Mapping the Changes in the Mental Lexicon of Pre-Intermediate Learners of English:
A longitudinal study of depth of word knowledge development

Dissertation summary
A doktori (PhD) értekezés tézisei

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1 Introduction

1.1 Topic of the dissertation

Vocabulary is a widely researched area in second language research and a lot of attention has been given to the subject of vocabulary acquisition, especially to the size and development of lexicons, that is, breadth of word knowledge (Read, 2004). However, in comparison with the abundance of research on how and how many lexical items are acquired, there is still a lack of investigations on depth of word knowledge, that is, how well single words are known; and even less is known about how particular words are acquired over a longer period of time. The problem is all the more complex since it can be supposed that individuals differ in the acquisition of words; furthermore, the notion of knowing a word is also problematic. The reason for this is that words are learnt incrementally, not “in a not acquired/acquired manner” (Schmitt, 1998a, p. 283), thus there are different levels of knowing a word, and meaning is just one element of this. This incremental nature of vocabulary acquisition can only be observed over a longer period of time, which calls for a longitudinal investigation.

It is important to examine what it means to know a word through individual behaviour for two reasons. On the one hand, observing the incremental nature of vocabulary acquisition could provide a deeper understanding of the processes of vocabulary learning. On the other hand, through examining depth of word knowledge we might gain an insight into how words are organized in the
bilingual memory. Research into vocabulary acquisition has indicated that L1 and L2 words are stored in a common lexicon and recent studies have also aimed at investigating the connections between words through word associations. However, as most of the research to date has either compared native and non-native associations or used advanced L2 speakers, little is known about the organization of beginner or pre-intermediate learners’ mental lexica. Furthermore, there is also a lack of appropriate measures for the analysis of word associations and other depth of word knowledge categories.

This thesis attempts to fill the void in three ways:

1) by investigating the changes in depth of word knowledge of lower level learners

2) by using a longitudinal research design and observing the participants on three different occasions over the course of 16 months

3) by examining the participants’ depth of word knowledge with the help of all the word knowledge categories available.

1.2 Aims of the study

The present research project aimed at exploring the depth of word knowledge through examining all the word knowledge types (spoken form, written form, grammatical and collocational behaviour, frequency, register, meaning and associations) with a special emphasis on word associations. Following the line of research started by Schmitt and Meara (1997), a further aim was to investigate the relationships between the different word knowledge
components. To achieve this, the participants of this longitudinal study were given the same target words in English on three occasions over the period of sixteen months (September, 2005; May, 2006 and January, 2007), and changes in the depth of their word knowledge and word association use were observed in order to investigate the types of connections that exist between L1 and L2 words in pre-intermediate learners’ bilingual memory as their language proficiency developed.

1.3 Overview of the dissertation

Following the introduction, the theoretical framework for the proposed study was presented in an attempt to review the theoretical background as well as previous research carried out on the topic, and outline the design of the research that was undertaken. This was followed by the results of data collection and discussion of the findings in the light of previous research. The conclusion section summarized the results and explored some pedagogic implications, but it also pinpointed the limitations of this investigation as well as showing some further research possibilities. In the following I would like to detail how the chapters and appendices in my dissertation are organized.

Chapter 2 reviews the literature relevant to the study. The first section of Chapter 2 gives an overview of the theories and models of L1 and bilingual mental lexicons, also focusing on evidence based on empirical data. The second section of Chapter 2 is devoted especially to theories and research studies related to depth of word knowledge and word associations, while the final section raises
the problematic issues of previous research studies and provides a background and basis for the present one.

Chapter 3 outlines the research methodology used in the dissertation, addressing such issues as the rationale for the longitudinal research design, the selection of participants, the process of word selection, the interview protocol and procedure, as well as measurement procedures.

Chapter 4 and 5 contain the results of the study. Chapter 4 presents the findings of statistical procedures with regard to depth of word knowledge categories, while Chapter 5 examines the changes that take place in the participants’ associative behaviour, which are also placed into the context of the findings of previous research studies.

In Chapter 6, the conclusions and implications (both research and pedagogic) are considered and avenues of further research are discussed, along with the limitations of the present study. Following the references, the appendices include the placement vocabulary test, the dictionary entries of the 21 stimulus words used in the study, the interview protocol and samples from the interviews both in relation to the various depth of word knowledge categories, as well as the associations provided by the participants on the three occasions.

