was to be found among the first 2,000 most frequent words. Two (15.38%) of the 13 words were from the next 3,000 most frequent words and the remaining 10 words (76.92%) to be acquired were off-list words. In passage two (Pickpockets) 2 (15.38%) of the selected 13 words were among the 2000 most frequent words, 4 (30.77%) words belonged to the range of the 2,000-5,000 most frequent words and the remaining 7 (53.85%) were not in either list. This implies that

the great majority of words selected to be learned were above the estimated intermediate level.

3.3.2.3 Testing instruments

To assess word acquisition and retention, two types of vocabulary tests were administered in order to measure the levels of previous (i.e. pre-treatment) word knowledge, as well as the immediate and delayed effects of the hypertext/ hypermedia treatment conditions. In all three tests learners were asked to perform recognition tasks.

The pretest was administered during the first meeting with the students (a few days before the first tutorial session), the first post-test was given immediately after the study sessions and a delayed post-test was administered 3 weeks later.

3.3.2.3.1 Self-report vocabulary pre-test

In order to compile the final set of words to be taught in the experiment a pre-test was administered. The test was designed in the form of student self-report, i.e. students were asked to indicate whether they knew the words they would read in the treatment texts. Every participant took the pre-test, even though on the basis of the piloting, the subjects were not expected to know any of the words. Subjects received a sheet with a list of 62 words (see Appendix A, p. 239). Forty of them were English words, and the remaining 12 were nonsensical “non-words” that looked like English words. The 40 English words were pre-selected from two texts by 61 intermediate-level secondary school students who did not participate in the experiment. As all forty words were indicated to be unknown by the majority of the students doing the pre-selection, these words were assumed to be unknown to the participants of the study too. The participants were asked to tick the words that they were absolutely sure they knew.

This procedure of using non-words in the list controlled for the possibility that subjects might overstate their knowledge and tick words they do not really know. This could be due to trying to show more than their actual knowledge was, or mistakenly assuming that they knew a word they did not, etc (see Read, 2000:165-167). By including these non-words it could be checked whether would-be subjects were telling the truth and through this it could be

indirectly verified that the words to be taught during the treatment were really unknown to the subjects.

After analysing the results of this test a final set of 26 words (13 words per text) were selected as the stimuli words for the treatment. Those students who reported to know more than 1 word out of the 26 (which is 3.84.% of all the words presented), and students who marked any non-words as known words were excluded from the final pool of research subjects. It was assumed that in this way there would be only such students participating in the experiment to whom all (or the prevailing majority of) the target words were going to be unknown.

3.3.2.3.2 Reading comprehension test

In the incidental vocabulary acquisition research condition, at the beginning of the tutorial session participants were asked to try and understand the text as well as possible, and were forewarned that at the end of the lesson they would be given a short test that would check the comprehension of the contents of the text. As announced before the tutorial session, after the learning phase a comprehension test with seven questions on the text was administered together with an immediate vocabulary acquisition post-test (discussed in detail below) that the participants were not forewarned of.

For the reading comprehension test the design pattern called “short-answer questions” (suggested in Alderson & Cseresznyes, 2003:29-30) was applied. Students were asked to give short (maximum 4 word long) answers in English to the 7 open-ended questions posed on the basis of the text content they had just read (see Appendix H, p. 239).

As the real purpose of the reading comprehension test was to provide the necessary conditions for incidental vocabulary learning, it basically functioned as a subsidiary exercise (or some sort of “distraction”) for the students in order to create the conditions of incidental vocabulary learning. Hence its output was not really relevant for the purposes of the present study, (even though there may be a strong interrelation between reading comprehension and vocabulary learning achievement), and therefore its results were not analysed.

3.3.2.3.3 Immediate vocabulary acquisition post-test

In order to assess the effects of the independent variables on vocabulary acquisition a vocabulary test (see Appendices I/1, p. 239 and I/2, p. 239) was designed. The participants were asked to take this test right after studying the texts in the tutorial sessions. Under the incidental learning condition, participants were not informed in advance that they would be tested on the knowledge of the new lexical items to avoid a conscious effort to learn the target words. In contrast, the subjects in the intentional condition were asked to learn as many of the new words as possible, and were also forewarned that they would be tested on them at the end of the tutorial session.

A so called “banked gap filling” vocabulary testing technique (suggested in Alderson & Cseresznyes, 2003:179-181) was used to measure participants’ receptive vocabulary learning achievement. The vocabulary tests were carried out not in an electronic format, but in a traditional paper-and-pen format in both the experimental and the control groups. Each participant was given a paper sheet with the text used in the presentation sessions, with each text including 13 blanks to be filled using a 16-item list of words to choose from at the end of the text. Subjects were requested to select the appropriate word from the 16 possible choices provided at the end of the text. In addition to the 13 target words to be inserted into the appropriate gaps in each text, 3 related English words were also included as distractors.

In order to potentially enhance students’ vocabulary acquisition achievement, it was decided that the original context (i. e. the texts used in the presentation) would be used. Each testing session lasted 15 minutes.

To enhance reliability all 240 immediate post-tests were marked only by the researcher. As the recognition test contained discrete- point items allowing only one correct answer, one point was granted for each correct solution. Because the total number of items in the test was 13, the maximum score to be achieved for the whole test was 13 points.

Before the test was administered in the experiment it had been piloted by the same group of intermediate students who also participated in the pre-selection of the potential stimuli words for the study. In the piloting the would-be post-tests proved to be adequately discriminate among students of different levels of ability.

3.3.2.3.4 Delayed vocabulary retention post-test

Three weeks after the tutorial sessions and the immediate post-tests, without any preliminary notice, delayed post-tests were administered to measure the long-term retention of the target vocabulary acquired during the tutorial sessions. In order to make its results comparable with those of the immediate post-tests, the delayed post-tests were exactly the same as the immediate post-tests, and they were given under the same conditions. The 240 delayed post-tests were scored by the researcher and the results were analysed in exactly the same manner as those of the immediate post-tests.

3.3.2.4 Questionnaires

In order to be able to measure the subjects' attitudes to the computerised hypertext vocabulary teaching materials used in the tutorial sessions, as well as to find out their beliefs about the effectiveness of using new technologies, questionnaires were compiled.

There were two questionnaires applied, one at the beginning, and another one at the end of the study. As both of these questionnaires were connected to computer use, they were only given to the participants exposed to some sort of computer-based treatment. Both questionnaires were conducted in a traditional paper-and-pen format.

All the questions in both questionnaires were asked in Hungarian to make absolutely sure that all participants could understand and answer them, which was hoped to contribute to the success of the study.

3.3.2.4.1 Questionnaire 1

One of the purposes of the first questionnaire (see Appendix B, p. 239) was to collect some of the potential participants' personal data. The main aim of the first mini-survey, however, was to make sure that the would-be participants of the computer-based research condition possessed the computer skills necessary for completing the tasks successfully.

The mini questionnaire consisted of 7 questions. Questions 1 and 2 inquiring about learners' personal details were open-ended by nature. In order to elicit more detailed

information from the students, question 7 was also open-ended, the remaining four questions were closed questions. The first 3 questions asked about students personal data: name (or pseudonym or some other form of identification), class, English learning experience (years). The remaining 4 questions referred to the learners' Internet skills. Question 4 asked learners how often they surfed the World Wide Web. Question 5 asked if they had ever used computers in general for language learning, and question 6 inquired if they had ever used the WWW for language learning purposes. If they gave an affirmative answer to question 6, the last, 7th question asked students to describe the details of what exactly they were using the WWW for language learning, and how they went about it

3.3.2.4.2 Questionnaire 2

At the end of the study (i. e. immediately after administering the delayed post-tests) the students participating in the computer-based treatment condition were asked to complete a twelve-item questionnaire (see Appendices J/1 p. 239 and J/2, p. 239) regarding their attitudes and reactions to the computer-based hypertext/hypermedia treatment they had been subjected to. The first nine questions of the questionnaire were close-ended expecting students to indicate their attitudes to the computerised hypertext/hypermedia-based vocabulary learning environment, and the last three were open-ended questions to provide more freedom for the subjects to express their ideas about the learning process they had participated in. The detailed content of the questionnaire was as follows:

The first question (Q1) asked students to rate the usefulness of computer-based hypertext programs in vocabulary acquisition.

The second question (Q2) inquired whether such programs should be applied in or out of class.

The third question (Q3) asked students how often they would like to use hypertext computer programs in the process of vocabulary acquisition.

Question 4 asked about the perceived ease of using the program in the study.

Questions 5 and 6 queried about the perceived effectiveness of input enhancement. Question 5 asked about the perceived importance of visual input enhancement through the use of a colour different from the rest of the text, whereas question 6 inquired about the usefulness of various hypertext gloss content types. Such gloss content types included the

following characteristics related to the words to be learned: phonetic transcription; pronounced form in audio-format; meaning(s) explained in English; Hungarian equivalent(s); synonyms, antonyms and other sense relations; affixed and derived forms; and providing context to demonstrate word use.

Question 7 asked about the perceived importance of the fact that by using a computer students could consult the information in the hypertext glosses as many times and as frequently as they wished.

In question 8 learners were queried whether they had ever learnt English words incidentally while they were trying to find some specific but not language learning related information on the World Wide Web.

In question 9 students who gave affirmative answers to question eight were asked what percentage of the words learnt by surfing the WWW they could still remember.

Questions 10 and 11 asked participants about the positive and negative attributes of the program they had used in the study. The former question asked them to describe the interesting and useful characteristics, while the latter one asked to name the moderately useful or boring features of the computer program.

The last question (Q 12) asked participants to give further comments on the program used in the study, and also to comment on this form of language acquisition in general.

3.3.3 Procedure of data collection

The study was conducted over a period of 7 weeks. Data collection took place during regular class time in three different secondary schools of Debrecen. The experiment was composed of three basic stages: 1) a pre-test and a questionnaire 2) a learning and immediate post-test session, and 3) a delayed post-test, which was the exact replica of the immediate post-test and a questionnaire. The learning sessions were computer-based in the form-focused and the meaning-focused experimental groups, whereas the control group got the same texts in traditional paper-based hard copies (see Appendices K/1, p. 239 and K/2, p. 239). All testing sessions were done with paper and pen. The exact schedule of data collection during the experiment can be seen in Table 5. (p. 120)

Table 5. Schedule of data collection during the experiment

Time	Action Taken
Week 1	Self-report pre-test Questionnaire 1
Week 2	Tutorial session 1 – incidental learning condition Immediate post-test 1 (at the end of the study session)
Week 3	Tutorial session 2 – intentional learning condition Immediate post-test 2 (at the end of the study session)
Week 4	Break
Week 5	Break
Week 6	Break
Week 7	Delayed post-tests (the exact replicas of immediate post-tests 1 and 2) Questionnaire 2

3.3.3.1 Week 1: pre-test and preliminary survey sessions

During week one participants were asked to take a paper-and-pen self-report pre-test (see Appendix A, p. 239) so that a final set of target words unknown to all subjects could be selected. During the same session they were also given a preliminary questionnaire (see Appendix B, p. 239) to find out about their personal data for further identification in the study and English learning experience. Besides, students in the experimental groups were also asked about their general computer skills and their experience in using the World Wide Web.

After analysing the results of the self-report pre-test, the form of the materials to be used in the study was finalised, and the experiment was launched in 3 days. It had to be done in as short a time as possible so as to avoid the possibility that in the meantime students might learn some of the stimulus words. Before conducting the tutorial sessions, the subjects' teachers also confirmed that the target words had not been taught institutionally before. A computer program (find diskette in Appendix M, p. 239) in the form of a hypertext/hypermedia web document was made in four different versions: two different webpages were made for the two reading passages, and each of those also had two versions, one with form-focused and another with meaning-focused annotations. These web pages were then uploaded onto a university server in order to be made easily accessible for the learners from their Internet workstations at school. At the same time the paper-based traditional

reading version of the two texts was also prepared for the subjects in the control group. Together with the materials for the input sessions, the post-test materials in traditional paper format were also prepared.

3.3.3.2 Week 2: incidental study and immediate post-test sessions

During week two the first treatment session took place under incidental learning conditions. Before the study sessions the 10 intact classes were randomly assigned to the form-focused, meaning-focused or the control learning conditions. At this first session a general introduction and basic induction about the computer program were provided, and then the subjects in both the experimental and control groups were given the first reading passage. It was explained to the members of the experimental group working with the hypertext program online that by clicking on highlighted words they could get various pieces of information about the selected word. They were also informed that within the time limits of the session (30 minutes) they could consult as many of the glosses as they wished to and also as often and as many times as they pleased. Subjects in all groups were asked to work strictly individually and not to consult any of their classmates either in the study or in the testing sessions. To avoid any misunderstanding, all the instructions were given in Hungarian.

At the beginning of the incidental vocabulary learning session participants were asked to study the text and the additional information provided (i. e. the glossary of paired equivalents in the control group, and the gloss content in the experimental groups) carefully, and they were forewarned that after studying the passage for 30 minutes they would be given a test checking comprehension. In this way it was hoped that learners would be concentrating on trying to understand the text as much as possible, rather than on learning the target words. In other words it was hoped that in this way incidental vocabulary learning would take place (see Hulstijn, Hollander, and Greidanus, 1996). The subjects in the two experimental groups were working with computers. They received input in a visually-enhanced form, and they were provided help in the form of hypertext/hypermedia annotations to be able to understand the target vocabulary. The members of the control group received the same text without any enhancement. They were given help to understand the stimulus words in the form of a bilingual word list which, besides the Hungarian equivalents, also included the phonemic transcription of the target words (Appendices K/1, p. 239 and K/2, p. 239).

After the time allocated for studying the passage had expired, students were given a short reading comprehension test (Appendix H, p. 239) as promised, but, simultaneously and unexpectedly, they were also asked to take a vocabulary test on the target words (Appendices I/1, p. 239, I/2, p. 239) to measure their receptive incidental word acquisition achievement.

3.3.3.3 Week 3: intentional study and immediate post-test sessions

In week three the same procedure was repeated as in week two. Besides the fact that the same subjects were given a different text (see Appendix C/2, p. 239), the only difference was in the introduction to the session. At the beginning of these sessions participants were asked to learn as many new words from the text as possible. They were forewarned that at the end of the session they would be given a test measuring the acquisition of the new lexical items. In order to avoid their learning only the enhanced words or only the words provided on the bilingual list (as a result of their test-taking experience from the previous session), they were also forewarned that any lexical item occurring in the text could be tested. Beyond such “guidance” participants were given no more help with the target texts whatsoever in the study session of week three. Instead, they were encouraged to try and infer the meanings if they should come across unknown words other than the ones explained in the glosses or translated on the bilingual list. So as to measure immediate word gain, students were given a 13-item banked close test (see Appendices I/1, p. 239 and I/2, p. 239) with the target words omitted in a text. In order to make the task more difficult, 3 distractors were also provided mixed with the valid words. To avoid the variation-due-to-task effect, it was decided that the texts used in the tutorial sessions would be used for the tests without any alterations at all.

3.3.3.4 Week 7: delayed post-test and survey session

After giving students a three-week break (one of which was literally school holidays), in week seven, three weeks after the last study session participants were unexpectedly given the same two vocabulary tests (see Appendices I/1, p. 239 , and I/2, p. 239) as they had been given in week two and three respectively. As they were asked to take two tests they were allowed to work for 30 minutes. The aim of these tests was to measure potential long term retention of the words acquired in the previous two sessions. The students had not been able

to go over the items again, because they were not allowed to take notes during the tutorial or the immediate post-test sessions, and the web sites with the texts containing the target vocabulary were removed from the Internet immediately after the tutorial sessions. Besides, the participants' teachers assured the researcher that the lexical items concerned had not been studied institutionally during the 3-week period between the treatment session and the administration of the delayed post-tests. All this served as a means of verification that the results gained in the delayed post-test would reflect learners' long-term retention of the vocabulary acquired in the tutorial session.

In the same session the subjects taking part in the experimental computer-based conditions were asked to fill in a questionnaire which measured their attitudes towards the computer environment, the perceived effectiveness of the various kinds of hypertext gloss contents, interactivity, and asked about the strong and weak points of the program used in the experiment.

3.4 ANALYSIS OF DATA

After week seven the test, questionnaire and log results were analysed by the researcher using quantitative or qualitative methods.

3.4.1 Analysing test results

The scores from the immediate and delayed vocabulary test for each student were recorded with the help of an SPSS 8.0 software program and subjected to statistical analysis.

The study had a complex, mixed design. One research focus aimed to compare the effectiveness of the vocabulary learning formats of subjects exposed to:

- form-focused input enhancement,
- meaning-focused input enhancement and
- input with no enhancement.

The other focus of the research was to measure the differences in vocabulary learning achievement under incidental and intentional learning conditions. For this latter experiment the same three groups of subjects were used twice. First they were tested under incidental vocabulary acquisition condition, and then in intentional vocabulary learning condition.

Consequently, both a within-subjects and a between-subjects repeated-measures multivariate analysis of variance (MANOVA) was applied to try and find significant differences in the vocabulary test achievements between the different methods and learning conditions. On realising that the test results gained did not represent normally distributed data, it was decided that for inferential statistical analysis nonparametric methods would be used.

The Kruskal-Wallis nonparametric test procedure followed by Mann-Whitney U-tests provided analysis of variance for the effects of the three different and independent input types (viz. form-focused, meaning-focused and control), and the Friedman test repeated-measures procedure complemented by the Wilcoxon Signed Rank Test provided analysis of variance for making the same measurement twice with related data, once in incidental and once in intentional learning condition with the same research population. The null hypotheses were tested at a $p < .05$ level of significance.

The results gained through the use of the testing instrument were checked for validity, and the lexical items retained by the largest and the smallest number of students were subjected to linguistic analysis.

3.4.2 Analysing questionnaire results

Responses given to the close-ended questions (questions 1-9) in the quantitative part of the questionnaire conducted at the end of the study were analysed with SPSS version 8.0 statistical program. To check for significant differences in relation to the frequency of the data obtained, a nonparametric statistical procedure, a one-way design Chi-Square Test was applied. Responses to the remaining three open-ended questions (questions 10-12) were analysed in a qualitative way, by trying to spot tendencies in participants' answers. Answers to a particular question that were alike or very similar to one another were counted, and thus a general idea about tendencies in participants' beliefs and attitudes could be formed.

Potential correlation between the answers to closed questions 1, 5 and 7 and the test results achieved, as well as possible correlations between the answers to the above three questions as given by participants exposed to form-focused or meaning-focused input enhancement, were analysed using the Spearman Rank Correlation technique. Correlation values between $R = 0.5$ and 1 were considered as strong positive correlation; between $R = 0$ and 0.5 as weak positive correlation; between $R = -1$ and -0.5 as strong negative correlation,

and between $R = -0.5$ and 0 as weak negative correlation. Correlation values $R = +1$ or -1 indicated perfect positive and negative correlation respectively. All statistical tests were interpreted at .05 significance level.

3.4.3 Analysing the log files

The primary aim of the log files was to make sure that the participants really consulted all (or most of) the glosses in the text. In this way it could be verified that such interaction did take place, and thus the outcome of the study could potentially be attributed to learners' interaction with input made salient through highlighting and due to the different (meaning- vs. form-focused) gloss contents.

Besides the main purpose of verifying that participants really consulted all, or at least the overwhelming majority of the glosses, the other aim of employing the tracking device was to try and analyse the research subjects vocabulary learning strategies through their clicking behaviour. The process of analysis that was followed is described below.

The log data recorded by the host server were converted into a MS Excel spreadsheet software program for the sake of easier handling. From the mass of data gained with the help of the tracking device the data irrelevant for the research had to be eliminated from the log file for the sake of easier handling (see a sample of the original data set in Appendix L/1, p. 239). The following data were judged to be useless for the current research, and consequently were deleted:

- the Internet Protocol (IP) number of the machine and some other technical information, such as the code indicating the success of download,
- the length of the downloaded object in bytes,
- the download method (which was "get"), and
- the types of Internet protocols (HTTP1.0 and HTTP 1.1 depending on the target school facilities) used for the transmission

The IP numbers did not carry useful or interesting information as, due to the firewall and proxy protection, each school showed only one IP number, that of the school server, rather than giving access to all the IP numbers of the individual work stations involved in the experiment.

After eliminating the variables irrelevant for the current study recorded by the server automatically during the tutorial sessions, the following data categories were left:

- the date, hour, minute and second of each occasion when a particular student consulted the web document by clicking on a hypertext link;
- the title of the document used at a particular time,
- the student's identification code;
- the exact type of information that was asked for by clicking on a hyperlink (see sample in Appendix L/2, p. 239).

In order to verify that all students consulted all, or the prevailing majority of the glosses in the text, the mean number of glosses consulted without repeated clicks was calculated. The exact method of getting these figures will be described below under the description of the process of calculating all mean figures in the log files.

Participants' vocabulary learning strategies were analysed on the basis of their clicking behaviour, i.e. by looking at when, how many, which glosses, and what kind of information within the glosses they had consulted. Consequently, the total and the mean values of clicks were calculated together with some most and least frequently occurring phenomena in students' clicking behaviour.

Using the "counta" function of the MS Excel the following total sum values were calculated:

- Total number of glosses consulted (repeated clicks inclusive)
- Total number of target words consulted (repeated clicks inclusive)
- Total number of phonemic transcriptions consulted (repeated clicks inclusive)
- Total number of Hungarian equivalent(s) consulted (repeated clicks inclusive)
- Total number of audio-format pronunciation consulted (repeated clicks inclusive)

The mean values were also worked out with the "counta" function of the MS Excel program. The count was carried out twice: once including all repeated consultations of a particular gloss and once without repetition, i. e. in the latter case only one encounter with a particular gloss was counted. The mean value of consulting a particular gloss with repetitions inclusive was calculated by counting, the total number of clicks on a particular gloss type and dividing this sum by the number of participants per session, which was invariably 40. When

calculating the mean figures for a particular gloss without repeated clicks (i. e. without repeated consultations of one and the same gloss) a so called “unique records only” advanced filter of the MS Excel had to be applied to avoid the repetition of the same gloss type. In order to enable the program to identify unique records and thus come up with sensible and useful results, the exact time (seconds and minutes) and date of consulting these gloss types had to be eliminated for the duration of these calculations, as their presence would have caused the program to identify each record with a new time as unique. By eliminating the time and date from the dataset, it was limited only to the students’ identification codes and the gloss types consulted. These calculations were then repeated four times to get the characteristics of learner behaviour for both the form- and meaning focused versions of the first and the second texts.

Naturally, when the mean number of glosses consulted per text was to be worked out (e. g. with repetitions), the total number of consultations per gloss type was counted in the form- and meaning-focused version of a particular text, then these totals were added and their sum was divided by the number of students (40) per treatment group.

Following the above method, the following mean sum figures per text were calculated:

- Mean number of glosses consulted (without repetition)
- Mean number of target words consulted (without repetition)
- Mean number of phonemic transcriptions consulted (without repetition)
- Mean number of Hungarian equivalent(s) consulted (without repetition)
- Mean number of audio pronunciations consulted (without repetition)
- Mean number of glosses consulted (repeated clicks inclusive)
- Mean number of target words consulted (repeated clicks inclusive)
- Mean number of phonemic transcriptions consulted (repeated clicks inclusive)
- Mean number of Hungarian equivalent(s) consulted (repeated clicks inclusive)
- Mean number of audio pronunciations consulted (repeated clicks inclusive)

Besides measuring the mean number of times students consulted the glosses in the program, it was also thought to be interesting to measure the time variable in their behaviour. This included both the mean time spent on a particular gloss and the mean time lapse between clicking on a particular word and consulting a particular annotation within the main gloss of

that word (e. g. the time lapse between clicking on a particular word and looking up its Hungarian equivalent).

Three MS Excel worksheets were opened in a text with form-based enhancement for a) the Hungarian equivalent, the b) phonemic transcription and c) the audio-format pronunciation. In the meaning-focused version of the texts this was limited only to the Hungarian meaning as it was the only gloss that could be measured by counting clicks. In order to be able to calculate time lapses, gloss-subgloss data pairs had to be set up by applying a custom filter. An example of such datapairs is a) cargo – Hungarian equivalent of cargo, b) cargo – phonemic transcription of cargo, c) cargo – audio-format pronunciation of cargo. For each word the time difference between the two clicks in each such datapair was calculated separately. Having done this, the mean time lapse between each datapair for each word was worked out by adding all time lapses/datapair/word and dividing this sum by the number of time differences measured, The mean time lapse for a particular datapair for all target words in a text was calculated similarly.

