

**Self-Selected Strategies of L2 Learners: Effects on Immediate-
and Delayed Word Retention in Intentional and Incidental
Vocabulary Acquisition, With Eye-Tracking Implementation**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(وَمَا تَوْفِيقِي إِلَّا بِاللَّهِ عَلَيْهِ تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ)

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Abstract

This study establishes the preferences for vocabulary learning strategies (VLSs) in different contexts, by examining two groups of learners of Arabic (one with L1 English and the other with L1 Chinese) as an L2. The first and second experiments were designed to identify the selection and use of VLSs in intentional and incidental modes of vocabulary learning, and to examine the effects of VLSs on immediate and delayed word retention. The third experiment (eye-tracking) explored these strategies in depth, alongside the behaviours utilised for incidental vocabulary acquisition, also assessing the factors influencing VLS use, using the eye tracking technique to aid stimulated verbal recall.

A mixed methods design was used, based on triangulating the findings from quantitative (vocabulary tests and retrospective reporting of strategies) and qualitative (interviews and stimulated recall interviews using eye-tracking) data collection instruments.

The study identified a list of VLSs that were used in both modes, and these were then systematically classified into four vocabulary learning categories. The quantitative data revealed a number of strategies were vulnerable to the significant effects from predictor variables; i.e., group, mode of learning, and test time. The quantitative data also showed a significant relationship between the VLSs used and the uptake of vocabulary type (noun/verb) and subtypes (concrete/abstract noun & action/state verb) in post and delayed post-test tasks. The qualitative data highlighted different ways of implementing VLS, especially with strategies identified in the incidental mode, such as guessing strategies, and repeated reading. The findings showed further interesting variations in the vocabulary gained, confirming that VLSs are conscious and essential in both modes of learning (intentional/incidental). The implications of these findings as they effect learning and teaching in the intentional and incidental context are presented and discussed.

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Author's Declaration

I hereby declare that the work contained in this thesis is my own, except where otherwise referenced, and it is the result of study that has been conducted since the official commencement date of the degree. This work has not, in whole or in part, previously been published and never been submitted for any other degrees for the University of York or otherwise.

1 Introduction

There are many factors that motivate the learning of an additional language, such as scientific interest and knowledge exchange between nations, as well as the appreciation and awareness of other cultures, and the cognitive advantages that language learning may provide (Bialystok, 2009; Ryding, 2013; Sanz, 2012). From an economic perspective, being able to speak another language increases one's chances of finding gainful employment (Graddol, 2006). Many people learn English as a second language, however, other languages, such as Arabic, Mandarin, and Spanish, have increased in popularity in recent years (Graddol, 2006; Ryding, 2013).

Despite the significance and various benefits of learning languages, many adult learners find it a difficult and frustrating experience. One of the major difficulties that L2 learners encounter is the considerable number of words they have to learn, which represents a significant challenge (Barcroft, 2009; Gu & Johnson, 1996; Laufer, Elder, Hill, & Congdon, 2004; Laufer & Hulstijn, 2001; Lawson & Hogben, 1996; Meara, 1988; Nation, 2006; Nation, 2001, 2013; Nemati, 2009; Schmitt, 2008b; Webb, 2013). Another challenge is that teaching and learning practices and policies are continually changing; thus, both teachers and learners must adapt their teaching and learning strategies to respond to these changes (O'Malley & Chamot, 1990; Oxford & Crookall, 1990). Nation (2001) notes that learners need to employ several learning strategies, such as guessing from context, using word cards, using word parts, using mnemonic devices (see subsection 2.4.4 for definition), using keyword techniques, and making use of dictionaries to succeed.

There has been much academic interest in language learners, and how they implement their learning strategies (Fan, 2003; Nemati, 2013). In particular, there is growing interest in the learner-centred approach to language learning which has focused on the significance of

successful ‘independent’ language learners. This interest is based on the common assumption “that language learners who take greater control of their learning will become more successful than those who do not” (Fan, 2003, p. 222). Accordingly, both teachers and researchers have begun to pay attention to the strategies employed by good language learners (Ahmed, 1989; Al-Shuwairekh, 2001; Barcroft, 2009; Cohen, 1998; Gu & Johnson, 1996; Lawson & Hogben, 1996; Oxford & Crookall, 1990; Oxford, 1990; Purpura, 1999; Rubin, 1987; Schmitt, 1997; Vann & Abraham, 1990; Xiang-hong, 2005). For example, McCarthy (2001), has attempted to illuminate the “secret to vocabulary learning”:

“The successful learners are those who develop techniques and disciplines for learning vocabulary: it might just be a question of keeping a notebook, or using a dictionary properly or perhaps disciplining yourself to look over your notes or to read a lot outside of class. The more independent you become as a learner, the better and stronger your vocabulary becomes, I think” (McCarthy, 2001, p.2)

Hedge (2000) observed that many studies have focused on vocabulary learning and teaching in reference to the following three questions: 1) what strategies should learners use to acquire new vocabulary? 2) How is a learner’s mental lexicon organized? 3) Why are some words easier to learn and remember than others? A number of empirical studies have investigated the nature of the relationships between strategy use and vocabulary knowledge (Al Qahtani, 2005; Al-Shuwairekh, 2001; Aljdee, 2008; Barcroft, 2009; Beaton, Gruneberg, & Ellis, 1995; Bisson, van Heuven, Conklin, & Tunney, 2015; Cook & Mayer, 1983; Erten, 1998; Gu & Johnson, 1996; Khoii & Sharififar, 2013; Lawson & Hogben, 1996; Nemati, 2009; Xiang-hong, 2005). One of the most controversial issues in the field of vocabulary learning is how best to identify successful approaches and strategies for teaching and learning vocabulary that result in longer retention and easier retrieval of lexical items (Alemi & Tayebi, 2011). Thus, additional research needs to be carried out to investigate the effects of various strategies for learning vocabularies – both incidental and intentional (see definition of these terms in subsection 3.3.1) – on learners’ acquisition of new vocabulary. The current study aims to

examine the effects of different modes of L2 vocabulary learning (intentional and incidental), as well as the influence of L2 learners' self-selected strategies, on short- and long-term retention of new lexical items.