2 Theoretical background

The theoretical framework of the study is based on psycholinguistics and focuses on the following issues: Firstly, features of the L1 mental lexicon and
lexical access are discussed, including justifications for its existence, information about its size, conceptual models of organization, storage, lexical access and word selection. This is followed by a detailed analysis of the bilingual mental lexicon, covering conceptual and lexical representation (what is stored and where), lexical access in L2, lexical selection, as well as models of the organization of the L2 lexicon and the problematic aspects of these models. Then theoretical issues and empirical findings of both depth of word knowledge and word associations are presented. Finally, conclusions and problematic issues from previous studies are highlighted, accentuating the aims of the present study and its research questions.

Although the significance of vocabulary acquisition in a second language is unquestionable, there is still relatively little known about the actual processes that take place during the course of activation and actual production of lexical items; and much attention as the organization of the lexicon in a second language has gained recently, there is still a lot of confusion concerning terminology as well as theory (Kormos, 2006). Swain and Carrol (1987) characterized the nature of second language vocabulary acquisition as “incremental, potentially limitless and heavily constrained by the individual’s experience” (p. 193, as cited in Santos, 2002). Therefore, in order to gain a deeper understanding of the issues in question, in the first part of the review of literature theoretical issues are addressed, followed by the findings of empirical research.

One of the shortcomings of previous studies is that few investigations have been made into the actual organization of the bilingual lexicon and there is still a mismatch between theory and research methodology. Furthermore, as
Schmitt’s original depth of word knowledge investigation was undertaken in 1998, the aim of the present study was to overcome some of the methodological issues raised by Schmitt and focus on what was amenable, in order to investigate as many components of deep word knowledge as possible.

With regard to the word association paradigm, especially compared to research on lexical depth, there has been a bulk of data generated. Word associations have promoted a deeper understanding of second language acquisition in four main areas: comparison of first and second language language use, bilingualism, vocabulary assessment and the structure of the mental lexicon. Although there is no doubt that research in all these fields has yielded important results, it was clear to me that the most controversial and yet most promising avenue would be the exploration of the bilingual lexicon.

To date the findings seem to confirm the existence of a bilingual lexicon, where various L1 and L2 lexical items are connected with each other to a varying degree and various word types might be stored at different places. Nevertheless, as most research has been concerned with native speakers or advanced L2 learners (except for Piper & Leicester, 1980; Bell, 2009), this study intended to gain more insight into the mental lexicon of less advanced learners of the language.
3 The research

3.1 Research questions

Based on the findings and limitations of previous research studies mentioned in the review of literature, the pivotal aim of this investigation was the exploration of depth of word knowledge with a special emphasis on the lexical network of the mental lexicon. In order to achieve this, fourteen students were tested on their deep word knowledge of twenty-one words three times from September, 2005 to January, 2007. The study was guided by the following research questions:

1. What characterises the participants’ depth of word knowledge of the selected 21 words at pre-intermediate level?

2. How does the participants’ depth of word knowledge change over the period of 16 months?

3. Is there a developmental order for the depth of word knowledge categories?

4. How are words organized and connected in a pre-intermediate learner’s mental lexicon?

5. What changes take place in the mental lexicon of pre-intermediate learners in 16 months as their language proficiency develops?

6. What does the change in the depth of word knowledge and association use imply about the organization of the bilingual lexicon?

In order to answer these research questions, the depth of word knowledge (spoken form, spelling, grammatical and collocational behaviour, word meaning and other meaning senses, word and sentence formation) of a
group of pre-intermediate learners of English were explored in two different ways: (1) changes in their deep word knowledge were analyzed with the help of quantitative methods, (2) the nature of and changes in their associative behaviour were observed with mixed methods techniques, relying on both qualitative and quantitative data.

3.2 Method

3.2.1 Participants

The participants of the present research were a group of first year students (aged fifteen) in the non-bilingual section of a dual language secondary school in Budapest, therefore they could be considered representative of the Hungarian secondary school population. One reason for selecting this particular group of students was the researcher’s close contact with the teacher in question, which made the arrangement and operationalization of the interviews easier. Another reason for experimenting with this particular group of learners was that because longitudinal studies are prone to participant attrition, it was in these circumstances (familiar teacher, secondary school environment) that the development of students could best be traced with minimal attrition.