In order to get easily interpretable, statistically non-distorted results, before starting time-related calculations, the outrageously outstanding time values had to be eliminated from the data set. After carefully studying the time-related data, it was observed that a typical consultation time/student in the overwhelming majority of the cases was within 30 seconds. Therefore a threshold level of 30 seconds was set up and extremely high time values for consulting a gloss such as 4-5 minutes/gloss/student were eliminated from the dataset to be analysed. In this respect the following data were studied and worked out:

- Mean time spent on consulting a gloss
- Mean time lapse between clicking on a word and consulting its phonemic transcription (in seconds)
- Mean time lapse between clicking on a word and consulting its Hungarian equivalent(s) (in seconds)
- Mean time lapse between clicking on a word and listening to its pronunciation (in seconds)

Figuring out which words and gloss types were most and least frequently consulted also seemed to provide interesting and potentially useful information. The following most and

least frequently occurring phenomena in students' behaviour were calculated using the "sum", "min" and "max" functions of the program:

- Target words consulted most frequently (word/times)
- Target words consulted least frequently (word/times)
- Target words whose phonemic transcriptions were least frequently looked up
- Target words whose phonemic transcriptions were most frequently looked up
- Target words whose Hungarian equivalent(s) were least frequently looked up
- Target words whose Hungarian equivalent(s) were most frequently looked up
- Target words whose audio pronunciations were least frequently looked up
- Target words whose audio pronunciations were most frequently looked up

The potential correlation between lookup frequency and the test results achieved after being exposed to the different learning conditions were analysed using the Spearman Rank Correlation technique. Correlation values between $R = 0.5$ and 1 were considered as strong positive correlation; between $R = 0$ and 0.5 as weak positive correlation; between $R = -1$ and -0.5 as strong negative correlation, and between $R = -0.5$ and 0 as weak negative correlation. Correlation values $R = +1$ or -1 indicated perfect positive and negative correlation respectively. All statistical tests were interpreted at .05 significance level. The results of the above test, questionnaire and log measuring procedures are described in detail in Chapter 4 of the study.

Chapter 4: Results and Discussion

4.1 INTRODUCTION

As mentioned earlier, the study was conducted in order to determine whether learners' interaction with text-based computerised hypertext annotations would favourably affect the outcome of vocabulary acquisition and to find out if there was a difference in outcome when these annotations were applied in incidental or intentional learning conditions. In order to be able to draw a conclusion, three research instruments were employed:

- four vocabulary tests were administered
- questionnaires were distributed, and
- a computer tracking device recorded learners' clicking behaviour in log files during treatment sessions.

The results obtained for each of the foregoing will be considered in turn below.

4.2 TEST RESULTS

The study addressed two basic research questions. The first main question was whether intermediate level students exposed to texts with interactionally enhanced input modifications in the form of form- and meaning-focused computer-based hypertext/hypermedia annotations would outperform the control group students, who received input in traditional paper format, without such enhancement. The second main question was whether the students acquiring new L2 words incidentally would be outperformed by students learning new vocabulary intentionally. In order to answer these questions participants were tested immediately after the tutorial sessions (involving either incidental and intentional learning) to measure the acquisition and three weeks later to measure the retention levels of the new target words. These results then were analysed using the 8.0 version of SPSS statistical software program.

4.2.1 Descriptive analysis of test results

Since there were a relatively large number of research subjects (120 people with altogether 480 observations) randomly selected for the experiment, it was assumed that the sampling distribution was normal (see Hatch & Lazaraton, 1991:164), therefore the test means would give a fairly clear and reliable picture of the differences between the various factors in the experiment. Table 6. below shows the descriptive statistics of the results.

Table 6. Descriptive analysis of the mean test results

	Incidental condition						Intentional condition					
	Immediate post-test			Delayed Post-test			Immediate post-test			Delayed Post-test		
	F	M	C	F	M	C	F	M	C	F	M	C
Mean	9.45	10.05	8.98	6.75	8.78	7.18	11.3	11.93	10.00	7.73	8.40	7.50
Std. Dev.	4.24	3.68	3.31	5.08	4.38	4.30	2.53	1.65	3.17	4.33	4.14	4.10
Minimum	0	1	2	0	0	0	5	8	2	0	1	0
Maximum	13	13	13	13	13	13	13	13	13	13	13	13
Range	13	12	11	13	13	13	8	5	11	13	12	13

F = input provided with form-focused enhancement

M = input provided with meaning-focused enhancement

C = (control) input provided with no enhancement

The results observed in Table 6. above suggest various implications. For one thing, it can be clearly seen that the range of results is rather wide in almost all groups, which implies that the tasks were difficult enough for the research population. The widest range can be observed in the delayed post-tests of the groups, especially under incidental condition where the range was 100% of the total score in all three groups (i.e. in those subjected to texts with form- and meaning-focused enhancement and also the control group that received input without such enhancement).

The narrowest range can be observed in the immediate post-test results of groups in the intentional learning condition. While the range of scores of the participant groups generally varies between 11 and 13, which means 84.6% to 100% of the total score, in the case of the immediate post-test under intentional experimental condition the range is 8 (61.5%

of the total score) in the group exposed to texts with form-focused enhancement, and it is only 5 (38.4% of the total score) in the group using the meaning-focused annotations. Table 7. below illustrates the range of test scores as a percentage of the total score.

Table 7. Ranges of test scores expressed as a percentage of the total test scores

	Incidental condition						Intentional condition					
	Immediate post-test			Delayed Post-test			Immediate post-test			Delayed post-test		
	F	M	C	F	M	C	F	M	C	F	M	C
Range of scores as a% of the total score	100	92.3	84.6	100	100	100	61.5	38.4	84.6	100	92.3	100

F = input provided with form-focused enhancement

M = input provided with meaning-focused enhancement

C = (control) input provided with no enhancement

As Table 8. (p. 133) demonstrates, these groups also show the lowest standard deviations from the means, indicating that the results in these groups were the most homogeneous.

Table 8. Standard deviations of test scores expressed as a percentage of the mean test scores

	<i>Incidental condition</i>						<i>Intentional condition</i>					
	<i>Immediate post-test</i>			<i>Delayed Post-test</i>			<i>Immediate Post-test</i>			<i>Delayed post-test</i>		
	<i>F</i>	<i>M</i>	<i>C</i>	<i>F</i>	<i>M</i>	<i>C</i>	<i>F</i>	<i>M</i>	<i>C</i>	<i>F</i>	<i>M</i>	<i>C</i>
<i>Std. Dev. as a% of the mean score</i>	44.0.	36.6	36.8	75.2	49.8	59.8	22.3	13.8	31.7	56.0	49.2	54.6

F = input provided with form-focused enhancement

M = input provided with meaning-focused enhancement

C = (control) input provided with no enhancement

Although originally it was assumed that the mean test results would characterise the differences between the groups in various experimental conditions, after studying the descriptive statistics of the test results more closely (see Table 9. below) it was observed that the mean, the mode and the median of the test results did not coincide.

Table 9. Descriptive statistics of the test results in the study

		Statistics			
		Immediate post test results (incidental learning condition)	Immediate post test results (intentional condition)	Delayed post test results (incidental condition)	Delayed post test results (intentional condition)
N	Valid	120	120	120	120
	Missing	0	0	0	0
Mean		9,49	11,08	7,57	7,88
Median		11,00	13,00	8,00	8,00
Mode		13	13	13	13
Skewness		-,793	-1,296	-,253	-,160
Kurtosis		-,546	,827	-1,349	-1,299

This means that in spite of the relatively large number of randomly selected research population (120 people), the results gained in the experiment are not normally distributed, which may also be attributed to the small scale of possible test results (each test had only 13 test items). This relatively small scale of the taught and tested vocabulary items was designed on purpose. According to research evidence (see Hunt and Beglar, 1998) the optimal number of vocabulary items that can be effectively taught and consequently learned in one session is around five, which means that even so with the 13 lexical items per session and test applied, this condition had to be violated for the sake of achieving reasonably correct statistical results when analysing group performance. The number of taught and tested lexical items was designed in a way that they should contain the lowest possible number of words that could still be reliably analysed using statistical methods.

Since the distribution of the data does not appear to be normal, it is worth examining the kurtosis and the skew of the data. As Table 9. (p. 134) shows, the distribution of test results under all experimental conditions is mainly platykurtic, with the flat curve moving mainly in the negative direction in relation to the curve of the normal distribution (see

Bachman, 2004:50-53). The distribution of all the results is negatively skewed towards the left of the distribution. "In the negatively skewed distribution, some students performed much worse than we might expect them to. The data pulled the mean lower" (Hatch & Lazaraton, 1991:164). Figures 2-5. (pp. 136, 137) show the histograms of the test results compared to the bell-shaped curve of the Gaussian normal distribution. Besides the incongruence with the curve indicating normal distribution, the flat, platycurtic character and the negative skew of the test results are apparent in these figures.

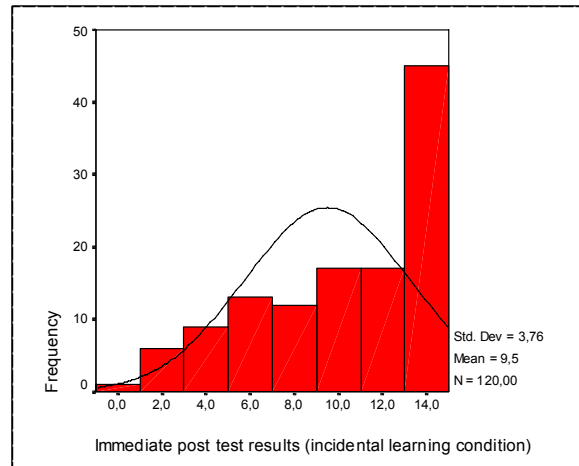


Figure 2. The distribution of the immediate post-test results (incidental condition) with the frequency polygon indicating the normal distribution curve

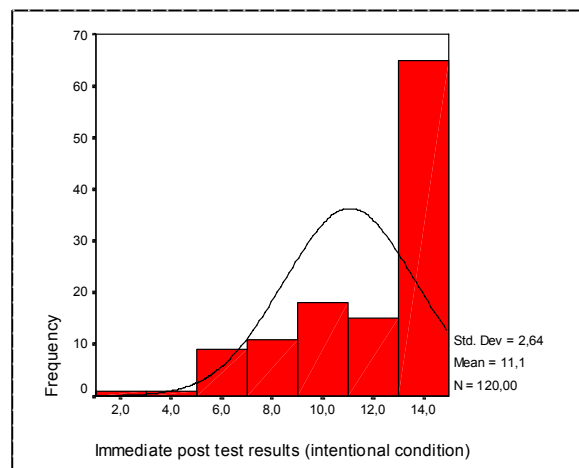


Figure 3. The distribution of the immediate post-test results (intentional condition) with the frequency polygon indicating the normal distribution curve

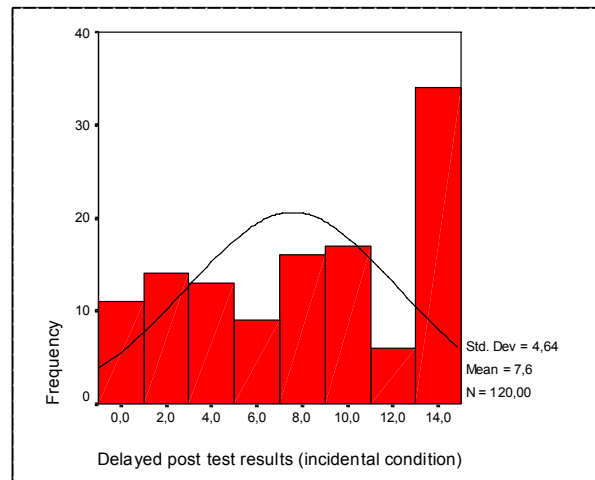


Figure 4. The distribution of the delayed post-test results (incidental condition) with the frequency polygon indicating the normal distribution curve

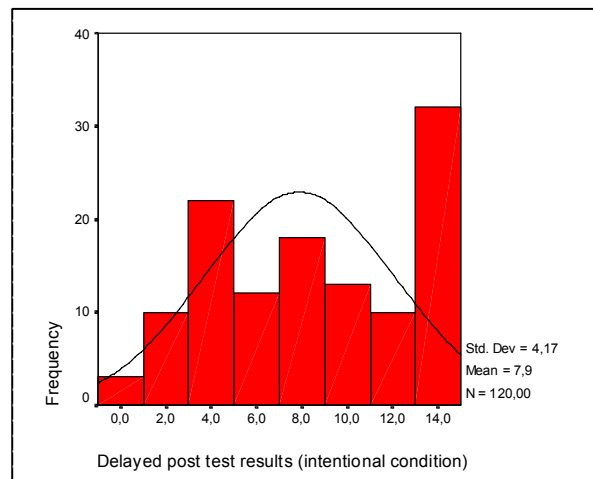


Figure 5. The distribution of the delayed post-test results (intentional condition) with the frequency polygon indicating the normal distribution curve

The fact that the test results gained are not normally distributed also implies that the central tendency most characteristic of the test results may be the median rather than the mean value. According to Hatch & Lazaraton (1991:166), “if the distribution of responses in the data includes a number of scores that skew the distribution, then the median is the best option”.

Even though the figures gained through the application of descriptive statistics may show certain tendencies concerning subjects’ performance, these data are far from being adequate for drawing conclusions whether the achievement of participants in some experimental conditions is significantly higher than the achievement of those exposed to other experimental conditions. In order to identify whether the differences spotted by means of analyzing descriptive statistical results were statistically significant inferential statistical methods were applied.

4.2.2 Analysing test results with distribution-free inferential statistical methods

Since the dependent variables were of not normal distribution, nonparametric or distribution-free statistical methods were more applicable (even though parametric statistics tend to be statistically more powerful than their nonparametric counterparts), as the validity of distribution-free tests under the null hypothesis did not require the specification of the distribution of the research population. The Kruskal-Wallis nonparametric test procedure followed by Mann-Whitney U-tests provided analysis of variance for the effects of the three different and independent input types (viz. form-focused, meaning-focused and control), and the Friedman test repeated-measures procedure complemented by the Wilcoxon Signed Rank Test provided analysis of variance for making the same measurement twice with related data, once in incidental and once in intentional learning condition with the same research population. The null hypotheses were tested at a $p < .05$ level of significance. The following sections of the paper will present the nonparametric inferential statistical analyses of the vocabulary test results.

4.2.2.1 Analysing test results concerning research focus A

For the analysis of the multiple between-subjects relationships, that is for finding out the relationship between the groups using form-focused and meaning-focused hypertextual

input enhancement as well as no enhancement (control group), the Kruskal Wallis test was chosen because it is nonparametric, it tests multiple levels and it was designed to test K-number of independent groups (i. e. suitable for measuring differences in a between-groups design that includes more than two groups). The variable of interest was continuous, the sampled populations were meant to be identical (except for a potential difference in median of the dependent variables), and lastly because the data to be checked were situated on an ordinal scale. Table 10. below shows the mean rank of the test results of the different participant groups

Table 10. The mean rank of the test results of the different participant groups

Ranks			
	Treatment type	N	Mean Rank
Immediate post test results (incidental learning condition)	form-focused	40	62,21
	meaning-focused	40	66,36
	control	40	52,92
	Total	120	
Delayed post test results (incidental condition)	form-focused	40	54,83
	meaning-focused	40	69,56
	control	40	57,11
	Total	120	
Immediate post test results (intentional condition)	form-focused	40	63,75
	meaning-focused	40	69,21
	control	40	48,54
	Total	120	
Delayed post test results (intentional condition)	form-focused	40	59,72
	meaning-focused	40	65,26
	control	40	56,51
	Total	120	

The Kruskal-Wallis test statistics determines if the rank sums are sufficiently different, and thus it states that not all the population medians are the same. If the p value received as the result of this test is smaller than 0.05 in a two tailed test, it indicates that not all medians are the same, and therefore the null hypothesis stating that learners exposed to hypertextually enhanced interactional input modifications in the two experimental groups will attain the same level of L2 vocabulary acquisition and retention as learners subjected to non-negotiated input in traditional paper format in the control group can be rejected, and it can be stated that

the achievements of the three groups were different. As it can be seen in Table 11., not all the medians were found to be identical in the experiment, therefore the null hypothesis stating that participants in the experimental groups attain the same level of L2 vocabulary acquisition and retention can be rejected. Table 11. also reveals that the condition where the medians were found to be significantly different was in the immediate post-test under the intentional learning condition.

Table 11. The asymptotic significance of differences between the group test results as calculated by the Kruskal-Wallis test.

Test Statistics^{a,b}				
	Immediate post test results (incidental learning condition)	Delayed post test results (incidental condition)	Immediate post test results (intentional condition)	Delayed post test results (intentional condition)
Chi-Square	3,314	4,269	9,050	1,325
df	2	2	2	2
Asymp. Sig.	,191	,118	,011	,516

a. Kruskal Wallis Test

b. Grouping Variable: Treatment type

The results suggest that a statistically significant difference exists between the acquisition achievements of the form-focused, meaning-focused and the control groups in the intentional learning condition. This test, however, does not determine precisely where the differences are. The strongest conclusion that can be drawn from this result is that all the mean ranks are not equal. From this result it is not clear whether students in the meaning-focused, form-focused or control group achieved significantly better results than the others. Therefore, as a follow-up, we need to determine which groups differ significantly from the others. In order to be able to do this, three separate Mann-Whitney U tests were conducted to compare the paired significance of the different treatment groups. When comparing two independent samples (populations), the Mann-Whitney test is one of the most powerful of the non-parametric tests. The Mann-Whitney U test, unlike its parametric counterpart the two-sample t-test, does not assume that the difference between the two samples is normally distributed.

When comparing the immediate post-test results of the meaning-focused group with those of the form-focused group (see Table 12. below) using the Mann-Whitney U test the mean ranks as well as the sum of ranks clearly demonstrated that the subjects using meaning-focused input enhancement outperformed those using form-focused input enhancement.

Table 12. Comparison of the mean ranks and rank sums of test results of the meaning-focused and the form-focused groups (immediate post-test in intentional learning condition) using the Mann-Whitney U test

Ranks				
Treatment type		N	Mean Rank	Sum of Ranks
Immediate post test results (intentional condition)	form-focused	40	38,75	1550,00
	meaning-focused	40	42,25	1690,00
	Total	80		

The results of the analysis also show, however, that no significant difference can be spotted between the test results of these two groups. The asymptotic significance found was 0.438 (see Table 13. p. 141), which is not significant. Even if considering the one-tailed nature of hypothesis 2 stating that participants subjected to meaning-focused input enhancement would outperform students subjected to form-focused input enhancement, the 0.219 result is still not significant. Therefore hypothesis 2 has been disproved for the relationship between the meaning-focused and the form-focused groups.

Table 13. Test of significance in relation to the Mann-Whitney U test

Test Statistics ^a	
	Immediate post test results (intentional condition)
Mann-Whitney U	730,000
Wilcoxon W	1550,000
Z	-,776
Asymp. Sig. (2-tailed)	,438

a. Grouping Variable: Treatment type

As Table 14. below shows, the participants using meaning-focused enhancement outperformed those using no input enhancement in the control group on the immediate post-test under the intentional learning condition.

Table 14. Comparison of the mean ranks and rank sums of test results of the meaning-focused and the control groups (immediate post-test in intentional learning condition) using the Mann-Whitney U test

Ranks				
	Treatment type	N	Mean Rank	Sum of Ranks
Immediate post test results (intentional condition)	meaning-focused	40	47,46	1898,50
	control	40	33,54	1341,50
	Total	80		

Table 15. below demonstrates that the difference between the achievements of the two groups is statistically significant at a significance level of $p < 0.05$.

Table 15. Test of significance in relation to the Mann-Whitney U test

Test Statistics ^a	
	Immediate post test results (intentional condition)
Mann-Whitney U	521,500
Wilcoxon W	1341,500
Z	-2,887
Asymp. Sig. (2-tailed)	,004

a. Grouping Variable: Treatment type

As Table 16. (p. 143) and Table 17. (p. 143) indicate, members of the group using form-focused input enhancement also significantly (one-tailed significance $p = 0.020$) outperformed the control group on the immediate post-test in the intentional learning condition. With this result hypothesis 1 stating that subjects exposed to input during

negotiated interaction through link-based hypertext presentation will attain higher levels of L2 vocabulary acquisition and retention than learners subjected to non-negotiated input has been proved, albeit only on the immediate post-test in the intentional learning condition.

Table 16. The comparison of the mean ranks and rank sums of tests of the form-focused and the control groups (immediate post-test in intentional learning condition) using the Mann-Whitney U test.

Ranks				
Treatment type		N	Mean Rank	Sum of Ranks
Immediate post test results (intentional condition)	form-focused	40	45,50	1820,00
	control	40	35,50	1420,00
	Total	80		

Table 17. Test of significance in relation to the Mann-Whitney U test

Test Statistics ^a	
	Immediate post test results (intentional condition)
Mann-Whitney U	600,000
Wilcoxon W	1420,000
Z	-2,050
Asymp. Sig. (2-tailed)	,040

a. Grouping Variable: Treatment type

In sum, significant differences could only be spotted between the different groups when comparing the rank sums of immediate test results in the intentional condition. The Mann-Whitney U test proved that there was no significant difference between the achievement of the group using meaning-focused input enhancement and that of the other group working with form-focused input enhancement. However, a statistically significant difference was found when comparing the group using form-focused glosses with the control group, in favour of the former. Participants using meaning-focused glosses during their studies also significantly outperformed members of the control group. Thus, hypothesis 1

stating that subjects using hypertextually-enhanced input would outperform those using no enhancement has been confirmed for the intentional learning condition and on the immediate post-test. Hypothesis 2, which stated that students in the group using meaning-focused input enhancement would outperform members of the group using form-focused input was disproved. Even though subjects using meaning-focused input enhancement did perform better than those in the form-focused group, this difference was not significant under any experimental conditions.

4.2.2.2 Analysing test results concerning research focus B

Research focus B of the study examined the difference in effectiveness between incidental and intentional vocabulary learning. According to the null hypothesis there would be no difference between the achievement of the participants exposed to incidental vocabulary acquisition and that of the participants learning the target words intentionally.

So as to measure the potential difference in the output of the incidental and intentional conditions a within-groups repeated measures research design was applied, i. e. the same groups of participants were exposed to both experimental conditions. For the measurement of the difference between the effectiveness of incidental and intentional vocabulary learning within one and the same group of subjects, the Friedman test was applied. "The Kruskal-Wallis test parallels a one-way ANOVA where the comparisons are between groups. A parallel nonparametric test for a Repeated-measures ANOVA is the Friedman test" (Hatch & Lazaraton, 1991:355).

The Friedman test compares the rank sum of values in the related groups examined. The more different the rank sums or the mean ranks in the two groups are, the more significant result the Friedman test will yield, that is the more different the medians of the test results in the two groups are. Therefore, if the null hypothesis is true, the rank sums should be fairly close in size. If the null hypothesis is not true, at least one mean rank should be significantly different in size from at least one other mean rank. In other words, if the significance of the Friedman test is below $p = .05$, the null hypothesis can be rejected.

On the basis of the results shown in Tables 18 and 19 (p. 145) we can conclude that not all population medians are the same and therefore there is a significant difference between research subjects exposed to incidental and the intentional vocabulary learning conditions.

Table 18. Comparison of the rank sums of test results of the incidental and the intentional learning conditions using the Friedman test

Ranks	
	Mean Rank
Immediate post test results (incidental learning condition)	2,72
Immediate post test results (intentional condition)	3,15
Delayed post test results (incidental condition)	2,05
Delayed post test results (intentional condition)	2,09

Table 19. Test of significance in relation to the Friedman test

Test Statistics ^a	
N	120
Chi-Square	75,539
df	3
Asymp. Sig.	,000

a. Friedman Test

The rank values of the Friedman test suggest that the two levels (i.e. the incidental and intentional independent variables) produce different outcomes. On the basis of the robust $p = .000$ calculated level of significance (see Table 19. above) of the within-groups repeated-measures statistical test, the null hypothesis of research focus B stating that students learning target vocabulary intentionally will attain the same levels of L2 vocabulary acquisition and retention as students acquiring the same vocabulary incidentally can be rejected. To find out exactly which learning mode is favourable, further exploration is required to establish the differences between pairs of conditions. To measure the matched paired rank order of differences the Wilcoxon Signed Ranks test was applied as a follow-up. This test makes use of information about the direction of change in paired data. “The Wilcoxon Signed ranks test does this by giving more weight to a pair which shows a large difference between the two

groups than a pair which shows a small difference (Hatch & Lazaroton, 1991:297). As Tables 20. and 21. report on the evidence of the results of the immediate post-tests, the participants learning the new words intentionally significantly ($p = .000$) outperformed those acquiring the same words incidentally.

Table 20. Comparison of the mean ranks of immediate post-test scores under the incidental and intentional learning conditions

Ranks		N	Mean Rank	Sum of Ranks
Immediate post-test results (intentional c.) -	Negative Ranks	26 ^a	34.15	888.00
Immediate post-test results (incidental c.)	Positive Ranks	59 ^b	46.90	2767.00
	Ties	35 ^c		
	Total	120		

a. Immediate post-test results (intentional c.) < Immediate post-test results (incidental c.)

b. Immediate post-test results (intentional c.) > Immediate post-test results (incidental c.)

c. Immediate post-test results (incidental c.) = Immediate post-test results (intentional c.)