1.1 Study motivation

Before identifying the motivation behind the study, it is necessary to first clarify the status of vocabulary in language learning. For several reasons, vocabulary forms the building blocks of any language and is the fundamental component of language proficiency, constituting the basis for learners' performance in regard to other language skills, such as reading, listening, speaking, and writing (Nemati, 2013; Ramos & Dario, 2015). In both L1 and L2, vocabulary plays the most significant role in terms of how adept the individual learner is (Nemati, 2013). In addition, "lexical competence is at the heart of communicative competence" (Meara, 1996a, p. 35). Accordingly, there is no meaningful communication, whether written or spoken, without a rich vocabulary (Allothman, 2014). Finally, knowledge of vocabulary is the most important unit in measuring text readability and is regarded as the first predictor of reading comprehension (Laufer, 2003; Nation, 2013; Nemati, 2013). Therefore, one thing that L2 learners, language teachers, and researchers unanimously agree on is that learning vocabulary is a crucial part of mastering a second or foreign language (Schmitt, 2008a). The following widely cited statement by Wilkins (1972, p. 111) indicates the status of vocabulary acquisition in learning another language: "Without grammar, little can be conveyed, without vocabulary, nothing can be conveyed."

In spite of the significance of vocabulary learning, until the 1980s grammar received greater attention over vocabulary in the field of second language research. Scurfield (2003) has pointed out that research on vocabulary learning has flourished since the 1980s, following a long period of neglect. According to Taylor (1990, cited in Alipour, et al., 2015), vocabulary has been an underappreciated area for a long time, yet, as mentioned, it is vital to mastering a

language. However, in the last three decades, researchers have investigated many areas of vocabulary learning, such as ways and methods of teaching vocabulary (Folse, 2004; Nation, 1990; Schmitt, 2008a, 2008b), strategies to acquire lexical items (Barcroft, 2009; Brown & Perry, 1991; Ellis & Beaton, 1993; Green & Oxford, 1995; Gu & Johnson, 1996; Nemati, 2009; Oxford & Crookall, 1990; Schmitt, 1997), word size, word frequency (Coxhead & Nation, 2001; Laufer et al., 2004; Laufer & Ravenhorst-Kalovski, 2010; Nation, 2006), measurement and assessment of vocabulary knowledge (Daller, Milton, & Treffers-Daller, 2007; Milton, 2009; Read, 2007; Schmitt, 2010c), and the effects of and differences between teaching/learning words in context and in isolation (Folse, 2004; Kasahara, 2011; Krashen, 1989; Prince, 1996; Webb, 2008, 2009), amongst other areas. All such studies are related, together seeking to expand existing knowledge of how the vocabulary of another language can best be taught, acquired, and used.

A topic that has stimulated a certain amount of heated debate in this area is whether words should be learnt/taught intentionally or incidentally (reviewed fully in 3.3), that is, asking the question: under which modes of learning can students achieve better retention and retrieval of vocabulary? Many researchers have analysed the vocabulary size levels required for comprehension. For example, Laufer (1989) has recommended that at least 3,000 word families (the words: ‘running’ and ‘ran’ are family members of run), corresponding to about 4800 words, are required for text comprehension (according to Laufer, the figure of comprehending texts is 95%). As for Arabic word estimates, Al-Batal (2006) states that “we can estimate that for a learner of Arabic to reach the advanced level of proficiency, a vocabulary of 3,000–3,500 high frequency words is needed” (p. 333). Psychologists argue that human brains are designed to forget, not to remember (Waring, 2002). Indeed, retaining new words in memory over a long period of time is a significant challenge for L2 learners and their vocabulary teachers. Thus, to understand and ensure effective second language acquisition

(SLA), scholars and learners should consider several questions. For instance, how can learners skilfully manage to learn large amounts of new vocabulary? What level of awareness is required to retain new words, and elicit them in a timely manner? And finally, with regard to learning strategies, which learning mode should be used in second language vocabulary acquisition, monitoring, and retention: *incidental*, or *intentional*? The current study is motivated and designed to investigate these questions by identifying the most frequently used strategies (by two different groups of learners) that may affect the retention of new L2 Arabic words in intentional and incidental L2 vocabulary acquisition.

In intentional learning, various studies have examined the effect of the keyword method strategy (defined in 2.4.4) on vocabulary acquisition; however, very few studies, notably those by Barcroft (2009) and Lawson and Hogben (1996), have examined the effects of other L2 vocabulary learning strategies. Moreover, neither Barcroft (2009) nor Lawson and Hogben (1996) examined the effects of strategies on long-term word retention. Accordingly, Barcroft (2009) suggested that future studies should examine the extent to which the positive relationship between vocabulary proficiency and the use of a variety of strategies (e.g. Ahmed, 1989) is consistent over an extended period.

Alemi and Tayebi (2011) did not find any significant difference between incidental and intentional learning of vocabulary. In their discussion of the limitations of their study, they expressed a belief that some intention must have been involved in the supposed incidental vocabulary and the incidental learning was not entirely incidental. The current study, however, is expected to have clearer outcomes, as it compares the results of two different groups exposed to two methods of learning (intentional and incidental), and involving a larger vocabulary target size. Alemi and Tayebi (2011) targeted only 12 words (see Section 3.5.1.6 for further review).