3.2.2 Instrument

Twenty-one target words were carefully selected from the second thousand words of the Brown frequency list (Francis and Kucera, 1982, cited in Waring & Nation, 1997, p. 12). The most important criterion for selection was
that words had to have depth in order to fulfill as many requirements of the categories as possible. Finally, twenty-one words were selected, which are listed below:

- 7 nouns: accident, advantage, advice, experience, interest, nature, reason;
- 10 verbs: allow, appear, concentrate, develop, decide, grow, laugh, mean, move, relax;
- 4 adjectives: able, foreign, successful, worth.

### 3.2.3 The interview protocol

As Santos (2002) reported, interview protocols have been considered to be a useful methodological technique for investigating deep word knowledge due to the fact that “the one-on-one format facilitates extensive probing of a learner’s network of meanings related to a particular word” (p. 21), which justified the use of it in the present study, despite its tiresome and lengthy nature. The following questions were asked about each word on all the three occasions in a strictly structured format:

1. Do you know how to say the word *baleset* in English? (accident) – *to elicit the spoken form + word meaning*
2. Can you spell it? – *to elicit the written form*
3. What words come to your mind when you hear this word? (either in English or in Hungarian) – *to elicit associations*
4. Do you know what part of speech this word is? – *to elicit grammatical behaviour*
5. Do you know any other forms of this word? – to elicit other forms of the same word
6. Can you think of any other meanings of this word? – to elicit other meaning senses
7. Could you say a sentence with this word? – to elicit productive knowledge
8. Can you think of any collocations of this word? – to elicit collocational behaviour

3.2.4 Analysis of depth of word knowledge

Data deriving from the three sessions were analysed using the software SPSS 17.0 for Windows. First, with the help of the software, descriptive statistics (mean, standard deviation, skewness and sums) were calculated to shed light on characteristics of deep word knowledge. Since sample size was small in the case of adjectives, non-parametric tests, such as the Friedman test and Wilcoxon Signed-ranks tests for post-hoc analyses were used to determine significance in the differences between the depth of word knowledge of nouns, verbs and adjectives, which would be of paramount importance in order to draw comparisons between depth of word knowledge and association use. Thirdly, as a result of the fact that deep word knowledge for the 21 words did not always comply with the requirements of parametric statistical analysis, Friedman’s ANOVA analyses were applied for comparing the results of the three occasions with regard to the depth of word knowledge categories (word meaning, spoken form, written form, part of speech, other word forms, other meaning senses,
sentence production and collocation use). However, the analyses regarding word class (i.e. the knowledge of nouns, verbs and adjectives) and receptive and productive vocabulary knowledge were carried out with Repeated Measures ANOVA. Following these, paired sampled T-tests were used to make post-hoc comparisons between conditions, applying Bonferroni corrections. Finally, in order to detect any developmental hierarchy between variables, the mean differences were calculated between the various components of lexical depth.

3.2.5 Analysis of word associations

As shown in the review of literature section of the dissertation, most research carried out with associations applied a purely quantitative approach, relying on either statistical comparisons between native and non-native speakers or grouping responses into already existing categories (paradigmatic, syntagmatic, phonological ‘clang’, and analytic), and quantifying them. Thus, the present study aimed to complement the word counts (which language students opt for, how many associations they provide), using Fitzpatrick’s (2006, 2007, 2009) classification of responses to stimulus words besides the existing word association categories. The use of two languages at the same time especially lent itself to a more qualitative and reflexive analysis.

Data on word associations were processed with the help of the software SPSS 17.0 for Windows. In order to distinguish between the two systems of classification, two databases were created: one for differentiating between paradigmatic and syntagmatic responses in all the phases, while the other for
exploring meaning-based and position-based association use in Phases 2 and 3. Descriptive statistics were calculated first (mean, standard deviation, skewness and sums). Following this, since the associations to the words were not normally distributed, Friedman’s ANOVA was applied in order to highlight the differences between the use of paradigmatic and syntagmatic associations for nouns, verbs and adjectives on each of the occasions. Following these, Wilcoxon Signed Rank tests were used to make post-hoc comparisons between conditions, applying Bonferroni corrections. Additionally, the same statistical procedures were used for establishing significance between meaning-based and form-based associations for nouns, verbs and adjectives in the three phases.