Table 21. Test of significance in relation to the Wilcoxon Signed Rank Test

Test Statistics ^b	
	Immediate post-test results (intentional c.) - Immediate post-test results (incidental c.)
Z	-4.128 ^a
Asymp. Sig. (2-tailed)	.000

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test

Significance level $p < .05$

The same cannot be said for the delayed post-tests. In the case of delayed post- tests, the learners under the intentional learning condition also performed better than those under the incidental learning condition (see Table 22. below). As Table 23. (p. 147) demonstrates, this difference, however, was statistically not significant ($p= 0.184$ one-tailed). This means that hypothesis 1 of research focus B stating that students learning target vocabulary intentionally will attain higher levels of L2 vocabulary acquisition and retention than students acquiring the same vocabulary incidentally was only partly proved. It was proved in the case of the immediate post-tests but disproved in the case of the delayed post-tests.

Table 22. Comparison of the mean rank of delayed post-test scores under the incidental and intentional learning conditions.

Ranks		N	Mean Rank	Sum of Ranks
Delayed post test results (intentional condition) -	Negative Ranks	45 ^a	42,43	1909,50
Delayed post test results (incidental condition)	Positive Ranks	47 ^b	50,39	2368,50
	Ties	28 ^c		
	Total	120		

a. Delayed post test results (intentional condition) < Delayed post test results (incidental condition)

b. Delayed post test results (intentional condition) > Delayed post test results (incidental condition)

c. Delayed post test results (intentional condition) = Delayed post test results (incidental condition)

Table 23. Test of significance in relation to the Wilcoxon Signed Rank Test

Test Statistics ^b	
	Delayed post test results (intentional condition) - Delayed post test results (incidental condition)
Z	-,898 ^a
Asymp. Sig. (2-tailed)	,369

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test

To measure the effect of time on the receptive retention of words, the test scores of the groups on each of the two test pairs (immediate and delayed post-tests) were submitted to Wilcoxon Signed Rank test. The Wilcoxon test is based on the assumption that one can rank order the magnitudes of test result differences in a meaningful way. The immediate and delayed test results were compared for the incidental and intentional learning conditions respectively.

The Wilcoxon Signed Rank test revealed a statistically significant effect of time for vocabulary learning. The difference between the immediate and delayed post-test results demonstrated absolute significance, $p = .000$ (significance level $p < .05$) under the incidental and the intentional learning conditions respectively. The results are reported in Tables 24-27.(pp. 149, 150)

Table 24. Comparison of the mean rank of test scores across time in incidental learning condition

Ranks		N	Mean Rank	Sum of Ranks
Delayed post test results (incidental condition) - Immediate post test results (incidental learning)	Negative Ranks	67 ^a	46,43	3110,50
	Positive Ranks	19 ^b	33,18	630,50
	Ties	34 ^c		
	Total	120		

- a. Delayed post test results (incidental condition) < Immediate post test results (incidental learning)
- b. Delayed post test results (incidental condition) > Immediate post test results (incidental learning)
- c. Immediate post test results (incidental learning) = Delayed post test results (incidental condition)

Table 25. Test of significance in relation to the Wilcoxon Signed Rank Test

Test Statistics ^b	
	Delayed post test results (incidental condition) - Immediate post test results (incidental learning)
Z	-5,353 ^a
Asymp. Sig. (2-tailed)	,000

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Table 26. Comparison of the mean rank of test scores across time in intentional learning condition

Ranks		N	Mean Rank	Sum of Ranks
Delayed post-test results (intentional c.) -	Negative Ranks	78 ^a	49.99	3899.00
Immediate post-test results (intentional c.)	Positive Ranks	14 ^b	27.07	379.00
	Ties	28 ^c		
	Total	120		

a. Delayed post-test results (intentional c.) < Immediate post-test results (intentional c.)

b. Delayed post-test results (intentional c.) > Immediate post-test results (intentional c.)

c. Immediate post-test results (intentional c.) = Delayed post-test results (intentional c.)

Table 27. Test of significance in relation to the Wilcoxon Signed Rank Test**Test Statistics^b**

	Delayed post-test results (intentional c.) - Immediate post-test results (intentional c.)
Z	-6.864 ^a
Asymp. Sig. (2-tailed)	.000

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Significance level $p < .05$

Due to retention loss, the scores of the delayed post-tests were significantly lower in the case of both the incidental and the intentional conditions. According to hypothesis 2, although in general better vocabulary acquisition and retention results will be achieved in the intentional learning condition than in the incidental condition, the application of form- and

meaning-focused hypertext glosses will decrease this difference. It is hypothesized that the difference between the attainment of the subjects in the control group in the intentional condition and that of the subjects in the treatment groups (either form- or meaning-focused) will not be significant. In order to prove hypothesis 2, paired Mann-Whitney statistical analyses were applied as the items examined were nonrelated. Only the immediate post-test results were compared as on the delayed post-tests no significant difference was spotted between the effectiveness of incidental and intentional learning conditions. Two paired comparisons were made to try and prove the lack significant difference.

- Subjects using meaning-focused input enhancement in the incidental learning condition compared with subjects using no enhancement (control group) in the intentional learning condition.
- Subjects using form-focused input enhancement in the incidental learning condition compared with subjects using no enhancement (control group) in the intentional learning condition.

Table 28. below shows that participants using meaning-focused input enhancement in the incidental learning condition outperformed subjects using no enhancement in the intentional learning condition.

Table 28. Comparison of the mean ranks and rank sums of the immediate post-test results of the meaning-focused group (incidental learning condition) and the control groups (intentional learning condition) using the Mann-Whitney U test

Ranks				
Treatment group		N	Mean Rank	Sum of Ranks
Test Results	Incidental1-meaning f	40	41,63	1665,00
	Intentional 1-control	40	39,38	1575,00
	Total	80		

As can be seen in Table 29. (p. 152), however, the asymptotic significance of this difference in favour of the students using meaning-focused enhancement is only 0.652, which is not significant at the accepted $p < .05$ level of significance.

Table 29. Test of significance in relation to the Mann-Whitney U test

Test Statistics^a

	Test Results
Mann-Whitney U	755,000
Wilcoxon W	1575,000
Z	-,451
Asymp. Sig. (2-tailed)	,652

a. Grouping Variable: Treatment group

As Table 30. illustrates, students using form-focused input enhancement in the incidental learning condition were slightly outperformed by subjects using no enhancement (control group) in the intentional learning condition. The data in Table 31. (p. 152) show that this difference is very insignificant ($p = .909$).

Table 30. Comparison of the mean ranks and rank sums of the immediate post-test results of the form-focused group (incidental learning condition) and the control groups (intentional learning condition) using the Mann-Whitney U test

Ranks

		N	Mean Rank	Sum of Ranks
Test Results	Treatment group			
	Incidental 1-form f	40	40,21	1608,50
	Intentional 1-control	40	40,79	1631,50
	Total	80		

Table 31. Test of significance in relation to the Mann-Whitney U test

Test Statistics^a

	Test Results
Mann-Whitney U	788,500
Wilcoxon W	1608,500
Z	-,115
Asymp. Sig. (2-tailed)	,909

a. Grouping Variable: Treatment group

The above data mean that there are no significant differences between the two pairs of groups compared. This also means that hypothesis 2 stating that the application of form- and meaning-focused hypertext glosses will decrease the difference between the achievements of students learning words intentionally and incidentally, i.e. the difference between the attainment of the subjects in the control group in the intentional condition and that of the subjects in the treatment groups (either form- or meaning-focused) will not be significant has been proved.

To summarise the results gained through the use of the testing instrument, the nonparametric ways of test score analysis revealed the following differences between the achievement of the groups participating in the experiment..

Research focus A

- A significant difference was found between the group of participants using meaning-focused hypertext enhancement and the control group (where the former outperformed the latter) on the immediate post-tests under the intentional learning condition.
- A significant difference was found between the group of participants using form-focused hypertext enhancement and the control group (where the former outperformed the latter) on the immediate post-tests under the intentional learning condition.
- No significant difference was found between the group of participants using meaning-focused hypertext enhancement and the group of participants using form-focused hypertext enhancement.

The first two findings suggest that the use of hypertextual input enhancement did favourably influence intermediate ESL learners' vocabulary acquisition. The fact that these significantly better scores were present only in the immediate post-test results can be accounted by the fact that participants were exposed to the target words only on one occasion, and they saw the new vocabulary only in one single context.

The second finding, contrary to what was hypothesized, suggests that neither meaning-focused nor form-focused input enhancement seemed to have a more profound influence on L2 vocabulary acquisition than the other. Participants using meaning-focused annotations invariably outperformed those working with form-focused annotations in all experimental

conditions. Nevertheless, the differences between the two groups never came up to a significant level. The lack of significant differences might be attributed to material design and students' cognitive behaviour. Since both form- and meaning-focused hypertext glosses included the target words' Hungarian equivalents, after realizing its availability, students in both groups tended to overuse this kind of information ignoring most other information types that were different in the form- and meaning-focused glosses. For the detailed discussion of learners' behaviour during the study sessions see the results gained by using the tracking device (p. 188).

Research focus B

- A significant difference was found between the effectiveness of intentional and incidental vocabulary acquisition where students learning intentionally outperformed those learning words incidentally on the immediate post-test.
- A significant difference was found between the effectiveness of the immediate and delayed post-tests, where due to forgetting the immediate test results were higher than in the case of delayed post-tests under both the incidental and the intentional learning conditions.
- No significant difference was found between the performance of participants using hypertext input enhancement in the incidental learning condition, and that of subjects using no enhancement (control) in the intentional learning condition.

Concerning research focus B, on the basis of the first finding it seems plausible to state that learners' awareness of the task does make a difference in their performance. When participants were forewarned about a pending vocabulary test on the words of the texts studied, they performed significantly better. The fact that no significant difference was established between the performance of participants using hypertext input enhancement in the incidental learning condition, and that of subjects using no enhancement in the intentional learning condition (as described in the third finding) may be the indication of the positive, beneficial effect of interactional input enhancement in the form of hypertext annotations on L2 vocabulary learning..

The second finding that all groups performed significantly lower on the delayed post-tests is hardly surprising, considering the three-week time lapse in between, and the single exposure to the vocabulary.

4.2.3 Validating the testing instruments

In order to check the validity and reliability of the banked close tests applied in the study, all four tests that the whole research population had been subjected to were analysed with the help of the MicroCAT ITEMAN software program.

All the 120 subjects participating in the experiment had been asked to do:

- a test measuring incidental acquisition
- a test measuring intentional acquisition
- a test measuring retention as a result of incidental learning (an exact replica of the test measuring incidental acquisition, applied 3 weeks later)
- a test measuring retention as a result of intentional learning (an exact replica of the test measuring intentional acquisition, applied 3 weeks later)

The results of the above four tests for all 120 students participating in the research were subjected to statistical item analysis in order to draw conclusions about the reliability, facility value, homogeneity and discriminating power of the tests. Table 32. (p. 156) presents the descriptive statistics from the item analysis of each of the above tests.

Table 32. Item analysis statistics of the post-test results for all 120 participants

	<i>Incidental Learning Condition</i>		<i>Intentional Learning Condition</i>	
	<i>Immediate Post-test</i>	<i>Delayed Post-test</i>	<i>Immediate Post-test</i>	<i>Delayed Post-test</i>
<i>N of Items</i>	13	13	13	13
<i>N of Examinees</i>	120	120	120	120
<i>Mean</i>	8.175	7.833	11.283	9.750
<i>Variance</i>	17.078	22.206	6.320	14.087
<i>Std. Deviation.</i>	4.133	4.712	2.514	3.753
<i>Skew</i>	-0.208	-0.338	-1.502	-0.919
<i>Kurtosis</i>	-1.346	-1.339	1.559	-0.375
<i>Minimum</i>	0.000	0.000	2.000	0.000
<i>Maximum</i>	13.000	13.000	13.000	13.000
<i>Median</i>	8.000	8.000	13.000	11.000
<i>Alpha</i>	0.903	0.936	0.844	0.903
<i>SEM</i>	1.285	1.188	0.996	1.168
<i>Mean P</i>	0.629	0.603	0.868	0.750
<i>Mean Item-Tot.</i>	0.675	0.753	0.576	0.680
<i>Mean Biserial</i>	0.881	0.962	0.936	0.937

Table 32. above shows that in the incidental learning condition the mean immediate post-test result is 8.175, and the mean delayed post-test result is 7.833 only, which natural decrease can be put down to forgetting during the three weeks between the immediate and the delayed post-tests. It is apparent from the table that the subjects acquiring new lexical units in the intentional learning condition outperformed their peers in the incidental learning condition both on the immediate and the delayed post-tests. The medians also demonstrate better achievement under the intentional learning condition.

When looking at the Mean P figures in the four tests, it can be seen that the mean proportion of the results in the four tests are 0.629 (62.9%); 0.603 (60%); 0.868 (86%); and 0.750 (75%). These figures demonstrate a slightly higher than the ideal (especially in the case of the immediate post-test in the intentional learning condition) facility value. Alderson, Clapham and Wall (1995:81) state that items with a facility value as near to 50% will assure high discrimination, i. e. that students scores are likely to range from very high to very low.

Despite some of the comparatively high facility values the mean item totals indicating the discrimination indices of the four tests (in the order indicated above) are 0.67%; 0.75%; 0.57%; and 0.68%. Even though the number of test items in each test was rather limited (13),

the above figures show that the mean item totals (i. e. the discrimination index of the tests) were between 0.576 and 0.753. This proves that the level of the banked cloze tests applied discriminated between the student-participants quite well as the discrimination index is well above 30%.

The figures also show considerable inter-item consistency, as the Cronbach alpha index in the four tests were 0.903; 0.936; 0.844; and 0.903, that is they ranged between 0.844 and 0.936. As can be clearly seen, the Cronbach alpha values are all fairly close to 1, which indicates high test reliability. “A perfectly reliable test would have a reliability index of +1.0.” (Alderson, Clapham, & Well, 1995:88).

4.2.4 Linguistic analysis of the differences observed in students’ performance

In order to try and account for the differences in the participants’ overall performance, the results for the vocabulary items that were solved correctly by the largest and the smallest number of students were subjected to a linguistic analysis. It was examined whether the success of retrieving a particular vocabulary item could potentially attributed to its pronounceability, orthography, length, morphological, syntactic or semantic features.

Since there were 120 subjects involved in the experiment and each of them wrote an immediate and a delayed vocabulary test after being exposed to incidental vocabulary learning, and each of them did another immediate and a delayed vocabulary test after learning words in an intentional learning condition, there were altogether 480 test results (240/incidental condition and 240/intentional condition) analyzed. Tables 33. and 34. (p. 158) present the distribution of the most and least frequently retrieved lexical items in the incidental and the intentional vocabulary learning conditions.

Table 33. Total number of correct answers per test item in Text 1 (incidental learning condition)

Text 1 – PIRATES

Total number of correct answers/test item – Incidental learning condition												
Test Item 1	Test Item 2	Test Item 3	Test Item 4	Test Item 5	Test Item 6	Test Item 7	Test Item 8	Test Item 9	Test Item 10	Test Item 11	Test Item 12	Test Item 13
175	206	170	<u>142</u>	173	171	144	191	<u>142</u>	159	169	144	<u>133</u>

Test item 1 - merchant
 Test item 2 - piracy
 Test item 3 - cargo
 Test item 4 - ransom
 Test item 5 - cavalier
 Test item 6 - dagger
 Test item 7 - desperate

Test item 8 - rags
 Test item 9 - rebelling
 Test item 10 - outlaw
 Test item 11 - elected
 Test item 12 - govern
 Test item 13 - conduct

Table 34. Total number of correct answers per test item in Text 2 (intentional learning condition)

Text 2 - PICKPOCKETS

Total number of correct answers/test item –Intentional learning condition												
Test Item 1	Test Item 2	Test Item 3	Test Item 4	Test Item 5	Test Item 6	Test Item 7	Test Item 8	Test Item 9	Test Item 10	Test Item 11	Test Item 12	Test Item 13
179	169	168	<u>152</u>	<u>151</u>	<u>151</u>	205	219	217	200	213	180	181

Test item 1 - rapidly
 Test item 2 - methods
 Test item 3 - gather
 Test item 4 - attentively
 Test item 5 - skillfully
 Test item 6 - efficient
 Test item 7 - dummy

Test item 8 - mannequin
 Test item 9 - racetracks
 Test item 10 - snatcher
 Test item 11 - cautious
 Test item 12 - alert
 Test item 13 - gatherings

As can be seen in Table 35. (p. 159), the following lexical items were retained correctly by most subjects: piracy (206/240 = 85.83%), rags (191/240 = 79.58%), merchant (175/240 = 72.91%) in the first text when subjects learnt new vocabulary under the incidental learning condition, and mannequin (219/240 = 91.25%), racetracks (217/240 = 90.41%),

cautious (213/240 = 88.75%), dummy (205/240 = 85.41%) and snatcher (200/240 = 83.33%) in the second text, when subjects learnt new vocabulary in the intentional learning condition.

The words that were least successfully retained in the tests by most students were as follows: conduct (133/240 = 55.41%), ransom (142/240 = 59.16%) and rebelling (142/240 = 59.16%) in the incidental condition, and efficient (151/240 = 62.91%), skillfully (151/240 = 62.91%), attentively (152/240 = 63.33%) in the intentional learning condition.

Table 35. Words retained correctly by the largest and smallest number of students as reflected by the test results

Words retained correctly by the largest number of students	Percentage (as compared to all items)	Words retained correctly by the smallest number of students	Percentage (as compared to all items)
Mannequin	91.25%	Conduct (n.)	55.41%
Racetracks	90.41%	Ransom	59.16%
Cautious	88.75%	Rebelling	59.16%
Piracy	85.83%	Efficient	62.91%
Dummy	85.41%	Skillfully	62.91%
Snatcher	83.33%	Attentively	63.33%
Rags	79.58%		
Merchant	72.91%		

4.2.4.1 Pronounceability

Since Hungarian has a fixed stress on the first syllable, whereas English has variable stress, Hungarian learners of English may find multisyllabic English words with the stress not on the first syllable difficult to pronounce, and thus difficult to learn and remember. Besides, the weakening of unstressed vowels may also cause difficulties, and learners tend to avoid phonologically difficult words. This latter phenomenon may act as a difficulty factor when the acquisition of novel words takes place through an oral-aural channel, therefore it will not interfere in the receptive acquisition of written words. Since in both texts applied the great majority (10/13 = 76%) of the words analyzed have the stress on the first syllable, the word stress is likely to cause no difficulty. As a matter of interest, some of the remaining words (re'belli^{ng}, e'ffici^{ent}, a'ttenti^vely) belong to the vocabulary items that were retained by only a small number of students. Most words involved were relatively easy to pronounce, perhaps with the exception of the noun 'conduct' that the smallest number of students (55.41%) were

able to get right. Since students tend to be more familiar with the pronunciation of the verb form [kən'dʌkt] of this word, having to pronounce it as a noun ['kɒndʌkt] may cause some confusion, even though the stress, similarly to Hungarian, is on the first syllable. The pronunciation slightly different from that of the verb, however, could by itself hardly account for the fact that the word 'conduct' was in fact retrieved by the smallest number of students.

4.2.4.2 Orthography

The words examined in the current study seem to show inconsistency in this respect as words with relatively difficult spellings such as 'mannequin' and 'cautious' were learned well by many subjects, whereas words with relatively simple spellings like 'ransom' or 'conduct' were learned by relatively few students. This is hardly surprising, however, considering the fact that the subjects did receptive, written tests where the spelling difficulty was only of secondary importance to them.

4.2.4.3 Word length

Among the words successfully retained by most students 'rags' is monosyllabic, there are five words with two syllables ('merchant', 'racetrack', 'cautious', 'dummy', 'snatcher') and two words ('piracy', 'mannequin') that are composed of three syllables. Among the least successfully retained lexical items two words ('conduct', 'ransom') are bisyllabic, three items ('rebell', 'efficient', 'skillfully') consist of three syllables and one ('attentively') is composed of four syllables. Even though there seems to be a tendency that the vocabulary items retained by fewer students are relatively longer, it is doubtful whether word length has really influenced the effectiveness of vocabulary learning in our study. The word 'mannequin', which was most successfully learned by most of the participants (91.25%), for instance, is composed of three syllables, whereas the word 'conduct' learned by the smallest number of subjects (55.41%) has only two syllables.

4.2.4.4 Morphology

a) Inflectional complexity

The inflectional morphemes examined in our tests are easy to identify, unmarked, and consequently do not seem to cause particular learning difficulties. They are either regular plural markers as in ‘rag-s’ and ‘racetrack-s’, or the **-ing** verbal suffix in ‘rebell^{ing}’ indicating the progressive aspect. Moreover, according to acquisition order studies, both the plural **-s** inflectional suffix and the verbal **-ing** marker are relatively early acquired (Krashen, 1977).

b) Derivational complexity

The derivational morphemes under study as in ‘snatch-**er**’, skillful-**ly**’ and ‘attentive-**ly**’ are absolutely transparent with morphologically very productive derivational affixes added to the base forms. The words ‘pira-**cy**’, and ‘cauti-**ous**’ are perhaps slightly less transparent, but these derivatives seem to have caused no or very little learning difficulty for the learners, as both these words were among the successfully learned lexical items. Conversion, on the other hand, may raise some confusion in learners. A shift of one word class to another as in the case of ‘conduct’ may be particularly difficult for the learner to spot. Hungarian learners of English tend to be more familiar with the verbal meaning and usage of this word, and may find it difficult to pronounce and use it as a noun. This may have also contributed to the fact that by far the fewest participants (55.41%) got this word right.

4.2.4.5 Grammatical – syntactic features

Concerning the learnability of different parts of speech the overall results of the tests in this study appear to support the findings described in the literature review (see p. 81). Although there are two nouns (‘conduct’ and ‘ransom’) that belong to the group of least frequently “guessed” words, the great majority (7 out of 8) of the words retained correctly by most subjects are nouns: ‘piracy’, ‘rags’, ‘merchant’, ‘mannequin’, ‘racetracks’, ‘dummy’, ‘snatcher’. As far as adjectives are concerned, it is difficult to judge their relative difficulty to other parts of speech in the study since there is one adjective among the words that belongs to the group of the most frequently guessed words (‘cautious’), and another one (‘efficient’) among the least frequently guessed words. The other reason why it is hard to judge the relative difficulty of adjectives compared to other parts of speech is because the occurrence of adjectives among all the test items is much lower than that of nouns. There is one verb (/were/ ‘rebell^{ing}’) on the list and it belongs to the words that were retained by the least number of participants, which might imply that verbs are more difficult to learn than nouns.

There are also two adverbs on the list of the words examined. Both ‘skillfully’ and ‘attentively’ are among the least frequently retained words judging by the overall test results. This also seems to support the findings mentioned in the literature review (see p. 81), which claim that adverbs represent a part of speech that is the most difficult to learn compared to the other parts of speech.

Collocations

Concerning the uniqueness and opacity of the word co-occurrences in the study it can be stated that both the most and least successfully learned words form fairly transparent free collocations without unique meanings. Consequently, the nature of collocations (or rather just word co-occurrences) does not seem to account for the effectiveness of the experimental subjects’ receptive vocabulary learning. Table 36. below presents the co-occurrences of the most and least successfully retained words in the texts used in the study.

Table 36. Co-occurrences of words retained correctly by the largest and smallest number of students in the study.

Co-occurrences of words retained correctly by the largest number of students	Co-occurrences of words retained correctly by the smallest number of students
<ul style="list-style-type: none"> - age of piracy - piracy lasted - dressed in rags - merchant ship - rob merchant ships - a dressed mannequin - important to be cautious - a dressed dummy - purse snatcher 	<ul style="list-style-type: none"> - conduct of business - to govern the conduct of business - to demand ransom for - were ... rebelling against - the most efficient pickpockets - skillfully stole the money - were attentively watching

The frequency analysis of these lexical co-occurrences in the Brown corpus and the BNC (using Online Concordancer v.4) presented next to no collocational force between the constituent words listed above. Since all the collocates in the study are both grammatically and semantically very loosely connected, the co-occurrence of words in the texts of the study has hardly any explanatory power as to why certain words were learned more successfully than others.

Sentence length and complexity

As Table 37. (p. 163) shows, the length and complexity of sentences in which the analyzed words occurred provide inconclusive evidence regarding the success of retrieval. Some of the words that were learned well by the largest number of students are located in long, complex sentences (e.g. ‘mannequin’, ‘cautious’, ‘dummy’), while some words retrieved with low frequency (e.g. ‘efficient’) can be found in shorter sentences and/or with a simple sentence structure.

Table 37. Length and complexity of sentences with the words retained correctly by the largest and smallest number of students in the study

Words retained correctly by the largest number of students	Sentence length (words)	Sentence type	Words retained correctly by the smallest number of students	Sentence length (words)	Sentence type
Mannequin	28	Complex	conduct (n.)	18	Complex
Racetracks	28	Simple	ransom	25	Complex
Cautious	25	Complex	rebellious	18	Complex
Piracy	16	Simple	efficient	12	Simple
Dummy	28	Complex	skillfully	21	Complex
Snatcher	13	Complex	Attentively	21	Complex
Rags	15	Complex			
Merchant	17	Simple			

4.2.4.6 Semantic features

Semantic intralexical difficulty factors include specificity of meaning, multiple meaning, metaphorical meaning, minor connotational and stylistic differences, and synonymy (Laufer, 1997).