From the studies conducted on incidental vocabulary learning discussed and reviewed in Sections 3.5.3 and 3.5.4.2, it can clearly be identified that no study has examined the

strategies used by L2 learners in incidental vocabulary acquisition. This is because incidental learning is thought not to involve conscious processes. Hence, to fill this research gap, the general research aim that was addressed in the second and third experimental studies (incidental vocabulary learning, and eye-tracking) was to identify the strategies that L2 learners used to learn newly encountered words during reading, and whether or not these learners' behaviour (i.e. strategies) towards learning those words positively influence the likelihood of their retention.

As an Arabic Second Language (ASL) teacher in the Institute of Teaching Arabic to Non-Arabs (ITANA) (see Section 2.2) in Saudi Arabia, I noticed that advice on vocabulary learning strategies is frequently requested by Arabic learners, since some of the strategies that they have successfully relied upon with European languages (e.g., strategies for learning English) do not produce the same effect or have the same success level for Arabic learning. These learners are often good language learners who find that Arabic vocabulary items do not yield to their ordinary learning strategies. Thus, one of the most useful contributions of this study is providing clear advice on strategies for studying Arabic vocabulary. This becomes even more important in light of the fact that published research addressing Arabic learning strategies is currently limited.

Many studies in the field of applied linguistics and psycholinguistics studies have demonstrated the impact of aspects of other words (e.g., part of speech, concreteness, abstractness) on vocabulary acquisition and retention (for further review see the discussion of dual coding theory in Section 2.4.2). However, very few studies have investigated the impact of different aspects of these words on vocabulary acquisition in the comparison between incidental and intentional learning (e.g., Pellicer-Sánchez & Schmitt, 2010), therefore, this study has investigated these issues not only in immediate post-test, but also in delayed post-test, to examine their effect on word retention over an extended period of time.

Moreover, scholars of dual coding theory (DCT) (reviewed fully in Section 2.4.2) claim that it can account for some of the most operative vocabulary learning strategies. Sadoski (2005, p. 233) emphasizes that “there is considerable theoretical value in such an accounting: knowing *what* works in vocabulary learning is one question, but understanding *why* it works is another. The answers to both these questions provide direction for future progress in this important area.” Thus, based on DCT perspectives, the current study will further examine *what* type of strategies work better for intentional and incidental L2 vocabulary learning, and will attempt to explain *why* some strategies might work better than others, based on different characteristics of words, for example nouns versus verbs, abstract versus concrete nouns, action versus state verbs, and high versus low frequency words. It will do so by extending existing research to the case of L2 Arabic, and by examining not only strategies used in intentional mode, but also those conscious and unconscious strategies used in the incidental mode of vocabulary learning in immediate- and delayed post-tests. The results of this study will add to our understanding of the cognitive strategies and processing across a variety of languages, as there is evidence that the extent to which effective strategy plays a role in lexical representation and access may differ cross-linguistically based on the characteristics and richness of the target language (e.g., Lehtonen, Niska, Wande, Niemi, & Laine, 2006; Schmitt, 1997, 2008a).

1.2 Purpose of the study

In general, the current study seeks to identify VLSs and the strategies most frequently selected for use by L2 learners (e.g., picture association, rote memorization, and cognitive and metacognitive strategies) in intentional and incidental vocabulary learning, and will proceed to explore the effects of these strategies on learners’ short- and long-term word retention. It will then explore in depth those strategies and behaviours utilized for incidental vocabulary acquisition, using the eye tracking technique and stimulated verbal recall.

The key issues to be investigated are as follows:

- The range, type, and frequency of vocabulary learning strategies (VLSs) selected and used by English and Chinese learners of Arabic in intentional and incidental vocabulary learning.
- The effects of the most frequent strategies (MFSs) on word retention in both short- and long-term memory.
- How individual differences (IDs) (e.g. mother tongue, and background knowledge), both between and within groups, can affect the choice of VLS.

To address these issues, this study is designed to determine whether the strategies used by L2 learners can positively affect retention in immediate- and delayed post-tests in intentional and incidental L2 vocabulary acquisition. To answer the research questions, the study will draw comparisons between:

- incidental and intentional vocabulary learning;
- initial uptake of knowledge and retention of knowledge; and
- types of strategies used by English and Chinese intentional and incidental learners of Arabic.

1.3 The importance of the thesis

The debate regarding the best strategies for vocabulary learning is ongoing (Schmitt, 2008b). Thus, through comparative work studying two modes of learning - intentional and incidental - and between two groups - English and Chinese learners of Arabic - this study will provide, supported by empirical evidence, some useful insights regarding the best strategy utilized by L2 learners themselves to acquire and retain vocabulary.

This thesis also aims to ascertain which of the most frequently used strategies lead to greater gains and better word retention over immediate and delayed post-tests, and how far the IDs (e.g. mother tongue, and background knowledge) can affect the selection of appropriate strategies in intentional and incidental vocabulary learning. It further attempts to explore

whether advanced learners learning new L2 Arabic vocabulary via two different modes makes a tangible difference, and if so, to what degree.

The investigation of the cognitive processes/learner behaviours that are considered a significant underlying factor affecting vocabulary acquisition (Sternberg & Sternberg, 2012) increases the significance of the present study in comparison to other incidental learning studies (e.g., Brown, Waring, & Donkaewbua, 2008; Horst, 2005; Hulstijn, Hollander, & Greidanus, 1996; Kweon & Kim, 2008; Pellicer-Sánchez & Schmitt, 2010; Pigada & Schmitt, 2006; Rott, 1999; Vidal, 2011; Waring & Takaki, 2003) that have focused only on the effect of frequency or meanings inferred from context (see Section 3.5.3 for a full review of previous incidental vocabulary learning studies).