4 Summary of the findings

4.1 Depth of word knowledge development

In Phase 1 the participants demonstrated more receptive knowledge of the 21 words selected for the study and had higher scores on the components of part of speech and written form, followed by spoken form and word meaning. There was a significant development of the 21 words over time and both receptive (i.e. written form, spoken form and word meaning) and productive (other word forms, sentence formation and collocation use) deep word knowledge components were found to improve parallel to each other. However, in the present study little progress was measured in the knowledge of part of speech and other meaning senses.
A hierarchical order for the word knowledge types was established with relevance to the present study, hypothesizing that part of speech and the written form are acquired first, followed by the spoken form and word meaning. Productive aspects, such as sentence formation and collocation use were found to develop next, after which the knowledge of other word forms progressed. The figure below illustrates the hierarchy established in the present study.

*Figure 1. Hierarchical order of development of word knowledge types.*
4.2 Changes in the use of associations between Phases 1 and 3

The findings of word association use illustrate important changes in the mental lexicon of these pre-intermediate learners. In Phase 1 of the study the participants relied on their mother tongue and gave more translations for nouns and concrete words than for verbs, adjectives and abstract words. L2 nouns were found to have a significant organizing role in pre-intermediate learners’ bilingual lexica. Over time, with a steady decrease in the use of the mother tongue, the links between L2 words seemed to strengthen and the convergence in association use implied a more standardized L2 network, where nouns, verbs and adjectives all play important roles. In Phase 3, in addition to the commonalities in associating, less frequent words were also provided. This might indicate that, within a more standardized network, there might be individual elements in the mental lexicon as L2 proficiency increases.

5 Conclusion

Based on the tenets of previous studies which highlighted the importance of investigating the role of individual words in the discovery of the mental lexicon (Schmitt, 1998a; Wolter, 2001), the present study was guided by the aspiration to give an insight into the changes that take place in the depth of word knowledge and mental lexicon of the fourteen participants of the research study within the period of sixteen months. To achieve this, the participants in this longitudinal study were given the same target words in English three times.
(September, 2005; May, 2006 and January, 2007), and changes in the depth of their word knowledge as well as their word associations were analysed in order to investigate the types of connections that exist between L1 and L2 words in pre-intermediate learners’ bilingual memory as their language proficiency developed.

Eventually, six research questions were formulated in an attempt to explore the depth of word knowledge development of the twenty-one target words, through examining all the word knowledge types (spoken form, spelling, grammatical and collocational behaviour, other forms, other meanings and sentence formation) with a special emphasis on word associations.

In contrast with the first phase, a strengthening of L2 links in the mental lexicon was apparent in the second phase, which might explain the need for fewer L1 words as the participants’ L2 proficiency developed. Secondly, there was an increase in commonality, pointing to a more standardized English network. With the increase in the number of syntagmatic associations for nouns, the participants were also shown to rely more on other word forms than nouns. As for their depth of word knowledge, significant development could be traced in the receptive aspects of word knowledge, such as word meaning and spelling. However, the most salient progress was made with regard to productive aspects of lexical depth, namely, in the knowledge of other word forms, collocation use as well as sentence formation.

In Phase 3, the tendencies observed in Phase 2 seemed to continue. There was a high number of common associations but at the same time, less frequent words were also elicited, indicating the emergence of idiosyncratic
elements in the participants’ bilingual lexica. Finally, there was a further increase in the use of other word forms than nouns, which show the growing significance of verbs and adjectives in the mental lexicon. Regarding the types of word knowledge, both receptive and productive aspects progressed, primarily spoken form, word meaning, written form and sentence production. This might be an indication that individual words are known receptively and productively to varying degrees and might develop parallel to each other.

In sum, it emerged from this particular project that aspects of deep word knowledge develop continually, there is no threshold between receptive and productive knowledge and effort is needed to stimulate productive use. Although further empirical evidence is needed, I believe that more emphasis should be given to the incremental nature of vocabulary development with a special focus on productive use and how it can be best triggered.

Despite numerous limitations, the findings of this study imply several avenues for further research. Firstly, in order to discover a more precise nature and structure of the mental lexicon, measures for the analysis of association responses are still in need of refinement. Secondly, it would be informative to investigate further changes in the mental lexicon through word associations as well as the depth of individual word knowledge with increasing proficiency, over longer periods of time. As the setting of the present investigation was quite particular and concerned one age group, it would be interesting to compare the results with those of other settings and institutional contexts. Finally, the most evasive and unobservable factor, that is, the actual learning and teaching
processes behind these changes, call for further investigation as they might give an insight into the reasons for the changes in the depth of vocabulary knowledge.

References