Abstractness vs. concreteness of meaning

Even though the participants in the study are teenagers, i.e. they have well reached the cognitive maturity of being able to handle abstract notions, the ease or difficulty of learning a word may depend on whether the denotational meaning of the lexical item to be memorized is concrete or abstract. Among the words studied there are only two abstract nouns: ‘piracy’,

and ‘conduct’. The former belongs to the successfully learnt words, while the latter was learnt by only a relatively low number of students. The remaining nouns all have concrete denotational meanings, and with the exception of ‘ransom’ they all (‘rags’, ‘merchant’, ‘mannequin’, ‘racetracks’, ‘dummy’) belong to the group of the most successfully learned and retained words.

Synformity, polysemy, sense relations, specificity, register restrictions, connotations

Blum and Levenston (1978) report that learners tend to use general terms (superordinates) in cases where L1 speakers use more specific terms (co-hyponyms). The noun ‘conduct’, which was learned by the smallest number of students, means some kind of moral behaviour. It is a hyponym of the more general ‘behaviour’, and as such its meaning is more specific in coverage, which also renders it more difficult to learn. The words examined do not seem to differ from one another considerably concerning register or connotations, so the differences in the effectiveness of their acquisition cannot be attributed to these factors.

Mother tongue equivalence - Transfer from L1

Mannequin in Hungarian and English may be considered cognates with only very limited equivalence or rather with very limited similarity in semantics. Similarities in sound, morphology and etymology facilitate word memorization (Nation 1982). As a matter of interest, in the current study positive transfer from the mother tongue seemed to work in the case of ‘mannequin’, where the comparison with the Hungarian word ‘manöken’ will have facilitated acquisition. Surprisingly, however, in the case of ‘(were) rebelling’, the cognate ‘rebellis’ or ‘rebellió’ used in the Hungarian language with a dated, historical connotation did not seem to cause positive transfer. This lexical unit was among the least effectively learned ones.

4.2.4.7 Frequency

As Table 38. (p. 165) shows, the analysis made to identify the frequency of the lexical items under study provided inconclusive evidence why certain words were retrieved by more students than other words. Studying the data in the table one can distinctly see that some of the words that were correctly retained by a large number of subjects have rather low ranks in usage (e. g. ‘mannequin’ or ‘snatcher’), whereas some of the least frequently retained words

(e. g. ‘conduct’ or ‘efficient’) have high usage ranks. This suggests that in our case word frequency has little if any explanatory power as to why certain words were remembered better than others.

Table 38. Rank in usage of the words retained correctly by the largest and smallest number of students out of the 86.800 most frequently used British English words (based on the ESOL Online frequency calculator, Ministry of Education, New Zealand).

Words retained correctly by the largest number of students	Rank in usage	Words retained correctly by the smallest number of students	Rank in usage
Merchant	4.583	Conduct (v.?)	2.422
Cautious	6.490	Efficient	2.502
Dummy	12.018	Ransom	13.434
Rags	13.845	Skillfully	15.799
Piracy	24.470	Attentively	28.416
Racetracks	38.492	Rebelling	42.518
Mannequin	56.848		
Snatcher	82.954		

4.2.4.8 Summary of the linguistic analysis

The results explored show that the linguistic characteristics of the words studied may very well have contributed to the fact that they were memorized and retained with ease or with difficulty. However, to attribute the effectiveness or lack of effectiveness in learning the target vocabulary exclusively to linguistic factors (at least in this particular case) would be an invalid conclusion. There are some phonological, morphological, syntactic and semantic features found in the study-texts of the current experiment that are likely to have affected the acquisition of the target vocabulary.

On the phonological level the different from Hungarian phonotactic behaviour of the L2 words, as in the stress pattern of (re’belling, e’fficient, a’ttentively) for instance, seemed to have unfavourably affected memorization. Orthographic and word length characteristics have yielded inconclusive evidence: some long words with relatively complicated spellings in which there was little grapheme-phoneme matching were frequently retained (e.g. ‘mannequin’), whereas some shorter words with uncomplicated orthographic features (e.g. ‘ransom’ or ‘conduct’) were learnt less successfully.

On the morphological level the overwhelming majority of the lexical items studied have proved to be transparent with easily identifiable unmarked inflectional and productive derivational suffixes, which facilitated their acquisition. Another morphological feature, conversion, in the case of 'conduct' (which was the least successfully retrieved word) may have caused confusion in Hungarian learners of English, who tend to be more familiar with the verbal meaning and usage of this word, and who may have found it difficult to pronounce and use it as a noun.

The outcome of the syntactic analysis of the texts in the current study support previous findings regarding the learnability of different parts of speech (see pp. 81 and 81). Nouns have been found the easiest to learn (7 out of the 8 words retained correctly are nouns: 'piracy', 'rags', 'merchant', 'mannequin', 'racetracks', 'dummy', 'snatcher'). Verbs appear to be more difficult to learn than nouns (cf. were ... 'rebell'), and adverbs tend to be quite problematic ('skillfully' and 'attentively' are among the least frequently retained words).

The length and complexity of sentences in which the analyzed words occurred provide inconclusive evidence regarding the success of retrieval. Some of the words in long, complex sentences (e.g. 'mannequin', 'cautious', dummy) were successfully learned by the majority of students, while some words (e.g. 'efficient') in shorter sentences and/or with a simple sentence structure were retrieved with low frequency.

Among the semantic features of the target vocabulary the concreteness or abstractness of the denotational meaning seems to have influenced learnability, as most of the nouns with concrete denotations ('rags', 'merchant', 'mannequin', 'racetracks', 'dummy') were successfully retained, while the abstract nouns (although very limited in number) were learned less successfully. The effect of the generality or specificity of word meaning can also be tracked down, as in the case of the noun 'conduct', which is a hyponym of the more general 'behaviour' meaning some kind of moral behaviour. As such, its meaning is more specific in coverage, which may also have contributed to the fact that it was learned by the smallest number of students. The words examined do not seem to differ from one another considerably concerning register or connotation, so the differences in the effectiveness of their acquisition cannot be attributed to these factors.

It is strange that cognates and positive transfer from L1, which were found to facilitate L2 vocabulary acquisition in previous studies, only partly helped in the current study. Positive transfer seemed to work in the case of 'mannequin', (cf. Hungarian 'manöken'), but in the case

of '(were) ... rebelling', (cf. Hungarian 'rebellis') no such positive transfer occurred as this word was among the least effectively retained ones.

Although drawing conclusions on the basis of linguistic features of the study-texts used in the experiment has provided some implications for the success of L2 vocabulary learning, relying on a tiny sample like this can offer only a rather limited scope of findings, which possess questionable external validity. We must also bear in mind that besides linguistic phenomena there are a large number of cultural, psychological, circumstantial and other factors that contribute to the success or failure of the vocabulary acquisition process.

4.3 RESULTS OF THE FOLLOW-UP QUESTIONNAIRE

The first nine questions were close-ended expecting students to indicate their attitudes, evaluating gloss types for their effectiveness and giving an account of their previous incidental vocabulary learning experience. The last three were open-ended questions to provide more freedom for the participants to express their ideas about the software program they were using and the learning process in general. The answers given to each of the twelve questions are as follows:

4.3.1 Results of the closed questions

Question 1

The first question asked students to rate the usefulness of computer-based hypertext programs in vocabulary acquisition. The great majority of participants (63.7%) judged hypertext useful for vocabulary learning. 25.1% of them thought that it was very useful, and 11.2% believed that it was only moderately useful. None of them chose the option “not useful at all”.

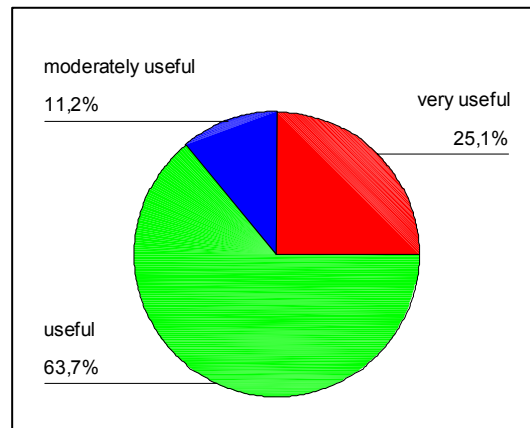


Figure 6. Perceived usefulness of hypertext for vocabulary learning

Question 2

The second question inquired whether such programs should be applied in-class or out-of-class activities. The general opinion of the participants (68.8% of all students asked) was that computerised vocabulary learning should take the form of out-of-class activities. Twenty-five percent of the 80 participants would like to use such programs in class, and 6.2% of them stated that it was not worth using such programs, which slightly contradicts the answers given to question 1, where nobody stated that such hypertext programs were “not useful at all”. The results show that the participants had an overall positive attitude towards hypertext-based computer programs, but most of them also believed that precious class time should be used differently, and that computerised learning might require more time, and should be practiced individually either at home or in the school after classes.

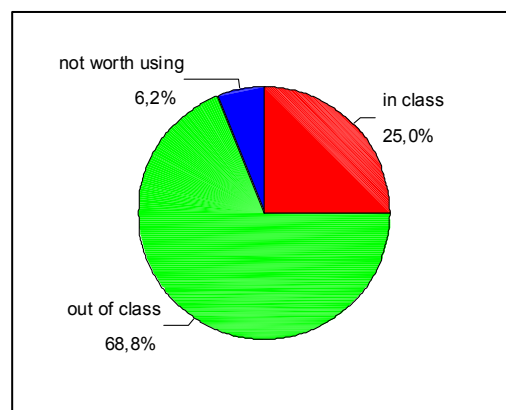


Figure 7. Where/when to use computers for vocabulary learning?

Question 3

The third question asked how often they would like to use hypertext computer programs in the process of vocabulary acquisition. Only 10% of the participants would like to use such computerised hypertext programs for vocabulary learning very often, and 33.8% would like to use them often, and 3.7% did not want to use computers at all. More than half of the students (52.5%) would like to use such programs sometimes, thus siding with a healthy balance between traditional approaches and the use of new technologies.

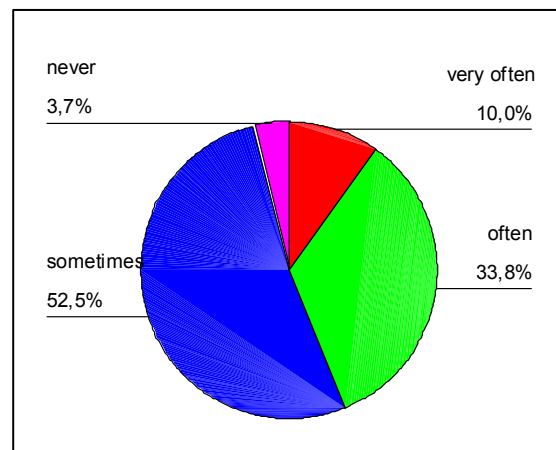


Figure 8. How often would you like to use computers for vocabulary learning?

Question 4

Question four asked about the perceived ease or difficulty of using the program in the study. Thirty-five (43.8%) of the eighty students asked reported that they found it very easy to work with the software program. Twenty-nine of them (36.2%) wrote that it was easy, and only 16 students (20%) had some kind of technical problems in the process of studying. This means that the great majority (80%) of all participants claimed to have no difficulties with the program whatsoever.

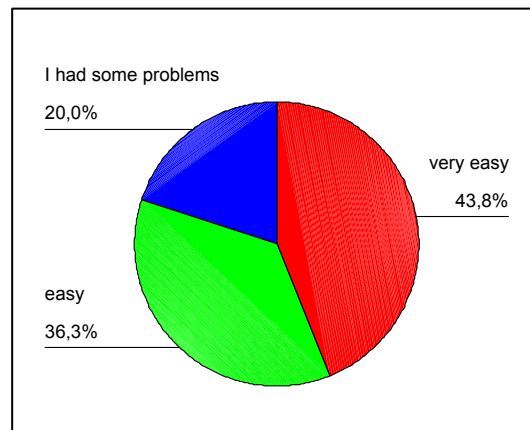


Figure 9. Perceived difficulty of using a computer for vocabulary learning

Questions 5 and 6 queried about the perceived effectiveness of input enhancement.

Question 5

The fifth question asked students about the perceived importance of visual input enhancement through the use of a colour different from the rest of the text (the hyperlinked words were blue and in bold typeface). Thirty-seven of the participants (46.2%) reported that making target words visually salient by highlighting them and providing some sort of additional information about them in the belonging glosses were only moderately helpful in the process of vocabulary learning. Almost as many of them (33 students = 41.1%) answered that highlighting helped them a lot. Only five participants (6.3%) thought that highlighting provided very much help, and the same number of them (6.3%) expressed that such visual enhancement of the target words did not help at all.

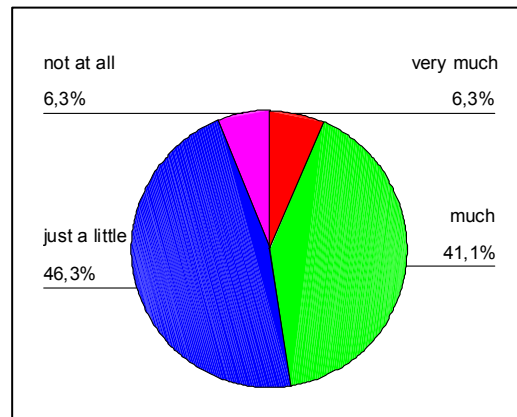


Figure 10. To what extent did the highlighting of words (+ the information provided in the gloss) help you learn the target words?

Question 6

The seven sub-questions of the sixth question inquired about the usefulness of hypertext gloss content types. Such gloss content types included the following characteristics related to the words to be learned: phonemic transcription; pronounced form in audio-format; meaning(s) explained in English; Hungarian equivalent(s); synonyms, antonyms and other sense relations; affixed and derived forms; contextual examples to demonstrate word use.

Question 6a inquired about the usefulness of phonemic transcription as hypertext gloss content. Seventeen participants (21.3%) thought that providing the phonemic transcription was very useful, and 41 of them (51.2%) stated that it was useful. This information, however, is very much in contradiction with the findings gained through the use of the tracking device. The log files showed that very few students made use of the glosses with the phonemic transcription of the stimulus words (cf. Tables 41, 42 and 43 on pp. 185, 186). So the opinions of the 18 participants (22.5%) who considered such a gloss type as moderately useful, and those the 4 students (5%) who wrote that it was not useful seem to be closer to reality.

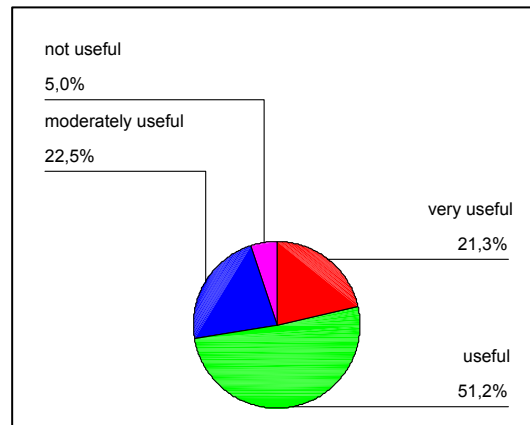


Figure 11. Perceived usefulness of gloss types applied in the study: phonemic transcription

In **question 6b**, participants were queried about the effectiveness of glosses containing sound files with the audio pronunciation of the given word. Thirty participants (37.5%) ranked this gloss type as very useful, and forty-three of them (53.8%) thought that such information was useful. These results correspond to those found in the log files measuring students study behaviour (cf. Tables 50, 51 and 52 on pp.185, 186). The log files showed that, in contrast to the underused phonemic transcriptions, the participants tended to use the audio files extensively. Six students (7.4%) of the eighty thought that audio-format pronunciation was only moderately useful, and only 1 participant (1.3%) considered it as not useful at all.

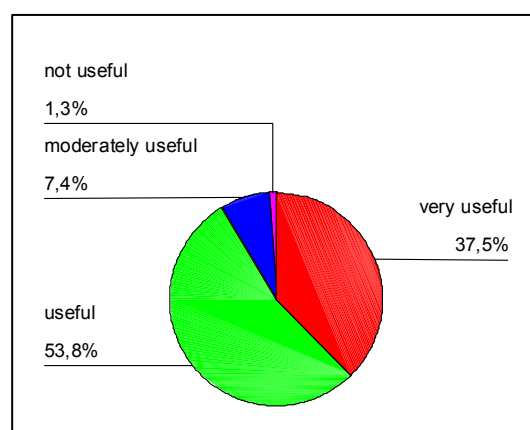


Figure 12. Perceived usefulness of gloss types applied in the study: sound files (audio-format pronunciation of the target words)

Question 6c asked students about the effectiveness of the gloss type containing the English definition(s) of the target words. The great majority of the participants expressed that explaining the meaning(s) of the words to be learned in the target language was important: thirty-one students (38.8%) regarded it as very useful, 36 of them (45%) thought that it was useful, twelve participants (15%) considered it moderately useful, and only one student (1.3%) said that it was of no use at all. The answers given to the open-ended questions of the survey also indicate that students must have felt very strongly about the usefulness of this type of information. In their general comments about the program, many of them commented that they both enjoyed English definitions and found them profitable in learning new vocabulary.

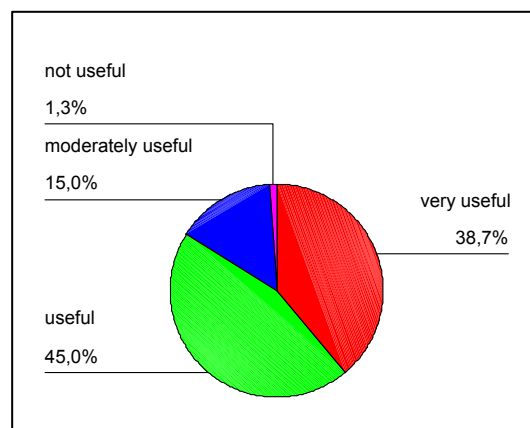


Figure 13. Perceived usefulness of gloss types applied in the study: English definition

Question 6d inquired about the importance of hypertext glosses with the Hungarian equivalents of the target words in them. In complete accordance with the evidence of student behaviour registered in the log files (cf. Tables 51 and 52 on pp .186, 194), 51 of the 80 participants (63.7%) queried were of the opinion that providing the Hungarian meanings of the stimulus words was a very useful feature of the program. Another 28 of them (35%) thought that giving the Hungarian equivalent was useful, and only one student (1.3%) wrote that it was moderately useful. No participant expressed that it was not useful at all. These

results imply that most intermediate students (in the research population anyway) tend to depend heavily on their mother tongue.

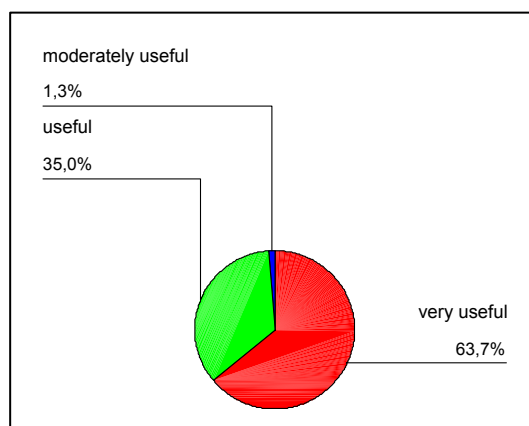


Figure 14. Perceived usefulness of gloss types applied in the study: Hungarian equivalent(s)

To **question 6e** asking about the importance of glosses providing the synonyms, antonyms and other sense relations of the stimulus words thirteen participants (16.3%) answered that such a gloss type was very useful, forty-four of them (55%) responded that it was useful, and twenty-three of them (28.7%) considered them only moderately useful.

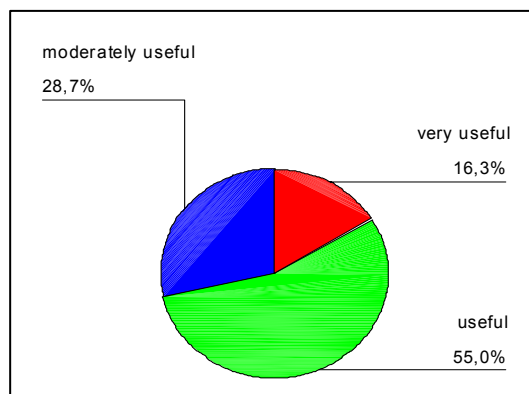


Figure 15. Perceived usefulness of gloss types applied in the study: synonyms, antonyms and other sense relations

Subjects were queried about the usefulness of annotations with the most important affixed and derived forms of the target words in **question 6f**. The distribution of their answers is as follows: sixteen of them (20%) were of the opinion that such an annotation type was

very useful, 40 students (50%) expressed a view that it was useful, and 24 participants (30%) reported that it was moderately useful.

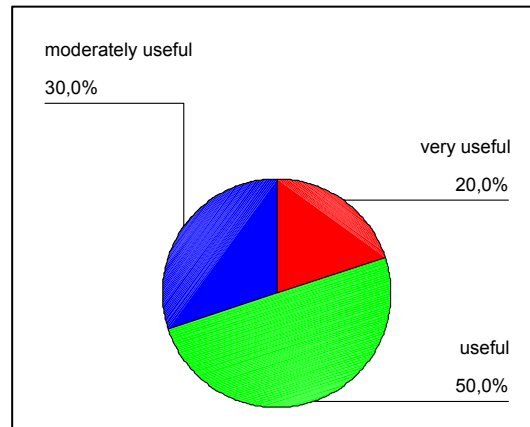


Figure 16. Perceived usefulness of gloss types applied in the study: affixed and derived forms

The importance of providing contextual examples of target word use was asked in **question 6g**. Twenty participants (25%) considered providing such additional contextualised information very useful in learning new words, and most of them (48 students = 60%) regarded it as important. Eleven participants (13.7%) held the view that it was only moderately useful, and one subject (1.3%) responded that showing the use of the new words in context did not help at all.

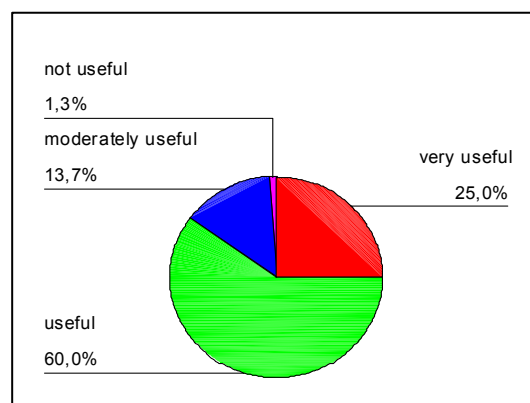


Figure 17. Perceived usefulness of gloss types applied in the study: examples of using the word in context

Figure 18. (p. 176) shows the summary of the perceived importance of the hypertext gloss types applied in the study. As can be clearly seen, the Hungarian equivalent (63.8% within type of gloss) was considered as by far the most useful gloss type. The reason for this could be learning and teaching traditions, but also the intermediate level L2 learner's natural need to heavily rely on the mother tongue. The other two gloss types also considered to have outstanding usefulness were the English definitions (38.8% within type of gloss) and the audio-format pronunciation of the words to be learned (37.5% within type of gloss).

In the group of annotations that participants referred to as useful, the most outstanding gloss type was the one that provided illustration of the word's use in context (60% within type of gloss), but showing the synonyms, antonyms and other sense relations of the word (55% within type of gloss) and providing the audio-format pronunciation (53.8% within type of gloss) were also considered as useful. Curiously, the data on the chart indicate that phonemic transcription (51.3% within type of gloss) is also considered to be useful for vocabulary learning. On the evidence of the log files, this information type was hardly ever looked up during the study sessions (see Tables 50., 51., and 52., on pp. 192, 193, and 194).

Among the items referred to as not useful phonemic transcription has the highest value (5% within type of gloss), with audio pronunciation (1.3% within type of gloss), English equivalent (1.3% within type of gloss) and contextual demonstration of use (1.3% within type of gloss) also mentioned. The low value of "audio pronunciation" is quite interesting again as this gloss type was frequently consulted by students using form-focused annotations (see Table 50. p.192).

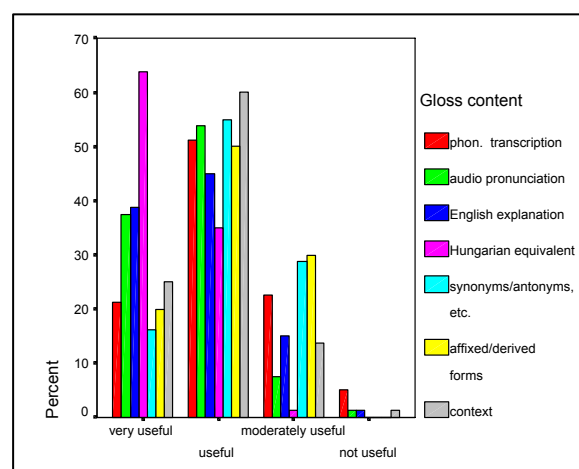


Figure 18. Summary of perceived usefulness of all gloss types applied in the study

Question 7

Question seven queried students about the help provided thanks to the interactive nature of computer programs. Exploiting the interactive feature of the computer meant that they could get more or less personalised help with the target words immediately whenever they needed some. They could consult the information in the hypertext glosses as many times and as frequently as they wished. Participants were asked to give their opinions about how important they considered this interactivity for the success of their vocabulary learning. Twenty-four of the participants (30%) found the possibility of interaction very important, forty one of them (51.3%) viewed interactivity as important, thirteen people (16.1%) found it moderately important, and two students (2.6%) were of the opinion that it was not important at all. The responses show that students in general (over 80% of them in the experiment) do appreciate the interactive nature of computer technologies in their language learning.