Furthermore, through the use of the eye-tracking technique and stimulated verbal recall, this study is, to the best of the researcher's knowledge, the first in the field of applied linguistics and second language acquisition to explore those conscious and unconscious strategies utilized within incidental vocabulary acquisition, providing an indication of the underlying cognitive processes that are potentially provoked during the incidental acquisition of vocabulary through reading.

It is also anticipated that the findings of this study will be useful for both language teachers and learners in outlining an intentional and incidental approach to vocabulary learning and teaching, in order to establish what it is feasible to achieve within a limited period of time.

1.4 Distinction between *second* and *foreign* language learning, and between *acquisition* and *learning*

It is necessary at this point to clarify the distinction between *second* and *foreign* language learning, and between *acquisition* and *learning*. “The difference between learning a second language and learning a foreign language is usually viewed in terms of where the language is learned and the social and communicative functions the language serves there”

(Oxford, 1990, p. 6). The term ‘second language’ (L2) is frequently used to describe the learning of a language that has social and communicative functions within the particular environment, for example, English learners of the Arabic language in Saudi Arabia. Conversely, foreign language (FL) learning normally refers to the learning of a language that is not commonly used in the country in which it is learned, for instance, English learners of the Arabic language in England. The term second language learning will be used throughout this thesis, because the majority of the participants were English and Chinese learners of the Arabic language in Saudi Arabia.

With regard to the terms *acquisition* and *learning*, *learning* can be seen as the conscious acquisition of knowledge of language rules, and does not lead to “conversational fluency” (Oxford, 1990, p. 4). On the other hand, *acquisition* occurs unconsciously and does lead to conversational fluency. Moreover, Krashen (1985) makes the claim that learning cannot be converted into acquisition; in other words, knowledge consciously-acquired through learning cannot affect the subconsciously-acquired knowledge in acquisition. Nevertheless, “the distinction seems too rigid. It is likely that learning and acquisition are not mutually exclusive but are rather parts of potentially integrated range of experience” (Oxford, 1990, p. 4). Both terms (learning and acquisition) are related to the processes of knowledge acquisition, based on the assumption that all learning is, to some extent, cognitively controlled (Takač, 2008). When one considers vocabulary learning, the two processes are particularly difficult to separate, since vocabulary knowledge requires both explicit and implicit learning approaches (Ellis, 2015; Laufer, 1986). Moreover, language learning strategies are related to all parts of the “learning-acquisition continuum”; for example, guessing and memory strategies are similarly useful in both learning and acquisition (Oxford, 1990, pp. 4-5). As such, in this thesis the terms ‘acquisition’ and ‘learning’ will not be considered to represent two different kinds of learning, and will be used synonymously.

1.5 Hypotheses

This study will test the following hypotheses:

- 1) There are many strategies besides the keyword method that can positively affect immediate and delayed retention in intentional and incidental L2 vocabulary learning. For example, picture association, and metacognitive and cognitive strategies (Ahmed, 1989; Al Qahtani, 2005; Barcroft, 2009; de Groot & Van Hell, 2005; Fan, 2003; Green & Oxford, 1995; Gu & Johnson, 1996; Lawson & Hogben, 1996; Nemati, 2009; O'Malley & Chamot, 1990; Oxford, 1990; Schmitt, 2008a; Takač, 2008).
- 2) The results of L2 learners' vocabulary acquisition differ when using intentional versus incidental modes of learning (Ahmad, 2012; Mondria, 2003).
- 3) Some learning strategies will produce a higher target word recall than others (Barcroft, 2009; Lawson & Hogben, 1996; Mondria, 2003).
- 4) There is a positive relationship between the number of strategies that an L2 learner uses whilst intentionally or incidentally studying new vocabulary and his or her vocabulary learning performance (Barcroft, 2009; Lawson & Hogben, 1996).
- 5) Individual differences (IDs) (e.g. mother tongue, and background knowledge), both between and within groups, can affect the selection of appropriate VLSs for intentional and incidental vocabulary learning (Fan, 2003; Khoii & Sharififar, 2013).

1.6 Research questions

The research questions addressed in the intentional and incidental experiments are as follows:

- 1- What strategies do L2 learners use in general and most frequently during intentional and incidental L2 vocabulary acquisition?
- 2- Do the results of L2 learners' immediate and delayed retention differ between intentional and incidental vocabulary acquisition?
- 3- Is there a difference depending on L1 background regarding strategy use and retention?
- 4- Is there a difference between learning words in context and isolation in incidental learning?
- 5- What is the relationship between the number of strategies employed and the uptake of new vocabulary?
- 6- What is the effect of frequency of strategies and uptake of target-words based on type (noun/verb) and subtypes (concrete/abstract noun and action/state verb)?

The research questions addressed in the eye-tracking experiment:

- 1- What strategies (or cognitive processes) do L2 learners use most frequently during incidental L2 vocabulary acquisition?
- 2- Can the duration of L2 learners' eye fixation on novel words during incidental learning predict their retention of these words in an unannounced vocabulary post-test?

1.7 Outline of the thesis:

This thesis consists of seven chapters: Chapter One (the introductory chapter) presented the background, motivations, purpose and the significance of the study, as well as a brief distinction between second and foreign language learning, and between acquisition and learning, followed by hypotheses and research questions of the study.