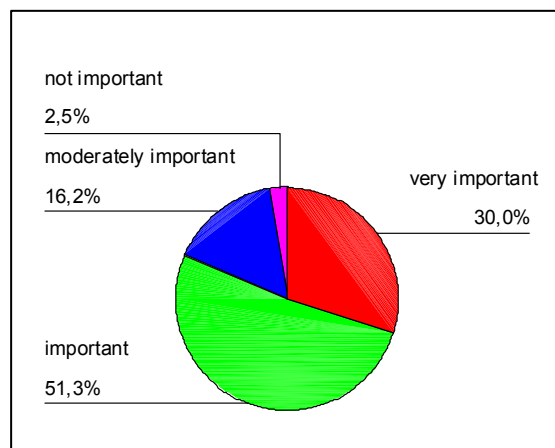


Figure 19. Perceived importance of the possibility of interaction with the computer for learning outcome

Questions 8 and 9 inquired about participants' previous incidental vocabulary learning experience on the World Wide Web.

Question 8

In question 8, learners were queried whether they had ever learnt English words incidentally, as some kind of a “by-product” while they were trying to find some specific information on the Web which was not directly related to language learning. Besides trying to find out if students ever had such learning experience, the purpose of this question was to find out whether learners were aware of the fact that vocabulary acquisition may take place incidentally, even though the target of the web activity might not have a direct relationship to a linguistic problem, nor is it intentional language learning. Forty-two of the respondents (52.5%) reported that they had learnt new words like this just once or twice, i. e. infrequently, twenty-nine of them (36.3%) reported to have had such incidental vocabulary learning experience frequently, and 9 participants (11.2%) had never learnt words like this. The answers given to this question show that the great majority of the participants (88.8%) already had such incidental learning experience and they were aware of the fact that they had learnt new words in this way.

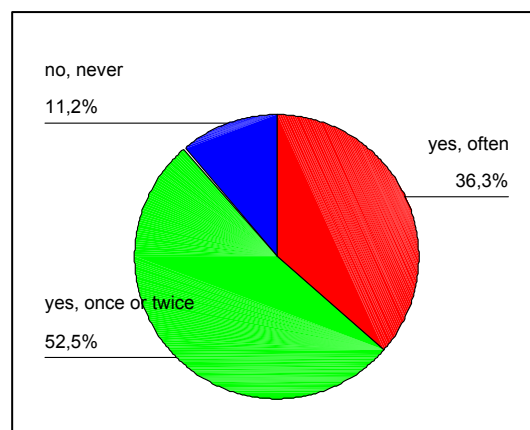


Figure 20. Have you ever learnt English words while looking for some other information on the World Wide Web?

Question 9

The people who gave an affirmative answer of some kind to question eight were asked an additional question (question 9) as to what percentage of the words learnt in this way they

thought they could still remember. There were 71 people (88.8%) who answered this question, and the following answers were given: the majority of the participants (38 people = 47.5%) claimed that they could remember just one or two of the words learned in this way, thirty-three of them (42.3%) reported that they remembered most of the words, seven students (8.7%) stated they could still remember all of the words learnt in this way, and 2 people (2.5%) said they did not remember any.

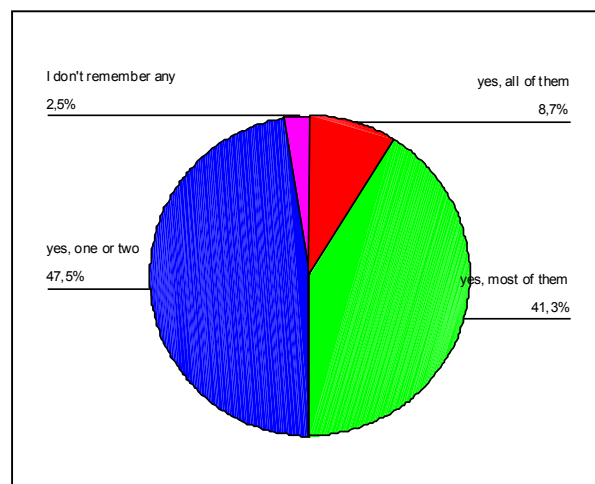


Figure 21. Can you still remember any of the words you have learned in this way?

4.3.2 Results of the open-ended questions

In order to give participants more freedom to express their thoughts on their opinions about the computer-based, hypertext-format vocabulary learning, besides the nine close-ended questions, participants were also asked three open-ended questions. This part of the research was analysed qualitatively. In analysing the results gained through this open-ended part of the questionnaire, it was found that the answers showed a rather varied and often contradictory picture. The features listed as interesting and/or useful by some students were sometimes referred to as only moderately interesting and/or boring by others. This can be accounted for by the participants' different personalities and learning styles. In spite of the varied and overlapping nature of the answers, the results did present a clear-cut tendency in learners' opinions, which will be presented and discussed below.

Questions 10 and 11 asked participants about the positive and negative attributes of the program they had used in the study. The former asked to describe the interesting and useful characteristics of the software, while the latter asked to name the moderately useful or boring features.

Question 10

In the first part of question 10 participants were queried as to what characteristics of the software program they found interesting. The rationale behind this question was the assumption that interest generates motivation and motivation immensely facilitates the outcome of the vocabulary learning (see Hulstijn & Laufer's (2001) theory of task-induced involvement).

The most prominent tendency (17 of 80 students = 21%) showed that students found the subject matter of the texts interesting, which was very motivating for them. Some of them (15 of the 80 students = 18%) also indicated audio pronunciation of the target words (i.e sound files)) as the most interesting feature, which was the second observable trend. Some other interesting features of the program mentioned by the students were:

- English definitions
- example sentences
- “the program in general, which was easy to use”
- synonyms, antonyms and other sense relations
- “the varied way of learning new words”
- “access to a lot of new information through the hypertext format”.

As to the usefulness of the program asked in the second part of question 10 by far the most typical (25 of 80 students = 31%) answer was “providing the Hungarian equivalents”. This was followed by the “audio-format” pronunciation and the synonyms, antonyms and other sense relations feature (8 of 80 students = 10% respectively). The rest of the opinions concerning the usefulness of the software are not so prominent. They were as follows:

- English definitions
- phonetic transcription
- “many-sided introduction of the target words”
- “a lot of information was provided about the target words”

- "many related expressions could be learnt"
- affixed and derived forms
- "useful words learned in a quick and effective way"
- "all of it was useful"
- "highlighted words and glosses"
- "meanings can be learned quickly"
- example sentences.

Question 11

Question 11 inquired about the negative sides of the program. The first part asked participants to name the characteristics of the program which they considered as only moderately useful. Number one of such characteristics mentioned (15 of 80 students = 18%) was phonemic transcription. One student explained his/her attitude writing "why bother with phonetic transcription if the words are pronounced by the computer anyway?" Other features that the students found only moderately useful were: English definition, synonyms, antonyms and other sense relations, example sentences of word use, affixed and derived forms, poor quality audio, and using colours for highlighting words. A student complained that the text was too long, some others wrote that there was not enough time for studying the text and the new words adequately. Students in the group using meaning-focused annotations were missing the sound feature after finding out that there was such a feature available for students using form-focused hypertext input enhancement. Although they were absolutely right about it, it could not be helped as the software program was designed like that intentionally to compare the potential effects of linguistic form and meaning on L2 vocabulary acquisition.

The other part of question 11 asked students about what they found boring about the program. The most frequently (9 of 80 students = 11%) mentioned reason for finding the program boring was the lack of video, still images, or sound (the last item refers only to the meaning-focused counterpart of the texts, which had no multimodal constituents at all). The second most frequently mentioned problem why students found the program boring had to do with the "clicking design" of the software. Students complained of having to click too many times for being able to access the information they needed. The reason for this kind of design was that within each gloss I intentionally included further glosses so as to be able to measure students' study strategies through their clicking behaviour. Thus, in the text with form-

focused annotations, within the main gloss of a stimulus word learners needed to click three more times if they wanted to access the phonemic transcription, the audio-format pronunciation or the Hungarian equivalent of a word. Additionally, each time when they wanted to go back into the initial main gloss they had to click one more time on the “back” button at the lower part of the screen (see Appendix F/1, p. 239).

Some other comments on what students found boring about the program are as follows:

- “I was not interested in the subject matter of the texts”
- “the phonetic transcription was boring”
- “the layout of the web site was too simple”
- “the screen colours of the software program were dull”
- “the affixed and derived forms were not necessary and really boring”.

The above comments suggest that teachers deciding to use new computer technologies for language learning and teaching should concentrate not only on the linguistic content and the healthy pedagogical principles, but, beyond these, they will also need to be concerned with design principles, which may significantly influence students’ attitudes, and thus affect the learning outcome.

Question 12

The last question (Question 12) asked participants to give further comments about the program used in the study, and about this form of language acquisition in general. In order of descending frequency, the following typical answers were given:

- “It would be good if all the words were highlighted and hyperlinked with useful information (especially the Hungarian equivalents) in the text rather than just a few target words”.
- “I found the software program demanding and of high standard.”.
- “This way of learning words with hypertext is very useful, but I find it difficult to change my learning habits”.
- “It would be good if we could use such programs more frequently – I find it easier to learn a foreign language like this”.
- “I am pleased that I could try it out. I hope I will have an opportunity to study words with hypertext”.

- "It would be an extremely useful method, but most schools would not be able to use it as they would not have the necessary facilities for it".
- "More time and repetitions would be needed for long term memorisation".
- "It is very good we did not need to look up words in a traditional dictionary. All we needed to do was to click on the unknown word –knowledge was literally at our fingertips".
- "I liked it, I have learned a lot of new words, but I would never do it on my own".
- "What I liked about it was that I read the phonetic transcription, tried to pronounce the word, then I listened to the audio-format pronunciation to check mine. In most cases I was successful".
- "It is much easier to learn if we write down the words".
- "It was much easier to learn words in context.".
- "All available information forms (hypertext gloss options that can be selected) should be located on the side of the screen to avoid too many unnecessary clicks. (In the program students regularly had to use the return button to be able to return to the previous, home screen). "Otherwise I found it very useful, and it should be introduced in schools".
- "It gave antonyms, so I could learn two words at one go".

The overwhelming majority of students' responses indicated that they assumed a positive attitude towards the application of computerised hypertext glosses, as well as considered them an effective tool in vocabulary learning. Even though there were some discrepancies between their responses and their actions, as recorded by the tracking device, with regard to the usefulness of particular gloss types, the above results show that, on the whole, participants found the application of hypertext glosses a refreshing and useful change in their daily English learning routine, and expressed that they would be willing to use such programs more frequently to assist and promote their L2 studies.

4.3.3 Comparison of answers and test results achieved

Besides the descriptive analysis of the answers given to the closed questions, it was also examined whether there was any relationship between the answers given to some of the

closed questions and the test results achieved. Since the survey was conducted as the very last stage of the experiment, it was hoped that students' answers would reflect their experiences, positive or negative feelings gained in the experimental process. It was of specific interest, to what extent participants opinions, feelings about the application of computerized hypertext annotations in L2 vocabulary acquisition (as reflected in their answers to questions 1, 5 and 7 of the survey) would correlate with their performance on the post-tests. After crosstabulating the test results and the answers, the direction and strength of relationship between the two variables were analysed using Spearman's Rank Correlation technique.

As Tables 39., 40. and 41. (pp. 184, 185) demonstrate, no perfect positive or negative significant correlation was found between the eight different kinds of test results and the answers given to Q1 (usefulness of computer-based hypertext programs in vocabulary acquisition), Q5 (importance of visual input enhancement), or Q7 (help provided thanks to the interactive nature of computer programs) respectively.

Table 39. Summary of Spearman correlation values (with approximate significance) between the answers to Question 1. and the test results achieved

		Incidental condition		Intentional condition	
		R	AS	R	AS
Form-foc. Annotations	Post-test 1	-.001	.995	-.087	.595
	Post-test 2	.034	.833	.088	.588
Meaning-foc. annotations	Post-test 1	.211	.191	-.004	.980
	Post-test 2	.154	.344	.236	.142

R = Spearman's correlation value

AS = Approximate significance

Table 40. Summary of Spearman's correlation values (with approximate significance) between the answers to Question 5. and the test results achieved

		Incidental condition		Intentional condition	
		R	AS	R	AS
Form-foc. annotations	Post-test 1	.113	.488	-.045	.781
	Post-test 2	-.111	.496	.068	.675
Meaning-foc. annotations	Post-test 1	-.084	.605	.211	.190
	Post-test 2	-.109	.503	.120	.460

R = Spearman's correlation value

AS = Approximate significance

Table 41. Summary of Spearman's correlation values (with approximate singnificance) between the answers to Question 7. and the test results achieved

		Incidental condition		Intentional condition	
		R	AS	R	AS
Form-foc. annotations	Post-test 1	-.240	.136	-.094	.566
	Post-test 2	-.072	.658	.256	.110
Meaning-foc. annotations	Post-test 1	.052	.749	.041	.802
	Post-test 2	-.173	.286	.257	.109

R = Spearman's correlation value

AS = Approximate significance ($p < .05$)

As can be seen, the data in the three tables above show either a weak positive ($R > 0$ and < 0.5) or a weak negative ($R > -0.5$ and < 0) correlation, but the figures do not reepresent a clear-cut tendency about the correlation between any of the three data sets. This suggests that what students think (and what they state!) about the usefulness of program or its component features, may not necessarily coincide with their actual performance on the vocabulary tests.

4.3.4 Comparison of answers given by students working with form-focused and meaning-focused annotations

It was also looked at whether students participating in groups working with form-focused or meaning-focused input enhancement would give different answers to the same questions Q1 (usefulness of computer-based hypertext programs in vocabulary acquisition), Q5 (importance of visual input enhancement), or Q7 (help provided thanks to the interactive nature of computer programs), on the basis of their slightly dofferent experiences, i.e. due to the different gloss contets they had been exposed to in the study sessions..

The analysis of the descriptive statistics provided in Table 42. (p.187) show that 38 students in the for-focused group and 33 in the meaning-focused group thought that hypertext was useful for vocabulary learning. Two students in the form-focused group and 7 students in the meaning focused group believed that hypertext was only moderately useful. It would seem that students' attitude to hypertext in the form-forocused group is slightly more favourable that of those in the meaning-focused group.

As to the highlighting and explaining of target words (see Table 44., p. 187), 15 positive and 25 negative attitudes were expressed in the form-focused group, while 23 positive and 17 negative answers were given in the meaning-focused group. Students working with meaning-focused glosses appear to have had better opinion of making target words salient through highlighting plus providing a relevant gloss content.

Concerning the importance of interaction with the computer (see Table 46., p. 187), 33 positive and 7 negative answers were given in the form-focused group, while 32 positive and 8 negative opinions were formed in the meaning-focused group, which shows very similar, almost equally positive attitudes by members of both groups.

Table 42. Comparison of the perceived usefulness of hypertext technologies for vocabulary learning across learners exposed to form- and meaning-focused annotations

Treatment type * Usefulness of hypertext for vocab learning Crosstabulation

Count

		Usefulness of hypertext for vocab learning			Total
		very useful	useful	moderately useful	
Treatment type	form-focused	11	27	2	40
	meaning-focused	9	24	7	40
Total		20	51	9	80

Table 43. Spearman's Rank Correlation between answers given to Q1 by students working with form-focused and meaning-focused input enhancement

Symmetric Measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	.149	.108	1.333	.186 ^c
Ordinal by Ordinal	Spearman Correlation	.141	.109	1.254	.214 ^c
N of Valid Cases		80			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Table 44. Comparison of the perceived usefulness of highlighting (+ explanations) for vocabulary learning across learners exposed to form- and meaning-focused annotations

Treatment type * Did highlighting (+explaining) help you learn words? Crosstabulation

Count

		Did highlighting (+explaining) help you learn words?				Total
		very much	much	just a little	not at all	
Treatment type	form-focused	1	14	22	3	40
	meaning-focused	4	19	15	2	40
Total		5	33	37	5	80

Table 45. Spearman's Rank Correlation between answers given to Q5 by students working with form-focused and meaning-focused input enhancement

Symmetric Measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.212	.106	-1.918	.059 ^c
Ordinal by Ordinal	Spearman Correlation	-.213	.108	-1.922	.058 ^c
N of Valid Cases		80			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Table 46. Comparison of the perceived importance of interaction with the computer across learners exposed to form- and meaning-focused annotations.

Treatment type * How important to your learning was interaction with the computer? Crosstabulation

Count

		How important to your learning was interaction with the computer?				Total
		very important	important	moderately important	not important	
Treatment type	form-focused	12	21	6	1	40
	meaning-focused	12	20	7	1	40
Total		24	41	13	2	80

Table 47. Spearman's Rank Correlation between answers given to Q7 by students working with form-focused and meaning-focused input enhancement

Symmetric Measures		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	.017	.112	.148	.883 ^c
Ordinal by Ordinal	Spearman Correlation	.016	.112	.141	.888 ^c
N of Valid Cases		80			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

However, as the Spearman test in Tables 43. (p. 186), Table 45. (p. 187) and Table 47. (p. 188) shows, hardly any correlation can be spotted between the answers given to these question by representatives of the two treatment types. This suggests that the fact whether participants were working with form- or meaning-focused hypertext input enhancement during the two study sessions did not really influence them in their answers. It can be stated that in this study no significant correlation was spotted between learning mode and participants answers on the usefulness of the Hypertext program or some its component features for vocabulary learning.

4.4 RESULTS GAINED THROUGH THE USE OF THE TRACKING DEVICE

As has been mentioned before, a tracking device was attached to the software program for the researcher to be able to follow subjects' behaviour. The main purpose of using the tracking device of the host server was to make sure that all or at least the overwhelming majority of participants in both computer-based hypertext treatment conditions really did consult all the glosses. By proving this, the results gained in the testing part of the study may potentially be attributed to the facilitative effect of interactionally modified enhanced input, that is to the different gloss contents related to the stimulus words.

The data detected by the tracking device were recorded in log files. The data in the log provided convincing evidence that the great majority of glosses were indeed consulted by the students. Analysing the log files, which reflected learners study behaviour through their clicking manner, it was found that the mean number of target words consulted in the first text

entitled "Pirates" was 11.75 (90.38%) in the case of the version with form-focused enhancement, and 12.15 (93.46%) in its meaning-focused counterpart. In the second text entitled "Pickpockets" (measuring intentional vocabulary learning), the mean number of such stimulus words consulted was 12.52 (96.30%) in the text version with form-focused annotations and 12.52 (96.30%) in the meaning-focused annotated version. When calculating these results, repeated clicks on the same target word were ignored and only one click per target word per student was taken into consideration. Considering that the total number of stimulus words in each text was 13, the mean results gained are quite convincing. The summary of the data mentioned above can be seen in Table 48. (p. 189).

Table 48 . Mean number of target words consulted (without repeated clicks) in the form-focused and meaning-focused versions of the two texts applied in the study

	Text 1 (Pirates)		Text 2 (Pickpockets)	
	With form-focused glosses	With meaning-focused glosses	With form-focused glosses	With meaning-focused glosses
Mean number of target words consulted	11.75	12.15	12.52	12.52

As a matter of interest, the log files also showed that the most and least frequently consulted target words in one and the same text were not identical (except for the word "govern") in the versions with form-focused and meaning-focused annotations. Table 49. (p. 190) demonstrates these differences.

Table 49. Summary of the most and least frequently consulted target words and of the glosses with the Hungarian equivalents in the two texts used in the study.

	Text 1 (Pirates)		Text 2 (Pickpockets)	
	With form-focused glosses	With meaning-focused glosses	With form-focused glosses	With meaning-focused glosses
Target words consulted most frequently (word/times)	Cavalier/ 41 Merchant/ 41	Ransom/ 42	Dummy/ 42	Attentively/ 41
Target words consulted least frequently (word/times)	Elect/ 31 Govern/ 31	Govern/ 31	Efficient/ 38 Skillfully/ 38	Mannequin/ 36
Target words whose Hungarian equivalents were most frequently looked up (word/times)	Cargo/ 38 Desperate/ 38	Desperate/ 39	Dummy/ 41 Racetrack/ 41	Attentively/ 41 Cautious/ 41
Target words whose Hungarian equivalents were least frequently looked up (word/times)	Govern/ 26	Govern/ 29	Efficient/ 37	Mannequin/ 35

The total number of clicks was also calculated as these data were thought to be characteristic of learners' vocabulary study behaviour and to give some information about the potential differences in difficulty between the two texts applied. As the design of the form-focused versions had a different structure (with different kinds of information provided) from the meaning-focused versions, only comparing form-focused with form-focused and meaning-focused with meaning-focused glosses could yield valid and relevant information. Table 51. (p. 193) shows that the number of glosses consulted in the two texts is slightly higher in text 2 both in form - form and meaning - meaning focused relations. The only exception can be spotted in the case of the phonemic transcriptions of the target words, where the number of consultations is 38 in text one, and 37 in text two. These differences could indicate that the second text was slightly more difficult than the first one, which also corresponds with the result of the informal interview with participants who stated that they found the second text a little more difficult than the first one.

What is more interesting about these totals is the tendencies in participants' vocabulary study behaviour and strategies. The most conspicuous phenomenon that catches one's eye is the extremely low number of consulting glosses with the phonemic transcriptions of the stimulus words. Considering the fact that if each student had consulted the phonemic

transcription of each target word only once, the total sum per text would have been 40 students times 13 words = 520 consultations. This, of course, is just the absolute minimum, as learners could consult a gloss any number of times within the time limits of a study session. As opposed to this, the log files showed that participants consulted phonemic glosses 38 times in the first text, and 37 times in the second one. These results are inconsistent with students' responses to the relevant question of the questionnaire, where 51.2% of them stated that phonemic transcription was very useful in learning new words, and 21.3% of them ranked this gloss type as very important (cf. Figure 11. on p. 172). Apparently students' answers and actions differed dramatically. They were aware of the importance of phonemic transcription for successful vocabulary learning but they may have found it far too complicated to use the IPA symbols.

The hypermedia glosses containing the audio-format pronunciation, whose importance was ranked by 53.8% of the participants as useful and by 37.5% of them as very useful in the questionnaire (cf. Figure 12., p. 172), were consulted much more frequently. In text 1 they were consulted 229 times and in text two 308 times. The results imply that students are inclined to use audiovisual tools in their studies, they find multimodal presentation more interesting, easier to handle and also more memorable.

If we look at the same issue from a different angle and study the number of all students consulting the glosses with phonemic transcription compared to the number of students consulting audio-format pronunciation, we get a similar picture that shows a great difference in favour of the audio pronunciation. Table 50. (p. 192) presents these differences indicated for each vocabulary item.

Table 50. Number of students consulting the phonemic transcription and the audio-format pronunciation of target words in text 1 (Pirates) and text 2 (Pickpockets).

	<i>WORDS</i>	<i>No. of students consulting phonemic transcription</i>	<i>No. of students consulting audio pronunciation</i>
<i>PIRATES</i> (used for measuring the effect of incidental vocabulary learning)	Cargo	7	22
	Cavalier	2	15
	Conduct	1	13
	Dagger	1	13
	Desperate	1	9
	Elect	1	10
	Govern	2	8
	Merchant	11	28
	Outlaw	0	10
	Piracy	5	19
	Rag	1	6
	Ransom	6	20
	Rebel	1	9
<i>PICKPOCKETS</i> (used for measuring the effect of intentional vocabulary learning)	Alert	3	14
	Attentively	2	20
	Cautious	4	17
	Dummy	1	17
	Efficient	2	22
	Gather	2	20
	Gathering	4	19
	Mannequin	3	18
	Method	5	22
	Racetrack	2	18
	Rapidly	5	28
	Skillfully	1	14
	Snatcher	3	15

Concerning the use of hypertext glosses with the Hungarian equivalents of the stimulus words, the data gained from the log file are completely in line with the answers given to the questionnaire. The usefulness of this gloss type was ranked as very useful by 63.7% of all participants and as useful by 35% of them (cf. Figure 14. on p. 174), and the log files showed that this was by far the most frequently consulted gloss type. In text 1 the total number of the Hungarian equivalents consulted was 445 in the form-focused version, and 454 in the meaning focused version. In text 2 these figures were even higher, 514 and 496. Table 51. (p. 193) summarizes the frequency of consulting various gloss types.

Table 51. Summary of the total number of various glosses consulted (repeated clicks inclusive) in the two texts used in the study.