Chapter Two will explain the context, and provide linguistic descriptions of the Arabic language, including its orthography, morphology, and lexicon, as well as a discussion of the intricacy of Arabic vocabulary knowledge in the first and second sections of the chapter. The

third section of Chapter Two will provide the theoretical background to a number of issues, including the cognitive theory of learning, dual coding theory, memory and language processing, and strategies and depth of processing.

Chapter Three will discuss a number of issues related to the research topic, and will review the existing literature relevant to the present study. The chapter will be divided into four sections; the first will provide an explanation of word knowledge, defining exactly what constitutes a ‘word’, and what ‘word knowledge’ entails. The second section of the chapter will explain the concepts of intentional and incidental vocabulary learning, clarifying their definitions, their relationships to the terms ‘implicit’ and ‘explicit’ learning, and their appearance in L2 vocabulary pedagogy. The third section will address in detail language learning and vocabulary learning strategies, providing their definitions, characteristics, and taxonomies. The fourth section will review a large number of existing publications in the area of second language acquisition that focus on the strategies used in intentional and incidental vocabulary learning. This will be followed by a discussion of studies related to eye-tracking and incidental vocabulary acquisition.

Chapter Four will present the methodology used to guide the three experimental studies conducted for this thesis: intentional, incidental, and eye-tracking. It will first provide an overview of the purpose of each of these studies, and the main research questions addressed in the three experiments. The second section of this chapter will justify the combination of quantitative (vocabulary test and the reports of strategies used) and qualitative (interviews and stimulated recall interviews) research methods adopted, and present the rationale for employing multiple data collection approaches in this study. Next, a discussion of the retrospective reporting and stimulated verbal recall methods will be presented, followed by a clarification of the general procedure of the data analysis, and the ethical considerations. The third section will outline the overall design for the pilot studies, and then describe in detail the pilot studies

undertaken for the intentional and incidental experiments. The fourth section of Chapter Four will present the conclusion and limitations of the two pilot studies, and the fifth section will use the findings of the pilot studies to clarify the methodology for the main study. For the main study, the researcher included the main study design, criteria for selection of the experimental words for all experimental studies, and addressed the subjects, and the procedures for data collection and analysis for the three experiments: intentional, incidental, and eye-tracking.

Chapter five will present the detailed results of the three experimental studies. First, it will present the results of the first two experimental studies, intentional and incidental vocabulary learning, according to the research questions they addressed. It will then present the results of the third study, eye-tracking and incidental vocabulary acquisition.

Chapter six will discuss the results of the data collection analysed in chapter 5. First section will present and discuss the classification of the identified VLSs in all three experimental studies. The Second section will discuss relationship between the number of strategies used and the uptake of vocabulary in post and delayed post-test tasks, and any difference between learner groups. The third section will discuss the relationship between VLSs and acquisition of vocabulary type (noun/verb) and subtype (concrete/abstract noun and action/state verb). The fourth section of Chapter six will discuss the relationship between fixation time and vocabulary gain.

Chapter seven, conclusion and implications, is dedicated to summarizing the outcomes of the current study and their pedagogical implications which could be drawn from this research. It ends with outlining the contribution of the study to knowledge, the limitations of the study and recommendations for further research in the area of VLS and vocabulary knowledge.

2 Context, Arabic as the target language and theoretical background

2.1 Overview

This chapter will be divided into three sections. The first section will provide a brief overview of the Institute of Teaching Arabic to Non-Arabs (ITANA), where this study of vocabulary learning strategies was conducted, including its programmes and textbooks used. Then, Section 2.3 will provide a linguistic description of the Arabic language including its orthography, morphology, and lexicon, and a discussion of the complexity of Arabic vocabulary knowledge. Section 2.4 will present the theoretical background to the study, including the cognitive theory of learning, dual coding theory, memory and language processing, and strategies and depth of processing.

2.2 The Institute of Teaching Arabic to Non-Arabs (ITANA)

The ITANA was initially founded in 1977, with connections to Riyadh's Al-Imam Muhammad Ibn Saud Islamic University's Arabic Language College. The assessment of vocabulary learning made in this research was undertaken at the ITANA. Its present name was adopted in 1981, when the institute became an autonomous educational facility, with the aim of enabling the university's courses on Arabic language and *Shāri'ah* religious principles to be studied by non-Arabic speaking Muslim students, equipping them with sufficient skills for effective communication. One of the objectives of ITANA is to strengthen general knowledge and linguistic understanding of religious sciences and Arabic through training educators. Additionally, ITANA also provides educators with programmes and training initiatives, as well as helping Islamic and Arabic educational facilities shape their pedagogical approaches and syllabi. The Institute is comprised of four departments: The Applied Linguistics Department;

the Arabic Language and Islamic Sciences Department; the Department for the Training of Teachers of Arabic as a Second Language; and, the research unit.

2.2.1 ITANA's textbook resources

The central curriculum is shaped around 37 workbooks in the Teaching Arabic series. Islamic sciences and TASL topics are also included, making for a comprehensive syllabus. The overall objective of the textbook resources includes improving the fluency of writing, reading, and speaking skills, preparing students for higher education, and facilitating students' comprehension of media, as well as giving the students adequate religious education. The morning and evening courses both utilize the Teaching Arabic series, which is composed in Standard Arabic.

2.3 The Arabic language

The Arabic language is classified as a Semitic language. Every Arab state considers Arabic to be its official language. In contrast with English and different Indo-European languages, the structure of Arabic has fundamental distinctions, as it is an inflectional or synthetic language as opposed to an analytic one. Essentially, in English, different individuals must be identified by distinct nouns or pronouns, whereas in Arabic the numerous tenses, derived forms, gender, numbers and persons are specified by suffixes, infixes, and prefixes attached to verbs, while case endings are used to signify the syntactic relationships between nouns.

Literary Arabic (typically known as Modern Standard Arabic) and spoken Arabic are two variations of Arabic language that are commonly utilized, due to the diglossic nature of Arabic (Ferguson, 1968). The differences between literary and spoken Arabic are evident in syntax, semantic, morphology, and phonology (Saiegh-Haddad & Henkin-Roitfarb, 2014). As Saiegh-Haddad (2004) and Asadi, Khateb, and Shany (2017) have explained, learning Arabic,

and particularly developing one's vocabulary, are complicated by such distinctions, specifically in relation to literary Arabic's core components (lexical and sub-lexical).

Given that there are two collections of vocabulary and two kinds of language (literary and spoken) to study, students who are learning Arabic as a second language face challenges due to its diglossic nature. Furthermore, it is common for one subject to have distinct meanings across the various Arabic dialects. Therefore, ITANA teaches only Standard Arabic, as one form of Arabic, as a means of resolving the diglossia issue. The lexicon, morphology, and orthography of Standard Arabic will be outlined in the subsequent sections. More in-depth information about the Arabic language is provided by Ryding (2013) and Holes (1995). The next section will explore the orthography, morphological structure, and lexicon of Arabic, and the intricacies inherent to its vocabulary.

2.3.1 Arabic orthography (script)

The arrangement of particular letters to produce meaningful words is the basis of the Arabic writing system, similar to the English writing system. However, Arabic is written and should be read from right to left, which is distinct from European languages. The Arabic alphabet is comprised of 28 letters – or, if “ء” /*hamzah*/ is included, 29 – all of which are consonants, although three diphthongs or long vowels are represented by ‘ا’- *alif*, ‘و’- *wāw*, and ‘ي’- *yā*. Furthermore, capital letters are not utilized. Arabic uses a cursive orthography, in which the letters are written in different ways depending on whether they occur in isolation, or are attached to the subsequent or previous letter. Some letters will only join to certain others that occur either previously or subsequently. Nevertheless, the letter's fundamental part does not alter. Therefore, Al-Juhani (1990) observed that for speakers for whom Arabic is not their first language, Arabic orthography will pose a significant challenge. Furthermore, some letters have an identical form and are distinguished only by the inclusion or exclusion, or number and location of superscript or subscript dots. Each letter can take one of four shapes: isolated, start,

middle, and end shape. Ultimately, reading proficiency, the rapidity of word identification (Abdelhadi, Ibrahim, & Eviatar, 2011; Khateb, Khateb-Abdelgani, Taha, & Ibrahim, 2014) and adeptness with literacy processes (Ibrahim, Eviatar, & Aharon-Peretz, 2002; Saiegh-Haddad & Henkin-Roitfarb, 2014) can be considerably influenced by fundamental difficulties discerning between letters due to the complexities of Arabic orthography. The isolated, initial, medial, and final positions of each letter in the Arabic alphabet, with their written and spoken forms, are presented in Figure 1 below.

sound	name	name	end	middle	start	isolated
ā	alif	ألف	ا	ا*	ا*	ا
b	bā'	باء	ب	ب	ب	ب
t	tā'	تاء	ت	ت	ت	ت
th	thā'	ثاء	ث	ث	ث	ث
dj	djīm	جيم	ج	ج	ج	ج
H	Hā'	حاء	ح	ح	ح	ح
kh	khā'	خاء	خ	خ	خ	خ
d	dāl	دال	د	د*	د*	د
dh	dhāl	ذال	ذ	ذ*	ذ*	ذ
r	rā'	راء	ر	ر*	ر*	ر
z	zāy	زاي	ز	ز*	ز*	ز
s	sīn	سين	س	س	س	س
sh	shīn	شين	ش	ش	ش	ش
S	Sād	صاد	ص	ص	ص	ص
D	Dād	ضاد	ض	ض	ض	ض
T	Tā'	طاء	ط	ط	ط	ط
Z	Zā'	ظاء	ظ	ظ	ظ	ظ
c	ʿayn	عين	ع	ع	ع	ع
gh	ghayn	غين	غ	غ	غ	غ
f	fā'	فاء	ف	ف	ف	ف
q	qāf	قاف	ق	ق	ق	ق
k	kāf	كاف	ك	ك	ك	ك
l	lām	لام	ل	ل	ل	ل
m	mīm	ميم	م	م	م	م
n	nūn	نون	ن	ن	ن	ن
h	hā'	هاء	ه	ه	ه	ه
w, ū	wāw	واو	و	و*	و*	و
y, ī	yā'	ياء	ي	ي	ي	ي

Figure 1. The sounds and written forms of the Arabic alphabet

The consonants may have diacritics located above or beneath the letter, representing the short vowels. The three short vowels are: فتحة /*fatha*/- with a minor slanted dash (◌◌◌) over

the consonant; *ضمة/dammah/-* with a minor *واو/wāw/* (◌ُ) over the consonant; and *كسرة*
/kasrah/- with a minor slanted dash beneath the consonant (◌ِ). Furthermore, the non-presence
of a vowel is represented by a further sign, known as the *سكون/sukūn/* (◌ْ), which appears over
the consonant, and which will never be present over a word's initial letter. Additionally, a
شدة/shaddah/ (◌ّ) may be present above a single letter, denoting two consonants without a
vowel in between. The term *مضعّف/mudaccaf/* doubled is typically used to refer to these letters
with the *شدة/shaddah/* (Al-Shuwairekh, 2001).