	<i>Text 1 (Pirates)</i>		<i>Text 2 (Pickpockets)</i>	
	With form-focused glosses	With meaning-focused glosses	With form-focused glosses	With meaning-focused glosses
<i>Total number of glosses consulted</i>	1196	952	1377	1001
<i>Total number of target words consulted</i>	484	498	518	505
<i>Total number of Hungarian equivalents consulted</i>	445	454	514	496
<i>Total number of audio pronunciation consulted</i>	229	N/A	308	N/A
<i>Total number of phonemic transcriptions consulted</i>	38	N/A	37	N/A

N/A = not applicable (such gloss type was not present in meaning-focused glosses)

As all the above figures also include repeated clicks on a particular gloss type, it was believed that the mean frequency for each of the above mentioned gloss types was consulted without repeated clicks, would characterise participants' vocabulary learning strategies even more prominently. As Table 52. (p. 194) shows, the mean figures for each gloss type without repeated clicks presented a picture fairly similar to the one shown by the total number of clicks. The glosses with the Hungarian equivalents were by far the most frequently consulted annotation type with a mean of 11 and 11.15 clicks in the first text and 12.52 and 12.52 in the second one. The mean number of consulting the audio-format pronunciation of the stimulus words was 4.5 in the first text and 6.02 in text two. The mean number of single clicks on the hypertext annotations with the phonemic transcriptions of the target words was found extremely low, 0.95 in text one, and 0.92 in text two.

Table 52. Summary of the mean number of various gloss types consulted (without repeated clicks) in the two texts used in the study.

	<i>Text 1 (Pirates)</i>		<i>Text 2 (Pickpockets)</i>	
	<i>With form-focused glosses</i>	<i>With meaning-focused glosses</i>	<i>With form-focused glosses</i>	<i>With meaning-focused glosses</i>
<i>Mean number of Hungarian equivalents consulted</i>	11	11.15	12.35	12.25
<i>Mean number of audio pronunciation consulted</i>	4.5	N/A	6.02	N/A
<i>Mean number of phonemic transcriptions consulted</i>	0.95	N/A	0.92	N/A

N/A = not applicable (such gloss type was not present in meaning-focused glosses)

The mean time lapse between consulting a gloss and a sub-gloss within the gloss was also examined, as it was thought to provide a characteristic perspective of participants' cognitive behaviour. Each gloss was designed in a way that it provided the Hungarian equivalent of the target word only as the last piece of information if the student followed the traditional linear way of reading. The Hungarian equivalents were always to be found at the very bottom of the screen, and they could be accessed only by scrolling down and clicking on a new hyperlink. It was hypothesised, however, that learners would heavily rely on the Hungarian equivalents, and after familiarising themselves with general gloss structure they would skip the English definitions and other relevant information, and instead they would go straight for the Hungarian equivalents. Therefore, the hypothesis was advanced that the mean time lapse between clicking on a target word (i.e. the highlighted main hyperlink) and within that gloss clicking on the Hungarian equivalent of that word would be quite short. The log files confirmed this hypothesis (see Table 53 on p. 195), as compared to the mean length of time spent on consulting a word (30 seconds), the Hungarian equivalents were on average looked up 7-8 seconds after clicking on the main word itself. Compared to this period, the mean time lapse between clicking on a target word and looking up its phonemic transcription

ranged between 11-13 seconds, and this mean time lapse for consulting the audio-format pronunciation was between 9-12 seconds.

Table 53. Summary of the mean time lapses between clicking on a target word and some within gloss annotation types in the two texts used in the study.

	<i>Text 1 (Pirates)</i>		<i>Text 2 (Pickpockets)</i>	
	<i>With form-focused glosses</i>	<i>With meaning-focused glosses</i>	<i>With form-focused glosses</i>	<i>With meaning-focused glosses</i>
<i>Mean time lapse between clicking on a word and consulting its Hungarian equivalents</i>	7 sec.	8 sec.	7 sec.	7 sec.
<i>Mean time lapse between clicking on a word and consulting its audio pronunciation</i>	12 sec.	N/A	9 sec.	N/A
<i>Mean time lapse between clicking on a word and consulting its phonemic transcription</i>	13 sec.	N/A	11 sec.	N/A

N/A = not applicable (such gloss type was not present in meaning-focused glosses)

Similarly to the procedure with some questions in the survey, in the case of the log files it was also examined how the observations gained through the use of the tracking device correlated with the results of the vocabulary tests. More precisely, it was looked at whether there was a relationship between the number of times participants consulted certain vocabulary items in the text, and how successfully these items were retained by them on the different post-tests. The descriptive analysis of these two data sets presented in Tables 54. (p. 196) and 55. (p. 196) suggests that there appears to be some relationship between the number of gloss look-ups and the frequency of retaining words. The vocabulary items occurring in both among the most/least frequently retained words as well as among the most/least frequently consulted hypertext annotations are printed in bold in the tables.

Table 54. Comparison of the most frequently retained words and the most frequently consulted words

		Most frequently retained words	Most frequently consulted words
Incidental condition	Form-foc. Input	Merchant 34/(20) Piracy 34/27	Cavalier 41 Merchant 41
	Meaning-foc. Input	Piracy 37/31 Cargo 36/(26)	Ransom 42 Cavalier 40 Rags 40
Intentional condition	Form-foc. Input	Snatcher 39/(27) Racetracks 38/(30) Mannequin 38/34	Dummy 42 Racetracks 41 Snatcher 41
	Meaning-foc. Input	Mannequin 4/0/(35) Dummy 39/(27) Racetracks 39/35	Attentively 41 Skillfully 40 Dummy 40

Figures before and after the "/" show the immediate and delayed post-test results respectively. Parenthetical figures indicate that the results do not correspond to the highest scores achieved.

Table 55. Comparison of the least frequently retained words and the least frequently consulted words

		Least frequently retained words	Least frequently consulted words
Incidental condition	Form-foc. Input	Rebelling 23/16 Conduct 26/17	Elect 31 Govern 31
	Meaning-foc. Input	Rebelling 26/(24) Conduct 27/20	Govern 31
Intentional condition	Form-foc. Input	Skillfully 28/19 Efficient 29/18 Attentively (30)/16	Efficient 38 Skillfully 38
	Meaning-foc. Input	Methods 28/ (23) Skillfully 31 (25) Efficient 34/(16) Gather (37)/21 Rapidly (37)/22	Mannequin 36 Racetrack 37 Rapidly 37

Figures before and after the "/" show the immediate and delayed post-test results respectively. Parenthetical figures indicate that the results do not correspond to the lowest scores achieved.

However, in spite of the sporadic cooccurrences, when the number of gloss look-ups is crosstabulated with the results achieved, the Spearman Rank Correlation values (see Table 56., p. 197) show only a generally weak negative correlation in the incidental learning condition, and in the intentional learning condition a weak positive correlation in the case of

form-focused annotations, and a weak negative correlation in the case of the meaning-focused annotations. None of the R values or the approximate significance figures show perfect positive or negative correlations between the two sets of data in question, which suggests that the number of correct answers does not seem to depend on the number of gloss consultations. Apparently, other qualitative factors may contribute to the successful acquisition of words, as for instance the quality of reading or/and the quality of lookups, etc.

Table 56. Comparing the number of correctly retained test items and the number of gloss consultations using Spearman's correlation values (with approximate significance)

		Incidental condition		Intentional condition	
		R	AS	R	AS
Form-foc. annotations	Post-test 1	.274.	.415	.364	.221
	Post-test 2	-.019	.950	.316	.293
Meaning-foc. annotations	Post-test 1	-.414	.159.	-.357	.232
	Post-test 2	-0.33	.914	-.001	.996

R = Spearman's correlation value

AS = Approximate significance ($p < .05$)

When summarising the results in the log files, some easily identifiable tendencies can be observed: students using computerised hypertext tools in the experiment were inclined to rely heavily on the Hungarian equivalents (in spite of the fact that the English explanation of target words linearly preceded the Hungarian in the gloss structure!), and they tended to use audio-format pronunciation help resources quite frequently. In contrast, glosses including more traditional IPA phonemic transcription symbols were as a rule avoided. The results gained through the use of the tests, questionnaires and the tracking device will be analysed in the next chapter, Chapter 5.

Chapter 5: Discussion and Conclusion

5.1 SUMMARY AND IMPLICATIONS OF THE FINDINGS

The main aims of this research were to find out more about the potential effect of interactionally modified salient input on the acquisition and retention of new, unknown vocabulary on a receptive level, as well as to investigate the effectiveness of incidental and intentional vocabulary learning under the above condition, i. e. when learners are exposed to interactionally modified linguistic input. More specifically, the researcher's aim was to explore whether texts enhanced with meaning- and form-focused computer-based hypertext glosses facilitated the processing of unknown lexical items, by linking them to the already available lexical units in the mental lexicon, and to find out whether such input enhancement affected the success of vocabulary acquisition and long-term memory retention under both incidental and intentional learning conditions. All these were examined under an experimental setup where all the variables were strictly controlled to make sure that the results of the study provided a true representation of the issues studied in the experiment. Participants' acquisition and retention of the target words were checked through banked cloze tests appropriate for testing receptive knowledge.

Even though state-of-the-art information technology is fully capable of integrating such multimodal elements as still and animated images and even video, the software program in the current experiment used only text-based materials, as the aim was to find out how linguistic elements (rather than multimedia technology) affected the acquisition and retention of new vocabulary. The only exception to this principle was the application of sound, which was considered to be inevitable for trying to more or less replicate the processes that take place in the mental lexicon when processing new vocabulary on the basis of formal cues (see Singleton, 1999). As the pronunciation of a new lexical item forms an essential part of formal cues, it was judged to be inadequate to just include the phonemic transcription of the unknown word, and the incorporation of audio pronunciation (sound files) was thought to be inevitable.

Besides the above mentioned main aims, the study had some subsidiary aims as well. Examining the participants' attitudes to and their perceptions of the application of such hypertext glosses to vocabulary learning, together with scrutinizing learners' actual study behaviour and strategies applied were also among the purposes of the current research.

5.1.1 Discussion of the findings gained by using the testing instrument

As mentioned above, the current research had a double focus investigating both a) the effect of interactional input modification through form- and meaning-focused computerised hypertext annotations on L2 vocabulary acquisition and retention, and b) the effect of incidental and intentional learning on L2 vocabulary acquisition and retention when using form- and meaning-focused computerised hypertext annotations. Accordingly, the research questions (RQ) of the study were as follows:

Research focus A

RQ: Does interactionally modified input made salient through computer-based hypertext annotations yield better L2 vocabulary acquisition and retention results among intermediate EFL learners than the application of a traditional paper-based text with a bilingual paired-associates vocabulary list to assist learners?

The null hypothesis (H0) claimed that learners exposed to hypertextually enhanced interactional input modifications in either of the two experimental groups would attain the same level of L2 vocabulary acquisition and retention as learners subjected to non-negotiated input in traditional paper format in the control group. On the basis of the results gained in the study, the null hypothesis could be rejected, as the results of the subjects using some form of hypertextual input enhancement were significantly different from those in the control group using no input enhancement.

Hypothesis 1 (H1), which predicted that learners exposed to input during negotiated interaction through link-based hypertext presentation would attain higher levels of L2 vocabulary acquisition and retention than learners subjected to non-negotiated input was only partly proved. The results of the current research did not provide satisfactory evidence to confirm this hypothesis. Even though there was a general tendency observable according to

which participants using hypertext annotations had better achievements on both immediate and delayed post-tests in incidental and intentional vocabulary learning conditions, this tendency did not reach a statistically significant level in all experimental conditions, therefore it must be considered as conjectural evidence. Participants using form-focused annotations and those using meaning-focused annotations both significantly outperformed subjects using the traditional paper-and-pen bilingual word list technique on the immediate post-test in the intentional learning condition. The same statistically significant ($p < 0.05$) difference, however, was not to be found on the delayed post-tests or in the incidental learning condition. Therefore, in sum, it must be stated that the results of the current research do not confirm the claim formed in hypothesis one. In spite of the positive results on immediate post-tests, when also incorporating delayed post-test, these results contradict De la Fuente's (2002) findings (who also reports Ellis et al., 1994; Loschky, 1994 as evidence of a significant difference in favour of the annotated input), but they corroborate the findings of Ellis and He's (1999), who report no significant difference between the premodified input group and the interactionally modified input group. The lack of significant differences on the delayed post-tests between students working with the various forms of input is probably due to the fact that participants had only one single exposure session to the target vocabulary.

Hypothesis 2 (H2), which predicted that learners subjected to meaning-focused input during negotiated interaction would outperform those subjected to form-focused enhancement condition in L2 receptive vocabulary acquisition and retention both under incidental and intentional learning conditions was also only partially confirmed by the results of the study. The hypothesis was formed on the basis of the psycholinguistic findings (see Singleton, 1999) that language learners at earlier stages of their study tend to rely primarily on formal features of L2 as well as on the L1 equivalent of the word to be learned, whereas in more advanced stages they rely more on semantic features. As it was assumed that students with an average English learning experience of five years belonged to this latter stage of development, it was thought that those using meaning-focused help facilities would achieve better results than participants in the other two groups participating in the experiment.

Although students subjected to meaning-focused hypertext annotations did outperform all the other participants in incidental and intentional learning conditions both on the immediate and delayed post-tests, only part of this better achievement was found to be

statistically significant ($p < 0.05$). As was mentioned above, members of the meaning-focused group achieved significantly better test results than those in the control group on the immediate post-test in the intentional vocabulary learning condition, but, contrary to prediction, participants learning with meaning-centred glosses never outperformed significantly those using form-centred annotations. Therefore, even though the tendency in test results shows that the intermediate (approximately B2 level in the Common European Framework, with around 300 lessons of institutionalized English learning experience) level EFL students participating in the study profited more in their vocabulary learning from using semantic annotations, for lack of statistical significance this conclusion also remains only conjectural. A possible, speculative explanation for the lack of significant difference in the performance of the students using form- and meaning-focused annotations could be participants' study behaviour or strategies (see 4.4, p. 188 for the results gained by using the tracking device). After realizing that the Hungarian equivalents of the target words were provided in the hypertext gloss (even though the last piece of information in the gloss when following the traditional linear order of reading), many students tended to neglect all other information types in the gloss, and headed for the Hungarian equivalent. In such a way, although meaning- and form-focused annotations had different linguistic contents referring to the same lexical item, owing to the shallow strategies applied by the subjects, the differences that were meant to be attributed to different gloss contents diminished. This could also be considered as poor material design, as such behaviour could have been foreseen by the researcher, and consequently Hungarian equivalents could have been excluded from meaning-focused glosses. When designing the software program, as well as the whole of the research process, serious thought was given to the question whether Hungarian equivalents should be exclusively provided in the form-focused hypertext annotations ex. At the time it was judged that not providing the Hungarian equivalents for subjects working with meaning-focused annotations might cause confusion among intermediate students about the meanings of the target lexical items, which in turn might hinder them in the efficient acquisition of the new vocabulary. Besides, Laufer & Hadar's (1997), and Laufer & Hill's (2000) studies found that students using bilingualized dictionaries performed better on both receptive and productive vocabulary tests. As the Hungarian equivalents were provided for all, the three (two experimental and one control) participating groups, it was hoped that the possible difference

in the learning output of these groups could be attributed to other variables different in the work of these groups.

Summarising the results of research focus A of the study it can be stated that although interactionally modified input made salient through computer-based hypertext annotations did yield better L2 vocabulary acquisition and retention results among intermediate EFL learners than the application of a traditional paper-based text with a bilingual paired-associates vocabulary list technique, this result was confirmed by statistically significant data only for acquisition (measured right at the end of the study sessions) results in the intentional learning condition.

Research focus B

RQ: *Is there a difference between the acquisition and long-term retention achievement of the aforementioned intermediate EFL students when they acquire new L2 lexical units incidentally or intentionally?*

The null hypothesis (H0), which predicted that students learning target vocabulary intentionally would attain the same levels of L2 vocabulary acquisition and retention as students acquiring the same vocabulary incidentally, could be distinctly rejected on the basis of the findings of the experiment as participants achieved different results in the two learning conditions.

Hypothesis 1 (H1), which predicted that students learning target vocabulary intentionally will attain higher levels of L2 vocabulary acquisition and retention than students acquiring the same vocabulary incidentally was confirmed by the results of the study. Nonparametric statistical analyses of the test results unanimously showed that, on the whole, participants learning in the intentional condition significantly outperformed those acquiring words incidentally. This was true both for acquisition and retention results. The results, which support Hulstijn's (1992), and Hulstijn, Hollander and Greidanus' (1996) findings, suggest that it does matter when students are focused on the task of mastering the new words intentionally. Nonetheless, incidental learning, where learners acquire new lexical units as a "side product" through extensive reading of books, magazines or browsing the World Wide Web, may be a useful alternative to complement the more effective intentional mode of vocabulary learning

Hypothesis 2 (H2) predicting that although intentional vocabulary learning will yield better results than incidental learning, both meaning- and form-focused enhancement will favourably affect (improve) the immediate post-test (i.e. acquisition) and the delayed post-test (i. e. retention) results of learners under the incidental learning condition was confirmed. As no statistically significant difference was found between the results of the control group in the intentional condition, and those of the experimental groups in the incidental condition, it can be concluded that participants using hypertext input enhancement in the incidental learning condition attained about the same levels of vocabulary acquisition as subjects using no enhancement in the intentional learning condition. This result manifests the beneficial effect of interactional input modification by using elaborative redundancy in the form of hypertext glosses.

5.1.2 Discussion of the findings gained by using questionnaires

Besides the above mentioned two main issues, the study also aimed at examining learners' attitudes to and perceptions of hypertextually enhanced computer-based language learning, and investigated students' vocabulary learning strategies in a hypertext environment.

The findings of the survey indicate that the majority of the participants had a positive attitude towards the application of new technologies in language learning. Sixty-three per cent of them judged hypertext useful for vocabulary learning and more than half of them expressed that they would like to use such programs. Laufer & Hill (2000:68) assert that "If a pedagogical tool is popular with the students, the chances are it will also be beneficial for learning. ...We believe that the favourable attitude of the learner and the variety of lookup options resulted in careful attention to the lexical information provided by the glosses". The results of the questionnaire (which are also supported by the data gained by using the tracking device) suggest that the multimodal presentation of information provides an impetus which students consider important and useful in their vocabulary acquisition. About 90% of all participants thought that audio-format pronunciation of the words was useful in vocabulary learning, and this claim was also justified by the contents of the log files. This corroborates the results of studies by Lyman-Hager et al. (1993), Martinez-Lage (1997), Chun & Plass (1997), Brett (1998), Lomicka (1998), who all found multimedia a popular and effective tool in L2 reading comprehension and vocabulary acquisition. Even though the present study

originally intended to measure the effect of linguistic features using a text-based program, and the audio component was introduced as a necessary component, it proved to be one of the most popular information/gloss types. This implies that the use of multimodal information in language teaching and learning is becoming more and more essential, partly because of its better educational power, and partly because present day youth have got so accustomed to audiovisual information that they tend to ignore traditional text-based materials.

Sixty-eight per cent of the participants thought that such computer programs should be used as out of class activities. Forty-three per cent of the participants found it very easy and 36% of them found it easy to handle such hypertext programs, and only 20% of them had some technical problems when using them. As to the effectiveness of making particular parts of input salient (e.g. by using colours), and providing some additional information about the enhanced parts, 93% of the subjects reported that such highlighting was helpful in their vocabulary learning, and only about 6% of them considered such visual enhancement not useful. This result suggest that students seem to be aware of the importance of guiding the attention to the target information.

When subjects were asked about the usefulness of the different gloss types/contents it was found that what students said and did was sometimes in contradiction with each other, as the log files recording learner moves during program use reported a different behaviour from that expressed in the questionnaires. For instance, there was a considerable discrepancy between what participants said and did concerning the usefulness of phonemic transcription. More than 70% of the subjects declared that such information type was useful, about 20% of them asserted that it was moderately useful, and only about 5% wrote that it was not useful for vocabulary learning. In contrast, the log files manifested an extremely rare use of this information type throughout the experiment. About 80% of the participants claimed that providing the English definition of the target words was useful. The answers given to the open-ended part of the questionnaire also confirmed that students both enjoyed the English explanations of the words to be learned and considered them effective.

The answers to the questionnaire indicated that another favourite information type used by the participants was the Hungarian equivalents of the target words. More than ninety-eight percent of the subjects expressed that providing the Hungarian equivalent was very useful, which information was very much in accordance with their gloss consulting behaviour as measured by the tracker device. This suggests that the intermediate EFL students in the

study with an average five years of language learning experience still depended heavily on their mother tongue. This result also supports previous findings by Ko (1995), Hulstijn et al. (1996), Davis & Lyman-Hager (1997) about the preference and heavy overuse of L1 in spite of the presence of other information types provided.

Seventy-two per cent of all participants asserted that glosses with various sense relations were effective and about the same number of them claimed that providing context or supplying the affixed forms of the target vocabulary was useful for vocabulary learning. The idea behind the application of both gloss types is that more elaborate processing of information (see Hulstijn's (2002) mental effort hypothesis) and connecting new lexical items to the already available mesh of words and schemas in the learner's mental lexicon will bring about better long-term retention (see e.g. Jonassen, 1992; Eklund, 1995). Participants also thought highly of the interactive nature of hypertext programs.

On measuring learners' awareness of incidental vocabulary learning it was found that 36% of the participants were aware of having had such incidental vocabulary learning experiences using the World Wide Web. Most participants found the subject matter of the texts in the program interesting, and it motivated them to study the words in the texts, which supports Laufer & Hulstijn's (2001) task-induced involvement hypothesis.

Students' answers show that a considerable amount of incidental vocabulary learning takes place e. g. when using the WWW, and most students reported to remember (at least some of) the words they came across in this way. This implies that the resources on the WWW should be more extensively exploited for language learning also in the form of incidental learning. Such incidental learning could take the form of data gathering or communication Internet projects including international collaboration (real-time or non-real time correspondance, joint web page design or other joint publications, contests, etc.).

Although participants in general thought favourably of the hypertext technology they were using for the purposes of vocabulary learning, no correlation was found between participants' attitudes and perceptions with their achievements as measured by the tests. Similarly, no correlation was found between their answers (only questions 1, 5, and 7 were analysed) when comparing those given by students in the group using form-focused or meaning-focused input enhancement. This suggests that even though students may be aware of the benefits of certain technologies and methodologies, this may not necessarily be reflected in their performance.

5.1.3 Discussion of the findings gained by using the computer tracking device

The log files created by the tracking device indicate some well-defined tendencies: as was mentioned above, students in the experiment were inclined to rely heavily on the Hungarian equivalents, and they tended to use audio-format pronunciation help resources quite frequently. In contrast, glosses including more traditional IPA phonemic transcription symbols were, as a rule, avoided. The log files show participants' heavy reliance on their mother tongue and their attraction towards the multimodal presentation of information, but they also seem to imply that students tend to go for the easy option and choose shallower strategies requiring less intellectual effort. The timing device made it possible to demonstrate, for instance, that after familiarising themselves with the general gloss structure, the majority of students made a bee-line for the Hungarian equivalent of the target word, painstakingly skipping and avoiding all other English-language information that linearly preceded the Hungarian equivalent on the page, and whose processing would have required more mental effort.

Although the log files reflecting learners' moves through their clicking behaviour did not provide an overall, exhaustive account of all the strategies applied, they were informative with respect to some of the characteristic features of the participants' cognitive behaviour. As a matter of interest, neither positive nor negative significant correlation was found between the frequency of consulting hypertext glosses, which, considering the good test results when using such hypertext input enhancement, might suggest that it is rather the quality than the quantity of consulting glosses that matters and brings about changes. The issue could be further clarified e. g. with think-aloud protocols, or by interviewing students right after using such technology in L2 vocabulary learning.

5.2 LIMITATIONS OF THE RESEARCH

There were some limitations to this study that might lessen the external validity of the research.

First, the results gained are not representative, even though an attempt was made to enhance the external validity of the study by the relatively large number and the randomized

selection of the subjects. Nevertheless, the same study could be repeated with a larger number of subjects selected from a much wider population, which could result in more power to generalize in detecting the impact of hypertext/hypermedia glosses on vocabulary learning. Besides, a language proficiency pretest would allow for a more finely-tuned analysis of the results.

Second, assessment of the receptive learning outcome was measured only with banked cloze tests which concentrated more on meaning than on form.. By using other assessment techniques that combine the elicitation of meaning as well as formal features of vocabulary knowledge, a more complex picture could be provided reflecting various aspects of vocabulary knowledge. Besides, the number of test items per test was rather low (13), which may have negatively influenced the explanatory value of results gained through statistical measures.

Third, the tests provided no significant differences between the treatment groups on the delayed post-test due to the fact that participants were exposed to the new, target vocabulary only in one study session (mainly for feasibility reasons), and only in one particular context. By recycling target vocabulary around six times (see e.g. Rott, 1999; Laufer & Hill, 2000; Zahar, 2001; Rott, 2005) in preferably different contexts, delayed post-tests might provide the hypothesized differences between the various experimental conditions in the study.

Fourth, although hypertext programs offer the user relative flexibility as far as learning styles and strategies are concerned, the software program in the study did not take particular language learners' individual characteristics, abilities, language aptitude, previous language learning experience, learning styles preferences into consideration, which might also have affected the final outcome of the study. .The current study made an attempt to get some feedback concerning students' attitudes to learning vocabulary using new, hypermedia computer technologies, mainly for feasibility reasons, it did not examine the participants' individual differences or their epistemic beliefs about learning in general, which aspect could have provided a better insight into the factors affecting attainment levels in vocabulary acquisition. Despite its weaknesses, the study found some results which are congruent with previous research, and allowed to gain some insight into some Hungarian intermediate students' of English beliefs and cognitive behaviour when studying L2 vocabulary in a hypertext environment.