The transparent or vowelized orthography is often initially used to develop children's
reading and vocabulary skills, as studies such as that by Abu-Rabia (2001) have indicated. An
in-depth or dense orthography is subsequently learned in the form of unvowelized Arabic
resource reading, usually starting in the fourth grade. As Abu-Rabia (2001) and Asadi et al.
(2017) explain, under these circumstances the majority of words are homographic, with only
long vowels and consonants utilized, and a lack of phonological data. Foundation to advanced
level Arabic L2 students are also taught in this manner.

Short vowels and root consonants are typically the only aspects of the Arabic word
indicated in the majority of instances. Three or four consonants typically make up the root
consonants, and in fewer instances, two or five. Particular pronunciations and meanings may
be indicated through the root having specific short vowels or intricate affixes - phono-
morphological data - attached. Moreover, the specific grammatical purpose of the words in a
phrase is revealed by the final letter's vowelization. However, if vowelization is not present
learners will face the mentally rigorous challenge of determining the short vowels while
reading. Therefore, as Abu-Rabia (2002) explained, in the absence of short vowel symbols (as
is common in the majority of printed and contemporary Arabic literature) the learner will have

to rely on information including preliminary contact with texts, grammar such as syntax and morphology, or established linguistic understanding.

Double vowel symbols are used if an indefinite noun and adjective ending is utilized, whereby a final ‘n’ sound - referred to as a تنوين/*tanwin*/ ‘nunation’ - is to be sounded. A noun prefix may be added in the form of ال/*al*/ ‘the’, if the word is definite. Indefinite nouns might be indicated using تنوين/*tanwin*/, despite Arabic not having an indefinite article.

Spelling in Arabic is regular in the sense that words are spelt as they are pronounced (Al-Shuwairekh, 2001). Nevertheless, Arabic spelling still presents some challenges for students of Arabic. For example, Al-Juhani (1990) explained how problems discerning long and short vowel sounds is the main challenge students encounter in relation to spelling, rather than irregularities related to sound-sign relationship, as is the case with English spelling. Furthermore, in certain words there are some redundant letters that are written but not pronounced, while some words contain letters that are pronounced but should not be written. Thus, as Al-Juhani (1990) emphasized, Arabic writing poses numerous significant challenges.

2.3.2 Arabic morphology

Three radicals (i.e., root part of a word) or consonants usually comprise the roots of Arabic words, roots which are used to construct or assess in more depth the overwhelming volume of Arabic vocabulary, and are its defining aspects. These three radical word roots are predominant in the Arabic language, although there is a substantial amount of two, four, and five radical word roots. By using these roots as a base and by varying the vowelizing of the simple root and adding prefixes, infixes, and suffixes, according to certain patterns, the actual words are produced (Abu–Rabia, 2002; Al-Shuwairekh, 2001). One example of this is the root سَلَّمَ/*SLM*/ - ‘to be safe’, from which the following can be produced: سَلِّمَ/*sallama*/ - to give the greeting Salam (peace be upon you) or ‘to deliver’; اسْلَمَ/*aslama*/ - submission, or conversion

to Islam; استلم/*istalama*/ - receive; استسلم/*istaslama*/ - surrender; سلام/*salām*/ - peace; and مسلم/*muslim*/ - a Muslim.

Consequently, the morphology of Arabic has a deep and vibrant character. Indeed, Taha and Saiegh-Haddad (2016) are examples of researchers who have suggested that a fundamental aspect of orthographic understanding concerns Arabic's morphological components. Furthermore, Boudelaa and Marslen-Wilson (2011, 2013, 2015) have suggested that the process of perceiving and identifying words is considerably influenced by morphology, in that the Arabic morphology is one of the organisational principles of the mental lexicon. Indeed, Saiegh-Haddad (2004) and Saiegh-Haddad and Henkin-Roitfarb (2014) proposed that words in Arabic are produced from a combination of roots representing the meaning of the word and patterns that determine their lexical and syntactical categories. Asadi et al. (2017) noted that the derivative procedures and patterns of the roots, as well as the inflectional procedures, shape most Arabic words. Therefore, expanding one's Arabic vocabulary may be significantly facilitated by mastering an understanding of the roots.

There are three parts to Arabic speech: verbs, nouns, and particles. These will be explored in detail below.

2.3.2.1 Verbs

The Arabic and English language have equivalent perceptions of verbs. Imperfect and perfect are the sole tenses for Arabic verbs, although because time is not the basis of the difference between these verbs, they are not strictly tenses. The 'tense' rather indicates whether an activity has finished or not. Thus, regardless of time, an unaccomplished activity is indicated by the imperfect tense, while an accomplished activity is indicated by the perfect. The future or present tense in English are typically synonymous with the Arabic imperfect tense, while the past tense in English is typically synonymous with the Arabic perfect (Al-Shuwairekh, 2001). Every root in Arabic has the potentiality of being expanded, the methodical attachment

of one or a number of affixes, into many other derived forms. Each of these derived forms bears a specific semantic relationship to the simple verb (Abu–Rabia, 2002)

In theory, various amendments to the form of every Arabic verb can occur. Denotation of an activity being completed, increasing intensity, intransitivity, transitivity, passivity, and other meanings can be indicated by such amendments, with certain amendments more pervasively utilized. Infixation, prefixation, lengthening of vowels, introducing two root consonants (emanation), and a combination of these actions, may be used to produce derived forms. The case and tense of a verb can both be revealed by the suffixes and prefixes utilized. Furthermore, the amount, gender, and person, as the subject of the verb, may be indicated by different suffixes and prefixes. The pronouns of the initial and subsequent objects - amount, gender, and person - are shown through suffixes (Khateb et al., 2014).