5.3 CONCLUSIONS

This study represents an effort to investigate the efficacy of hypertext glosses on second language vocabulary acquisition by comparing the effect of form- and meaning-focused glosses embedded in a hypertext computer program, and traditional learning using bilingual word lists. The work has considered both theoretical and research issues associated with the effective use of hypertext learning environments in incidental and intentional vocabulary learning conditions. Even though the study measured the acquisition and retention of new L2 words after only one exposure, it is hoped that the experiment could shed light on certain cognitive aspects of second language vocabulary acquisition as a result of interactional input modification using form- and meaning-focused hypertext glosses.

The current study aimed to prove that L2 vocabulary acquisition and retention can be improved by raising learners' awareness through familiarising them with the phonological, morphological, syntactic and semantic system that the novel word belonged to. As it was assumed that a significant part of this knowledge was already possessed by the learner, this "teaching" process needs some sort of knowledge scaffolding, which was hoped to be achieved through the use of hypertext glosses. In spite of the lack in statistically significant evidence, the current study suggests that meaning- and form-focused hypertext/hypermedia learning environments facilitate vocabulary acquisition. However, larger-scale empirical research is needed to further investigate this issue in order to provide substantial evidence in support of the beneficial effect of such hypertext/hypermedia glosses.

New technologies that rely on human beings' natural multimodal perception are already with us, and they are getting more developed by the day. We also have a new generation of students with preference for audiovisual information. Internet offers us the World Wide Web with a wealth of English language materials offering extensive reading, and excellent opportunities for incidental (as well as intentional) vocabulary learning in an autonomous way. Even though this study has revealed that significantly better results can be achieved through intentional vocabulary learning, by no means does it mean that the role and significance of incidental vocabulary learning should be neglected. In fact, we are much more frequently involved in incidental vocabulary learning experiences than in intentional ones. We need to raise learners' awareness of the novel study strategies that match new technologies

best, and create intelligent software programs that keep track of individual learner differences and preferences, and assist the learner in a tailor-made way throughout the learning process.

Naturally, hypertext/hypermedia systems are not going to solve the problem of effective vocabulary learning. They can significantly contribute to the success of lexical acquisition if their design is supported by firm linguistic and valid instructional theories, but they are not likely to replace teachers' work. "Teachers can facilitate deep processing of new vocabulary within the framework of the interactionist view of language development through which social interactions play a key role. In so doing, they can help students connect word meanings to the semantic networks already in place" (Wood, 2001).

Although the tendency observed in this study is promising, more work is needed to validate L2 vocabulary acquisition involving computer-based hypertext/hypermedia systems. Unfortunately, the relevant literature does not abound with research evidence about the beneficial effect of hypertext on second language vocabulary learning. It is hoped that the results of the current study will contribute to future research in the field.

5.4 SUGGESTIONS FOR FURTHER RESEARCH

For feasibility reasons the size of this study is rather limited. Nevertheless, some of the issues emerged in this study would deserve further attention and more detailed investigation. Students in the current study were at intermediate level with the average English learning experience of five years, which made us uncertain whether they would prefer (and consequently profit better from) meaning-focused help in glosses or whether they would still represent the stage of development where L2 students tend to rely predominantly on formal linguistic features. The experiment should be repeated trying out the same methods with students representing other levels of linguistic proficiency. As was said earlier, more emphasis should be laid on measuring long-term retention some weeks after the study session, which would require exposure to the target words on several occasions, and in different contexts. It would be interesting to measure the possible effect of hypertext computer technologies on L2 vocabulary learning after doing such recycling work.

As was mentioned among the limitations of the study, hypertext programs, although accommodating a range of learning styles, are still rather rigid by nature with a fixed material content, fixed links, and additional information available in the glosses. As not all students are

typical, their individual characteristics, learning style preferences, and many more individual features and circumstances should be taken into account when designing the structure of hypertextual language learning environments. Further research is needed to design such systems and investigate their effect on vocabulary learning and second language learning in general. By making hypertext/hypermedia-based language learning environments more adaptive, the learning process could be further individualised, allowing the L2 student to follow a learning path that suits their short- and long-term needs, interests or mood. To achieve this Lomicka (1998) suggests that all users should fill in an online questionnaire on learning style preferences when starting to work with the program, and on the basis of the results gained the software would channel the user accordingly in later stages of vocabulary learning.

A more sophisticated and flexible model is offered by Eklund (1995), who proposes **adaptive hypertext**. Such hypertext system would continually monitor the language learner's moves through their clicking behaviour, map their learning history, remember what words have been consulted, how many times, what information type or help facility has been asked for, and gently assist and guide them along the program (which can also be a relatively open system as large as the Internet) on the basis of the detected, thus potentially providing considerably higher language learning effectiveness (see also Liu & Reed, 1995; Chun & Plass, 1997). De Ridder (2002) also emphasizes the importance of research on cognitive flexibility and cognitive profiles considering up-to-date technological developments. She proposes that "With the advent of Dynamic HTML for instance, the design of the screen can be instantly adapted to the learning and reading profile of the user" (Ibid.).

The present research yielded only certain tendencies that indicate the beneficial effect of such hypertext annotations. The limited framework of the current research, however, does not allow broad generalisations of the results. The current study could be followed up with a much larger sample of subjects taken from a wider, more varied population of Hungarian or non-Hungarian learners of English. Also further research is needed to shed light on the significance of form- and meaning-focused hypertext glosses in various proficiency stages of second language vocabulary acquisition.

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Appendices

Appendix A: Self-report vocabulary pre-test

Please put a tick (✓) next to the words whose meanings *you know in Hungarian*. Make sure that you tick **only the words you really know.**

Gather	Attentively
Skillfully	Warning
Discontinue	Efficient
Expert	Dalbew
Wallet	Snatcher
Tated	Mannequin
Respectable	Racetrack
Capture	Valuable
Emnire	Cargo
Demand	Laim
Ransom	Treasure
Cavalier	Fely
Mustache	Sword
Dagger	Belt
Desperate	Rags
Waste	Rebel
Outlaw	Skill
Elect	Haquau
Majority	Vote
Regulation	Govern
Nuriteer	Pirate
Conduct	Purse
Cautious	Alert
Gathering	Carbow
Pipetting	Piracy
Throughout	Victim
Altener	Rapidly
Increase	Crowd
Crime	Method
Dummy	railur
Fyme	Merchant

Appendix B: Preliminary questionnaire

Kedves Nyelvtanuló! Kérlek, segítsd a nyelvtanulással kapcsolatos kutatómunkámat azzal, hogy válaszolsz az alábbi kérdésekre.

Köszönettel: Sankó Gyula, Debreceni Egyetem, Angol Nyelvoktatási Tanszék

1. Neved (vagy jeligéd):

2. Osztályod:

3. Hány éve tanulsz angolul? (karikázd be a megfelelő számot).

1 2 3 4 5 6 7 8 9 10 11

4. Szoktál-e 'szörfözni' a World Wide Weben ? (karikázd be a megfelelő válasz betűjelét).

A gyakran (hetente többször)

B ritkán (havonta 1-2 alkalommal)

C már próbáltam, de nem igazán használom

D még nem próbáltam

5. Használtál-e már számítógépet nyelvtanulási céllal?

A igen, a nyelvi órán

B igen, a nyelvi órán és szabadidőmben is

C csak a szabadidőmben

D nem, még soha

6. Használtad-e már a World Wide Webet nyelvtanulásra?

A igen, a nyelvi órán

B igen, a nyelvi órán és szabadidőmben is

C csak a szabadidőmben

D nem, még soha

7. Ha már használtad a World Wide Webet nyelvtanulásra, kérlek röviden írd le, hogy konkrétan hogyan és mire használtad a világhálót nyelvtanulásod során.

.....

.....

.....

.....

Appendix C/1: Text chosen for the incidental vocabulary learning condition**PIRATES**

For hundreds of years pirates have attacked and robbed merchant ships on all oceans of the world. In reality pirates are sea robbers or bandits.

The great age of piracy lasted about 200 years, from the 16th to the 18th century. Pirates captured ships for the valuable cargo, attacked seaside towns and carried away riches and prisoners, and organized powerful groups to demand ransom for prisoners.

Probably most people have romantic ideas about pirates. The movies and some famous novels such as *Treasure Island* by Robert Louis Stevenson and *Captain Blood* by Rafael Sabatini have helped to create a romantic picture of pirates. The pirate is often pictured as a cavalier with a beard or moustache, gold earrings, and a large hat or turban. He usually has a sword or dagger in his hand and two or three pistols in his belt.

Actually most pirates were not romantic at all. Often they were desperate drunken men who dressed in rags and wasted food and money. They were often rebelling against the conditions of their home society and chose the freedom of an outlaw. Most pirates did not live long.

A kind of democracy often existed among pirate groups. They elected their own captains by majority vote and prepared rules and regulations to govern their business conduct.

During the 1600's and 1700's the great treasure ships of Spain carrying gold and silver from Spanish colonies to Europe were frequent victims of pirate attacks.

Among the men some famous pirate names in history are: Barbarossa, Ali Pichinin, Henry Morgan, Captain Kidd, "Black Bart" (Bartholomew Roberts), "Blackbeard" (Edward Teach) and among the women: Anne Bonney and Mary Read.

Appendix C/2: Text chosen for the intentional vocabulary learning condition**PICKPOCKETS**

Throughout history, people have been the victims of pickpockets. Today, pickpocketing is one of the most rapidly increasing crimes. Pickpockets are increasing in number and developing better methods to practise their skill. Approximately one million Americans lose money to pickpockets every year, and no one is really safe from a skilled pickpocket. His victims, or "marks" as they are called, can be rich or poor, young or old.

During the 18th century, pickpockets were hanged in England. Large crowds of people would gather to watch the hanging, which was supposed to be a warning to other pickpockets. However, in time the practice was discontinued. The reason: while people were attentively watching the hanging of a pickpocket, other pickpockets skillfully stole the money of the spectators.

Police officials say that the most efficient pickpockets come from South America. Many of these expert pickpockets are trained in special schools called "Jingle Bell Schools". A pickpocket graduates from a J.B.S. when he is able to steal a wallet from a dressed dummy (also called a mannequin) that has bells inside its pockets.

Even the most well-dressed, respectable person may be a pickpocket. Some of the favourite places of pickpockets are banks, airports, racetracks, supermarkets, lifts, and train and bus stations. Often a pickpocket will work with another pickpocket as his partner. Another kind of pickpocket works outside or inside bars and specializes in stealing from persons who have had too much alcohol to drink. The pickpocket that specializes in stealing from women is called a "purse snatcher".

To avoid being the victim of a pickpocket, it is important to be cautious and alert when in the middle of large gatherings of people.

Appendix D/1: Annotated words in the text selected for the incidental vocabulary learning condition

PIRATES

For hundreds of years pirates have attacked and robbed **merchant** ships on all oceans of the world. In reality pirates are sea robbers or bandits.

The great age of **piracy** lasted about 200 years, from the 16th to the 18th century. Pirates captured ships for the valuable **cargo**, attacked seaside towns and carried away riches and prisoners, and organized powerful groups to demand **ransom** for prisoners.

Probably most people have romantic ideas about pirates. The movies and some famous novels such as Treasure Island by Robert Louis Stevenson and Captain Blood by Rafael Sabatini have helped to create a romantic picture of pirates. The pirate is often pictured as a **cavalier** with a beard or moustache, gold earrings, and a large hat or turban. He usually has a sword or **dagger** in his hand and two or three pistols in his belt.

Actually most pirates were not romantic at all. Often they were **desperate** drunken men who dressed in **rags** and wasted food and money. They were often **rebell**ing against the conditions of their home society and chose the freedom of an **outlaw**. Most pirates did not live long.

A kind of democracy often existed among pirate groups. They **elected** their own captains by majority vote and prepared rules and regulations to **govern** their business **conduct**.

During the 1600's and 1700's the great treasure ships of Spain carrying gold and silver from Spanish colonies to Europe were frequent victims of pirate attacks.

Among the men some famous pirate names in history are: Barbarossa, Ali Pichinin, Henry Morgan, Captain Kidd, "Black Bart" (Bartholomew Roberts), "Blackbeard" (Edward Teach) and among the women: Anne Bonney and Mary Read.

Appendix D/2: Annotated words in the text selected for the intentional vocabulary learning condition

PICKPOCKETS

Throughout history, people have been the victims of pickpockets. Today, pickpocketing is one of the most **rapidly** increasing crimes. Pickpockets are increasing in number and developing better **methods** to practise their skill. Approximately one million Americans lose money to pickpockets every year, and no one is really safe from a skilled pickpocket. His victims, or "marks" as they are called, can be rich or poor, young or old.

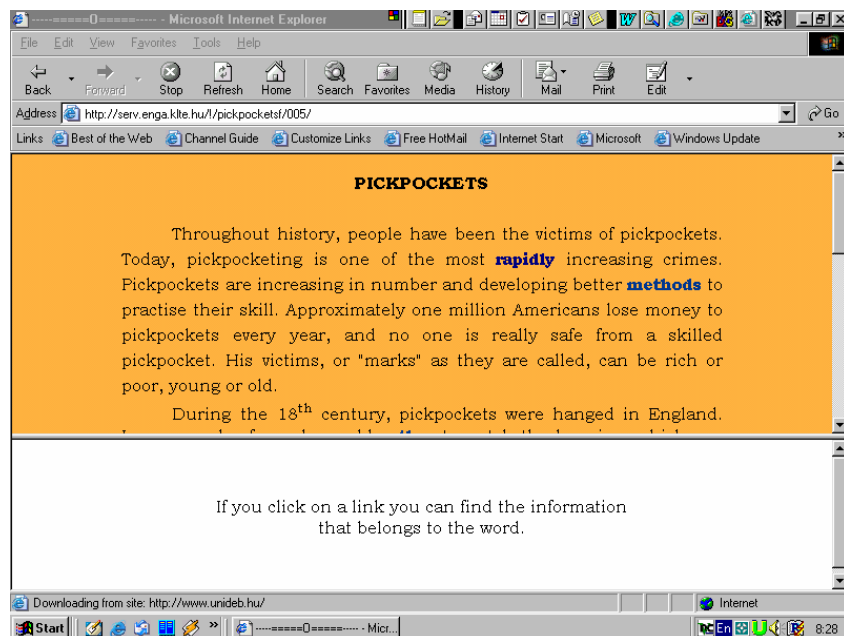
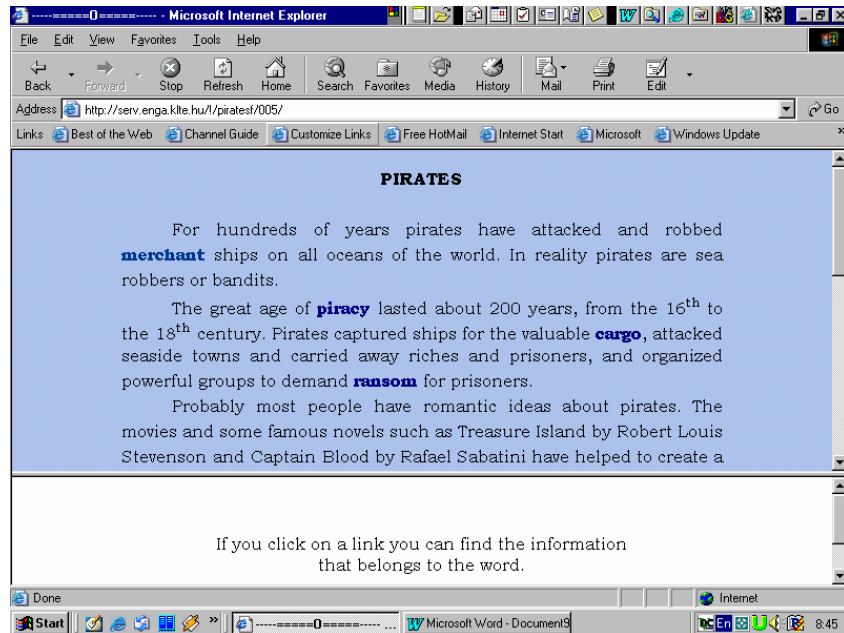
During the 18th century, pickpockets were hanged in England. Large crowds of people would **gather** to watch the hanging, which was supposed to be a warning to other pickpockets. However, in time the practice was discontinued. The reason: while people were **attentively** watching the hanging of a pickpocket, other pickpockets **skillfully** stole the money of the spectators.

Police officials say that the most **efficient** pickpockets come from South America. Many of these expert pickpockets are trained in special schools called "Jingle Bell Schools". A pickpocket graduates from a J.B.S. when he is able to steal a wallet from a dressed **dummy** (also called a **mannequin**) that has bells inside its pockets.

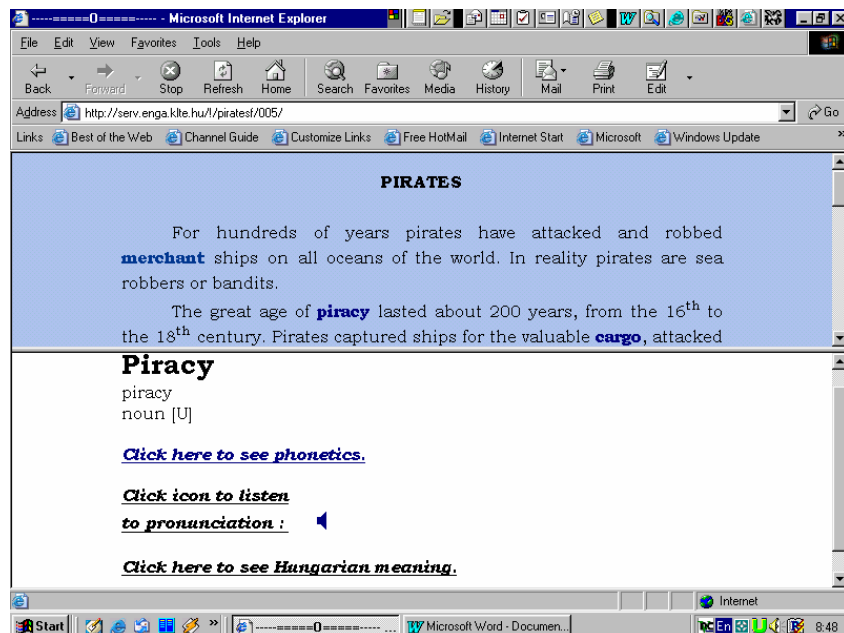
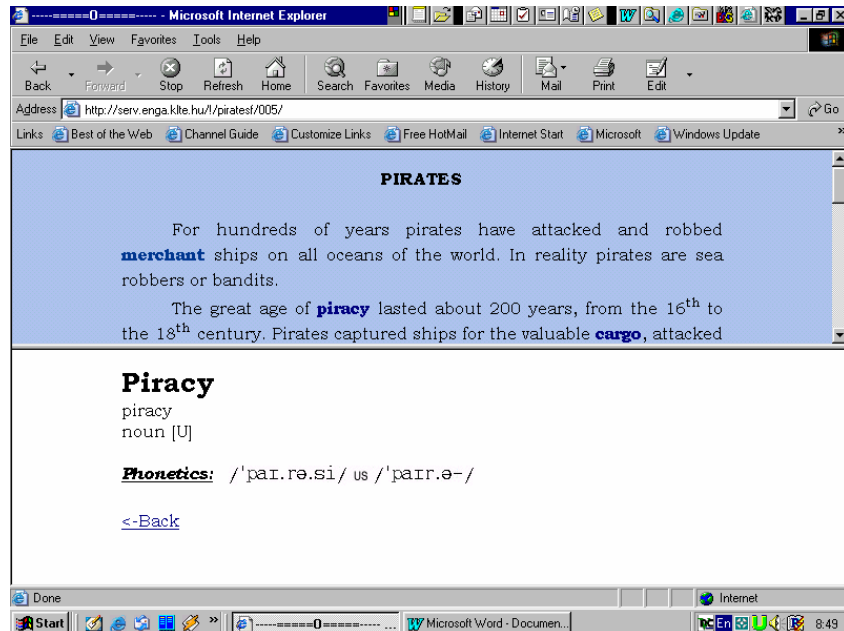
Even the most well-dressed, respectable person may be a pickpocket. Some of the favourite places of pickpockets are banks, airports, **racetracks**, supermarkets, lifts, and train and bus stations. Often a pickpocket will work with another pickpocket as his partner. Another kind of pickpocket works outside or inside bars and specializes in stealing from persons who have had too much alcohol to drink. The pickpocket that specializes in stealing from women is called a "purse **snatcher**".

To avoid being the victim of a pickpocket, it is important to be **cautious** and **alert** when in the middle of large **gatherings** of people.

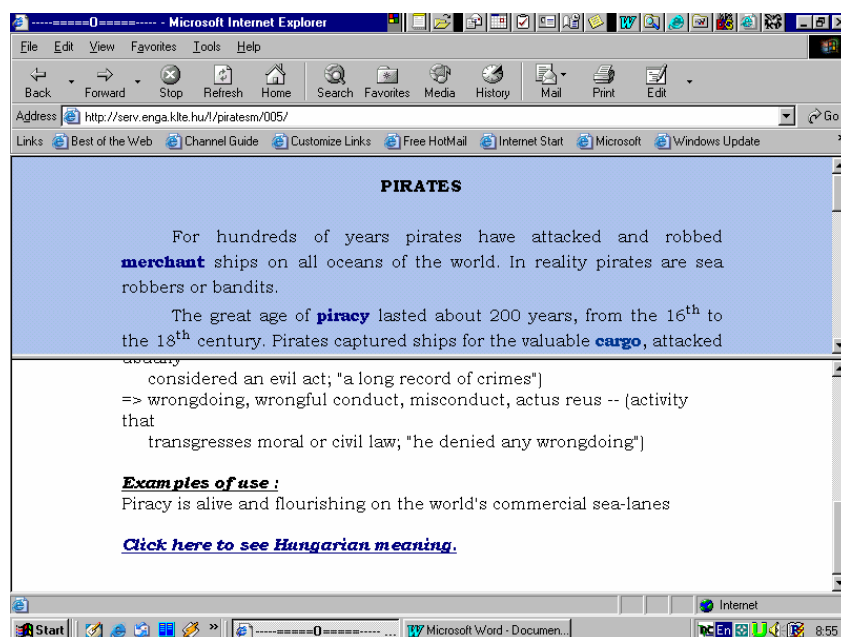
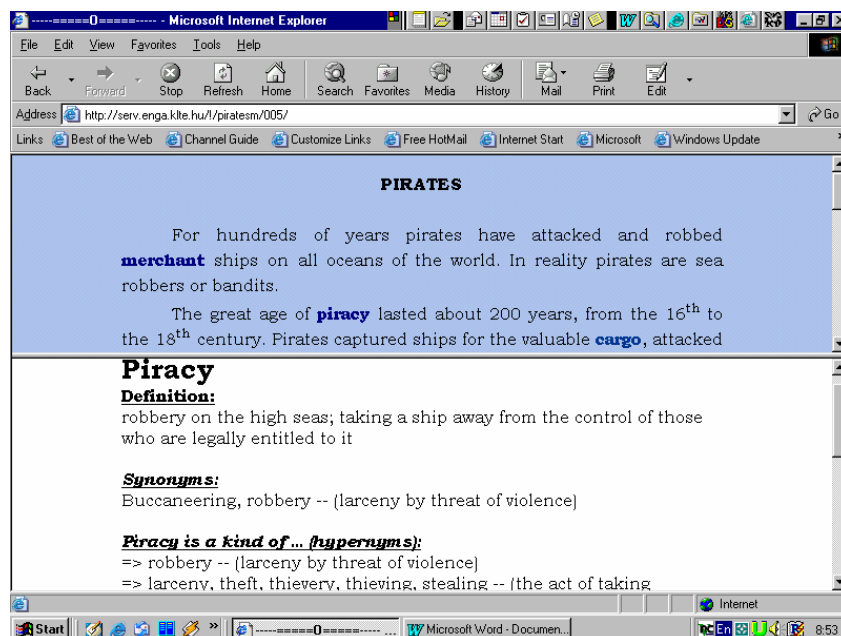
Appendix E: Illustration of screen design (texts used for incidental and intentional vocabulary learning conditions)



Appendix F/1: Illustration of the structure and content of form-focused glosses:



Appendix F/2: Illustration of the structure and content of meaning-focused glosses



Appendix G: Illustration of the cards participants used a) to access the web page with the target text, and b) to identify themselves

Internet-cím: <http://enga.klte.hu/piratesf/0117>

Név: _____

Internet-cím: <http://enga.klte.hu/piratesf/0328>

Név: _____

.....

Internet-cím: <http://enga.klte.hu/piratesm/0214>

Név: _____

Internet-cím: <http://enga.klte.hu/piratesm/0526>

Név: _____

.....

Internet-cím: <http://enga.klte.hu/pickpocketsf/1364>

Név: _____

Internet-cím: <http://enga.klte.hu/pickpocketsf/1574>

Név: _____

.....

Internet-cím: <http://enga.klte.hu/pickpocketsm/0216>

Név: _____

Internet-cím: <http://enga.klte.hu/pickpocketsm/0528>

Név: _____

Appendix H: Comprehension test administered at the end of the incidental vocabulary learning tutorial session

Answer questions 1-7 below in maximum four words. Write only words, not sentences. Write your answers on the lines after the questions. Please study the example (0).

0. How long did pirates' great age last? about 200 years
1. What did pirates take away from the towns attacked? _____
2. What was the effect of Stevenson's book on people's beliefs about pirates? _____
3. What jewellery did pirates wear? _____
4. How elegant were pirates? _____
5. How did they choose their leaders? _____
6. Why did they create rules and regulations? _____
7. Where did the treasure ships carry gold and silver from? _____

Appendix I/1: Immediate post-test administered for students learning vocabulary incidentally (exactly the same test was given as delayed post-test)

Student's name:

Some words are missing from the text below. Choose the most appropriate word from the list (A-Q) for each gap (1-13) in the text. There are three extra words that you do not need to use. Write your answers in the boxes after the text. You can find an example at the beginning (0).

For hundreds of years (0) _____ have attacked and robbed (1) _____ ships on all oceans of the world. In reality pirates are sea robbers or bandits.

The great age of (2) _____ lasted about 200 years, from the 16th to the 18th century. Pirates captured ships for the valuable (3) _____, attacked seaside towns and carried away riches and prisoners, and organized powerful groups to demand (4) _____ for prisoners.

Probably most people have romantic ideas about pirates. The movies and some famous novels such as *Treasure Island* by Robert Louis Stevenson and *Captain Blood* by Rafael Sabatini have helped to create a romantic picture of pirates. The pirate is often pictured as a (5) _____ with a beard or moustache, gold earrings, and a large hat or turban. He usually has a sword or (6) _____ in his hand and two or three pistols in his belt.

Actually most pirates were not romantic at all. Often they were (7) _____ drunken men who dressed in (8) _____ and wasted food and money. They were often (9) _____ against the conditions of their home society and chose the freedom of an (10) _____. Most pirates did not live long.

A kind of democracy often existed among pirate groups. They (11) _____ their own captains by majority vote and prepared rules and regulations to (12) _____ their business (13) _____.

During the 1600's and 1700's the great treasure ships of Spain carrying gold and silver from Spanish colonies to Europe were frequent victims of pirate attacks.

Among the men some famous pirate names in history are: Barbarossa, Ali Pichinin, Henry Morgan, Captain Kidd, "Black Bart" (Bartholomew Roberts), "Blackbeard" (Edward Teach) and among the women: Anne Bonney and Mary Read.

- | | | |
|-------------|------------|-------------|
| A cargo | G elected | M pirates |
| B cavalier | H expert | N rags |
| C conduct | I govern | O ransom |
| D brilliant | J merchant | P rebelling |
| E dagger | K outlaw | Q trained |
| F desperate | L piracy | |

0	1	2	3	4	5	6	7	8	9	10	11	12	13
M													

Appendix I/2: Immediate post-test administered for students learning vocabulary intentionally (exactly the same test was given as delayed post-test)

Student's name:

Some words are missing from the text below. Choose the most appropriate word from the list (A-Q) for each gap (1-13) in the text. There are three extra words that you do not need to use. Write your answers in the boxes after the text. You can find an example at the beginning (0).

Throughout history, people have been the (0) _____ of pickpockets. Today, pickpocketing is one of the most (1) _____ increasing crimes. Pickpockets are increasing in number and developing better (2) _____ to practise their skill. Approximately one million Americans lose money to pickpockets every year, and no one is really safe from a skilled pickpocket. His victims, or "marks" as they are called, can be rich or poor, young or old.

During the 18th century, pickpockets were hanged in England. Large crowds of people would (3) _____ to watch the hanging, which was supposed to be a warning to other pickpockets. However, in time the practice was discontinued. The reason: while people were (4) _____ watching the hanging of a pickpocket, other pickpockets (5) _____ stole the money of the spectators.

Police officials say that the most (6) _____ pickpockets come from South America. Many of these expert pickpockets are trained in special schools called "Jingle Bell Schools". A pickpocket graduates from a J.B.S. when he is able to steal a wallet from a dressed (7) _____ (also called a (8) _____) that has bells inside its pockets.

Even the most well-dressed, respectable person may be a pickpocket. Some of the favourite places of pickpockets are banks, airports, (9) _____, supermarkets, lifts, and train and bus stations. Often a pickpocket will work with another pickpocket as his partner. Another kind of pickpocket works outside or inside bars and specializes in stealing from persons who have had too much alcohol to drink. The pickpocket that specializes in stealing from women is called a "purse (10) _____".

To avoid being the victim of a pickpocket, it is important to be (11) _____ and (12) _____ when in the middle of large (13) _____ of people.

- | | | |
|---------------|--------------|--------------|
| A alert | G dummy | M racetracks |
| B attentively | H efficient | N rapidly |
| C cautious | I gather | O skillfully |
| D colleague | J gatherings | P snatcher |
| E collectors | K mannequin | Q victims |
| F create | L methods | |

0	1	2	3	4	5	6	7	8	9	10	11	12	13
Q													

Appendix J/1: Hungarian version of the questionnaire administered at the end of the study

Köszönöm, hogy segített a munkámat azzal, hogy kitöltöd ezt a számítógéppel segített nyelvtanulással kapcsolatos tapasztalataidra vonatkozó a kérdőívet.

Kérlek, karikázd be annak a válasznak a betűjelét, amelyikkel egyetérsz!

1. Hogyan értékeled a számítógépes hypertext programok szerepét a szótanulásban?
(hypertext = a világhálón alkalmazott szöveg a szövegben szerkesztési forma, amelyben pl. egy szóra történő kattintás után megjelenik az arra vonatkozó információ).

- | | |
|--------------------------|------------------------------|
| (A) nagyon hasznosak | (B) hasznosak |
| (C) nem igazán segítenek | (D) egyáltalán nem segítenek |

2. Véleményed szerint főként hol/mikor érdemes számítógépet szótanulásra használni?

- | | | |
|-------------|-------------------|---------------------------|
| (A) tanórán | (B) tanórán kívül | (C) nem érdemes használni |
|-------------|-------------------|---------------------------|

3. Milyen gyakran szeretnél számítógépet használni szótanulásra?

- | | | | |
|--------------------|-------------|----------|----------|
| (A) nagyon gyakran | (B) gyakran | (C) néha | (D) soha |
|--------------------|-------------|----------|----------|

4. Mennyire találtad könnyűnek a számítógéphasználatot a szótanulás során?

- | | | |
|-----------------------------|-----------------|---------------------------|
| (A) nagyon könnyű volt | (B) könnyű volt | (C) volt néhány problémám |
| (D) sok nehézségbe ütköztem | | |

Pl.:

5. Milyen mértékben segítette számodra egyes szavak más színnel történő kiemelése (és magyarázata) ezen szavak elsajátítását?

- | | | |
|------------------------------|--------------------|-------------------------|
| (A) nagyon sokat segített | (B) sokat segített | (C) egy kicsit segített |
| (D) egyáltalán nem segített. | | |

6. Véleményed szerint, mennyire segítenek a szavak tanulásában a következő típusú számítógépes hypertext-hivatkozások (a kiemelt szóra történt kattintás után kapott információk)?

a) A szó kiejtésének fonetikus átírása

- | | | | |
|--------------------|-------------|---------------------|--------------------------|
| (A) nagyon hasznos | (B) hasznos | (C) nem túl hasznos | (D) egyáltalán nem segít |
|--------------------|-------------|---------------------|--------------------------|

b) Hangfájlok (a számítógép kiejti a szót)

(A) nagyon hasznos (B) hasznos (C) nem túl hasznos (D) egyáltalán nem segít

c) A szó jelentésének magyarázata angolul.

(A) nagyon hasznos (B) hasznos (C) nem túl hasznos (D) egyáltalán nem segít

d) A szó magyar megfelelője/ megfelelői

(A) nagyon hasznos (B) hasznos (C) nem túl hasznos (D) egyáltalán nem segít

e) A szó szinonímái, antonímái, és egyéb jelentésviszonyai más szavakkal

(A) nagyon hasznos (B) hasznos (C) nem túl hasznos (D) egyáltalán nem segít

f) A szó lehetséges toldalékkal ellátott alakjai, ideértve a belőle képezhető új szavakat is. (pl.: value - valuables - valueless - to value - valuer - valuation - invaluable)

(A) nagyon hasznos (B) hasznos (C) nem túl hasznos (D) egyáltalán nem segít

g) A szavak használatának bemutatása példamondatokban .

(A) nagyon hasznos (B) hasznos (C) nem túl hasznos (D) egyáltalán nem segít

7. Mennyire volt fontos a szótanulásod sikere szempontjából, hogy akárhányszor rákattinthattál egy adott kiemelt szóra, és mindig megnézhetted a vonatkozó információkat ?

(A) nagyon fontos (B) fontos (C) nem túl fontos (D) egyáltalán nem fontos

8. Tanultál-e már meg angol szavakat, miközben valamilyen más, speciális információt kerestél a Világhálón (WWW)?

(A) igen, gyakran (B) igen, volt ilyen, de nem jellemző (D) nem, még soha

9. Ha az előző kérdésre igennel válaszoltál, emlékszel-e még az ily módon megtanult szavakra?

(A) igen, mindre (B) igen, a többségére (C) csak néhányra (D) már egyre sem

10. Az általad szótanulásra használt hypertext programnak mely jellemzőit tartod
 érdekesnek:.....?

hasznosnak:.....?

11. Az általad szótanulásra használt hypertext programnak mely jellemzőit tartod,
 kevésbé hatékonynak:
?

unalmasnak:.....?

12. Egyéb észrevételeid a használt programmal, a szövegekkel, nyelvtanulás ilyen formájával,
 körülményeivel kapcsolatban:

.....

Appendix J/2: English translation of the questionnaire administered at the end of the study

Questionnaire 2

Thank you very much for taking time to complete this questionnaire concerning your experience with computer-based language learning materials. I appreciate your help.

1. How would you rate computer-based hypertext programs for vocabulary learning?

(A) very useful (B) useful (C) moderately useful (D) not useful

2. In your opinion, where/when is it worth using the computer for vocabulary learning?

(A) in class (B) out of class (C) it is not worth using computers

3. How often would you like to use computers in learning vocabulary?

(A) very often (B) often (C) sometimes (D) never

4. How easy was it for you to use the computer for vocabulary learning?

(A) very easy (B) easy (C) I had some problems (D) I had many problems

For example:

.....
.....

5. To what extent did highlighting (and explaining) certain words help you learn these words?

(A) very much (B) much (C) just a little (D) not at all

6. How would you rate the usefulness of the following gloss types in a computerized hypertext program for successful vocabulary learning?

a) The phonemic transcription of the word

(A) very useful (B) useful (C) moderately useful (D) not useful

b) Sound files (i. e. the word pronounced by the computer)

(A) very useful (B) useful (C) moderately useful (D) not useful

c) The meaning explained in English

(A) very useful (B) useful (C) moderately useful (D) not useful

d) The Hungarian equivalent(s) of the word

(A) very useful (B) useful (C) moderately useful (D) not useful

e) Synonyms, antonyms and other sense relations of the word

(A) very useful (B) useful (C) moderately useful (D) not useful

f) Affixed and derived forms of the word

(A) very useful (B) useful (C) moderately useful (D) not useful

g) Putting the word in context (providing example sentences with the word).

(A) very useful (B) useful (C) moderately useful (D) not useful

7. How important to your learning were interactions with the computer?

(A) very important (B) important (C) moderately important (D) not important

8. Have you ever learnt new English words or expressions as a by-product while looking for some specific information on the WWW?

(A) yes, often (B) yes, once or twice (C) no, never

9. If your answer was “yes”, can you still remember the words you learnt in this way?

(A) yes, all of them (B) yes, most of them (C) just one or two (D) don't remember any more

10. What were the interesting/ useful characteristics of the hypertext program you used during your computer-based learning experience?

Useful:.....
.....

Interesting:.....
.....

11. What were the problematic (boring/ inefficient) points in the hypertext program you used during your computer-based learning experience?

Boring:

.....

Inefficient:

.....

.....

12. Do you have any additional comments concerning your computer-based language learning experience?

.....

.....

.....

.....

Appendix K/1: Text and bilingual word list used by control group students in incidental vocabulary learning condition

PIRATES

For hundreds of years pirates have attacked and robbed merchant ships on all oceans of the world. In reality pirates are sea robbers or bandits.

The great age of piracy lasted about 200 years, from the 16th to the 18th century. Pirates captured ships for the valuable cargo, attacked seaside towns and carried away riches and prisoners, and organized powerful groups to demand ransom for prisoners.

Probably most people have romantic ideas about pirates. The movies and some famous novels such as *Treasure Island* by Robert Louis Stevenson and *Captain Blood* by Rafael Sabatini have helped to create a romantic picture of pirates. The pirate is often pictured as a cavalier with a beard or moustache, gold earrings, and a large hat or turban. He usually has a sword or dagger in his hand and two or three pistols in his belt.

Actually most pirates were not romantic at all. Often they were desperate drunken men who dressed in rags and wasted food and money. They were often rebelling against the conditions of their home society and chose the freedom of an outlaw. Most pirates did not live long.

A kind of democracy often existed among pirate groups. They elected their own captains by majority vote and prepared rules and regulations to govern their business conduct.

During the 1600's and 1700's the great treasure ships of Spain carrying gold and silver from Spanish colonies to Europe were frequent victims of pirate attacks.

Among the men some famous pirate names in history are: Barbarossa, Ali Pichinin, Henry Morgan, Captain Kidd, "Black Bart" (Bartholomew Roberts), "Blackbeard" (Edward Teach) and among the women: Anne Bonney and Mary Read.

VOCABULARY

a merchant, -s	/ 'mɜ:tʃənt /	kereskedő
piracy	/ 'paɪrəsi /	kalózkodás
a cargo, -s	/ 'kɑ:gəʊ /	rakomány
ransom	/ 'rænsəm /	váltságdíj
a cavalier, -s	/ kævə'liə /	lovag
a dagger, -s	/ 'dægə /	tőr
desperate	/ 'despəɾət /	elkeseredett, kétségbeesett, mindenre elszánt
rags	/ rægz /	rongyok
to rebel, -led, -led	/ ri'bel /	fellázad
an outlaw, -s	/ 'aʊtlɔ: /	zsivány, törvényt kívüli
to elect, -ed, -ed	/ i'lekt /	megválaszt
to govern -ed, -ed	/ 'gʌvn /	irányít, kormányoz
conduct	/ 'kɒndʌkt /	magatartás, magaviselet

Appendix K/2: Text and bilingual word list used by control group students in intentional vocabulary learning condition

PICKPOCKETS

Throughout history, people have been the victims of pickpockets. Today, pickpocketing is one of the most rapidly increasing crimes. Pickpockets are increasing in number and developing better methods to practise their skill. Approximately one million Americans lose money to pickpockets every year, and no one is really safe from a skilled pickpocket. His victims, or "marks" as they are called, can be rich or poor, young or old.

During the 18th century, pickpockets were hanged in England. Large crowds of people would gather to watch the hanging, which was supposed to be a warning to other pickpockets. However, in time the practice was discontinued. The reason: while people were attentively watching the hanging of a pickpocket, other pickpockets skillfully stole the money of the spectators.

Police officials say that the most efficient pickpockets come from South America. Many of these expert pickpockets are trained in special schools called "Jingle Bell Schools". A pickpocket graduates from a J.B.S. when he is able to steal a wallet from a dressed dummy (also called a mannequin) that has bells inside its pockets.

Even the most well-dressed, respectable person may be a pickpocket. Some of the favourite places of pickpockets are banks, airports, racetracks, supermarkets, lifts, and train and bus stations. Often a pickpocket will work with another pickpocket as his partner. Another kind of pickpocket works outside or inside bars and specializes in stealing from persons who have had too much alcohol to drink. The pickpocket that specializes in stealing from women is called a "purse snatcher".

To avoid being the victim of a pickpocket, it is important to be cautious and alert when in the middle of large gatherings of people.

VOCABULARY

rapidly	/ 'ræpidli /	gyorsan
a method, -s	/ 'meθəd /	módszer, mód, eljárás
to gather	/ 'gæðə /	összegyűlik, gyülekezik, összejön
attentively	/ ə'tentivli /	figyelmesen, gondosan ügyelve
skillfully	/ 'skilfəli /	ügyesen, szakértelemmel
efficient	/ i'fijnt /	hatékony, hathatós, jól működő
a dummy, -ies	/ 'dʌmi /	báb, kirakati bábu, próbababa
a mannequin, -s	/ 'mænikən /	próbababa
a racetrack, -s	/ 'reistræk /	(ló)versenypálya
to snatch, -ed, -ed	/ snætʃ /	hirtelen elkap, hirtelen elragad, megkaparint
cautious	/ 'kɔ:ʃəs /	óvatos, körültekintő, elővigyázatos
alert	/ ə'lɜ:t /	éber, óvatos, elővigyázatos
a gathering, -s	/ 'gæðəriŋ /	csoportosulás, csődület, gyülekezet

Appendix L/1: Illustration of the original data set structure (with form- and meaning-focused annotations both in the incidental and the intentional learning conditions) as recorded in the log file (MS Excel format)

193.6.138.54	10:51:14	+0100]	GET	piratesf	645	index.htm	HTTPv1_0	301	315
193.6.138.54	10:51:22	+0100]	GET	piratesf	661	meanings-merchant_meaning.htm	HTTPv1_0	200	1885
193.6.138.54	10:51:24	+0100]	GET	piratesf	783	meanings-merchant_meaning.htm	HTTPv1_0	200	1885
193.6.138.54	10:51:24	+0100]	GET	piratesf	505	sounds-merchant_sound.htm	HTTPv1_0	200	1510
193.6.138.54	10:51:25	+0100]	GET	piratesf	505	sounds-merchant.wav	HTTPv1_0	200	8430
193.6.138.54	10:51:26	+0100]	GET	piratesf	913	sounds-ransom_sound.htm	HTTPv1_0	200	1500
193.6.138.54	10:51:27	+0100]	GET	piratesf	371	sounds-merchant_sound.htm	HTTPv1_0	200	1510
193.6.138.54	10:51:27	+0100]	GET	piratesf	913	sounds-ransom.wav	HTTPv1_0	200	9226
193.6.138.54	10:51:27	+0100]	GET	piratesf	371	sounds-merchant.wav	HTTPv1_0	200	8430

193.6.138.75	12:39:37	+0100]	GET	piratesm	296	dagger.htm	HTTPv1_0	200	2861
193.6.138.75	12:39:37	+0100]	GET	piratesm	024	govern.htm	HTTPv1_0	200	1963
193.6.138.75	12:39:38	+0100]	GET	piratesm	534	Meanings-outlaw_meaning.htm	HTTPv1_0	200	1062
193.6.138.75	12:39:38	+0100]	GET	piratesm	337	cargo.htm	HTTPv1_0	200	2143
193.6.138.75	12:39:38	+0100]	GET	piratesm	056	Meanings-rebel_meaning.htm	HTTPv1_0	200	1036
193.6.138.75	12:39:38	+0100]	GET	piratesm	272	outlaw.htm	HTTPv1_0	200	6777
193.6.138.75	12:39:40	+0100]	GET	piratesm	586	piracy.htm	HTTPv1_0	200	2544
193.6.138.75	12:39:41	+0100]	GET	piratesm	118	desperate.htm	HTTPv1_0	200	2268
193.6.138.75	12:39:42	+0100]	GET	piratesm	296	Meanings-dagger_meaning.htm	HTTPv1_0	200	1037

193.6.138.75	10:53:52	+0100]	GET	pickpocketsf	826	sounds-racetrack.wav	HTTPv1_0	200	13785
193.6.138.75	10:53:54	+0100]	GET	pickpocketsf	805	rapidly.htm	HTTPv1_0	200	1730
193.6.138.75	10:54:01	+0100]	GET	pickpocketsf	826	sounds-snatcher_sound.htm	HTTPv1_0	200	1478
193.6.138.75	10:54:01	+0100]	GET	pickpocketsf	826	sounds-snatch.wav	HTTPv1_0	200	10829
193.6.138.75	10:54:02	+0100]	GET	pickpocketsf	805	sounds-rapidly_sound.htm	HTTPv1_0	200	1473
193.6.138.75	10:54:02	+0100]	GET	pickpocketsf	805	sounds-rapid.wav	HTTPv1_0	200	11064
193.6.138.75	10:54:08	+0100]	GET	pickpocketsf	826	sounds-cautious_sound.htm	HTTPv1_0	200	1484
193.6.138.75	10:54:11	+0100]	GET	pickpocketsf	826	sounds-cautious.wav	HTTPv1_0	200	8268
193.6.138.75	10:54:12	+0100]	GET	pickpocketsf	684	index.htm	HTTPv1_0	301	319

193.6.138.75	10:56:20	+0100]	GET	pickpocketsm	868	meanings-gathering_meaning.htm	HTTPv1_0	200	1059
193.6.138.75	10:56:31	+0100]	GET	pickpocketsm	494	meanings-dummy_meaning.htm	HTTPv1_0	200	1045
193.6.138.75	10:56:37	+0100]	GET	pickpocketsm	494	mannequin.htm	HTTPv1_0	200	1735
193.6.138.75	10:56:40	+0100]	GET	pickpocketsm	095	snatcher.htm	HTTPv1_0	200	2365
193.6.138.75	10:56:46	+0100]	GET	pickpocketsm	095	meanings-snatcher_meaning.htm	HTTPv1_0	200	1086
193.6.138.75	10:56:51	+0100]	GET	pickpocketsm	494	meanings-mannequin_meaning.htm	HTTPv1_0	200	1047
193.6.138.75	10:57:00	+0100]	GET	pickpocketsm	494	racetrack.htm	HTTPv1_0	200	1627
193.6.138.75	10:57:33	+0100]	GET	pickpocketsm	494	meanings-racetrack_meaning.htm	HTTPv1_0	200	1048
193.6.138.75	10:57:41	+0100]	GET	pickpocketsm	095	cautious.htm	HTTPv1_0	200	1894

Appendix L/2: Illustration of the simplified data set structure (with form- and meaning-focused annotations both in the incidental and the intentional learning conditions) of the log file after filtering out the data types irrelevant for the study (MS Excel format)

Date	Time	Text	Student	Word
16.márc.04	11:40:53	piratesf	017	index.htm
16.márc.04	11:41:26	piratesf	017	merchant.htm
16.márc.04	11:41:38	piratesf	017	meanings-merchant_meaning.htm
16.márc.04	11:42:27	piratesf	017	ransom.htm
16.márc.04	11:42:46	piratesf	017	meanings-ransom_meaning.htm
16.márc.04	11:43:06	piratesf	017	piracy.htm
16.márc.04	11:43:12	piratesf	017	meanings-piracy_meaning.htm

Date	Time	Text	Student	Word
30.márc.04	9:22:50	piratesm	0214	index.htm
30.márc.04	9:33:24	piratesm	0214	piracy.htm
30.márc.04	9:33:59	piratesm	0214	meanings-piracy_meaning.htm
30.márc.04	9:34:04	piratesm	0214	meanings-piracy_meaning.htm
30.márc.04	9:34:32	piratesm	0214	ransom.htm
30.márc.04	9:34:35	piratesm	0214	ransom.htm
30.márc.04	9:34:43	piratesm	0214	meanings-ransom_meaning.htm

Date	Time		Student	Word
23.márc.04	11:39:23	pickpocketsf	019	index.htm
23.márc.04	11:40:22	pickpocketsf	019	gathering.htm
23.márc.04	11:40:35	pickpocketsf	019	sounds-gathering.wav
23.márc.04	11:41:50	pickpocketsf	019	attentively.htm
23.márc.04	11:41:54	pickpocketsf	019	sounds-attentive.wav
23.márc.04	11:42:03	pickpocketsf	019	Meanings-attentively_meaning.htm
23.márc.04	11:42:17	pickpocketsf	019	rapidly.htm

Date	Time		Student	Word
31.márc.04	9:25:51	pickpocketsm	0216	index.htm
31.márc.04	9:28:58	pickpocketsm	0216	snatcher.htm
31.márc.04	9:29:05	pickpocketsm	0216	meanings-snatcher_meaning.htm
31.márc.04	9:29:13	pickpocketsm	0216	gathering.htm
31.márc.04	9:29:18	pickpocketsm	0216	meanings-gathering_meaning.htm
31.márc.04	9:29:25	pickpocketsm	0216	racetrack.htm
31.márc.04	9:29:28	pickpocketsm	0216	meanings-racetrack_meaning.htm

Appendix M: The software program used in the experiment

Subjects working in the experimental groups of the present study were exposed to four different conditions. Accordingly, a small-scale hypertext program was developed in four different versions. To see the four versions of the program open folder 'Incidental' or 'Intentional' and run '**index.html**' in each of the four subdirectories entitled 'Form-focused' or 'Meaning-focused'.