2.3.2.2 Nouns

Proper nouns, pronouns, adverbs, and adjectives are all considered to be nouns in Arabic. Nevertheless, root derivatives are myriad and characterize nouns in a similar manner to Arabic verbs. One example is the root كَتَب /KTB/ or ‘wrote’, which can be used to produce the following nouns: كاتب/*kātib*/, writer; مكتوب/*maktūb*/, a written object; كتابة/*kitābah*/, writing; كتاب /*kitāb*/, book; مكتب/*maktab*/, office; and مكتبة/*maktabah* / library.

Regarding adjectives, these are perceived as explanatory nouns, and are not considered a separate part of speech. The noun that is being explained by the adjective must be in accord, while the noun always precedes the adjective. Al-Shuwairekh (2001) explains that in relation to adverbs, adopting the accusative case adjective that accords with the adverb is a typical means of rendering the adverb.

There are two kinds of Arabic nouns: deverbal and denominative nouns. The former variety are comprised of verb derivatives, while various different nouns are used to produce the latter kind. Two patterns of denominative nouns can be further distinguished: primary and

derivative nouns. Examples such as يَدّ /*yadd*/, hand, and دَمّ /*damm*/, blood, are indicative of the three-root nature of most primary patterns. A small number of Arabic nouns, for example فندق /*funduq*/, hotel, have fewer or more than three roots. Through attaching external phonemes to the basic root, or where the basic vowel or consonants are influenced by internal alterations, the derivative patterns can be produced. These phonemes are usually defined as حروف الزيادة 'letters of addition', and consist of (س، ا، هـ، ي، ن، و، م، ت، ل، ء). Examples of deverbal nouns include nouns of instance and form, instrument and time, location, participles, and verbal nouns. Like verbs, a deverbal noun is formed by adding prefixes and suffixes to the stem (Ibrahim et al., 2002; Saiegh-Haddad & Henkin-Roitfarb, 2014).

Number

Singular, dual, and plural are the three types of Arabic numbers. Al-Shuwairekh (2001) explains that there are two forms of plural, the irregular or broken plural, and the sound or regular plural. The former can be created through over 30 patterns of suffixes, infixes, and prefixes, or an internal vowel alteration may occur. Thus, أولاد /*awlād*/, boys, is the plural of ولد /*walad*/, boy. The sound or regular plural is produced through the singular having suffixes attached to it. The attachment of suffixes is also the process for the dual, as in the case of sound plurals.

Gender

There is no neutral gender in Arabic, with each noun being masculine or feminine. The most common way of making the feminine form of a word is to add the suffix (ة) to the masculine form. Nevertheless, as Ryding (2013) notes, there are exceptions, as some particular feminine suffixes can be attached to masculine nouns, for example خليفة /*khalīfah*/, caliph, while gender indications for feminine nouns, such as شمس /*shams*/, sun, may be omitted.

Pronouns

Pronouns consist of interrogative, relative, demonstrative, and personal pronouns, in addition to the compound pronoun. Personal pronouns can be 'bound' or 'free'. Al-Shuwairekh (2001) and Ryding (2013) explain that due to the specific case of each pronoun, and the gender or amount indicated, numerous forms are apparent, which makes for a rather complex relative pronoun system in Arabic. Demonstrative pronouns agree with the gender and number of the object referred to.

2.3.2.3 Particles

The particle is a word that does not convey any complete meaning until another word is added to it. Thus, genuine patterns or roots do not contain any particle. Interjections, prepositions and conjunctions are types of particles. Particles are usually referred to as 'letters' by Arabic linguists, and depending on the utilisation of a particle, or letter, they may be distinguished into three sets, which, according to Al-Juhani (1990), are adopted for nouns, verbs, and verbs and nouns, respectively.

2.3.3 Arabic lexicon

The majority of Arabic dictionaries are arranged according to the roots of verbs and nouns that are present, and the patterns of derivation from these roots. A considerable amount of lexical items spread across an array of eras and subjects comprise the traditional Arabic lexicon. Consequently, Standard Arabic has a rich and vibrant lexicon. This richness is, as Ferguson (1968, cited in Al-Shuwairekh, 2001) points out, the result of the long continued use of Classical Arabic and its continual enrichment through the borrowing of dialect and the coining of new terms. Nevertheless, many of the tremendous amount of Standard Arabic words are rarely used.

As an example, the Holy Quran incorporates various words adopted from other languages, with Semitic and Indo-European languages often being the main sources from which Arabic has adopted words throughout its long usage. In the contemporary context, when

cultures speaking Arabic have met other cultures, various pieces of terminology have been adopted by speakers of local Arabic dialects. Nevertheless, in Arabic writing the utilization of foreign terminology has been rejected in many of the intellectual arenas in the Arab sphere. However, across numerous subject areas, Arabic has had to adopt some technical terminology from other languages. Several methods have been adopted for this, including: expanding a current Arabic word semantically; adapting foreign terms; expanding a current root analogically; phonological as well as morphological incorporation of a foreign term; and integrating a foreign word (Al-Shuwairkh, 2001).

It is widely acknowledged that Arabic is extremely rich in synonyms, as Asadi et al. (2017) emphasized, and ideas and items may have myriad terms used to refer to them. Nevertheless, there can be particularly nuanced distinctions between the synonyms, resulting in their not being entirely equivalent. Al-Shuwairkh (2001) argued that these almost, but not identical synonyms can present great challenges for L2 learners.

Having discussed the Arabic orthography, morphology, and lexicon, the following section will discuss the complexity of Arabic vocabulary knowledge.

2.3.4 The complexity of Arabic vocabulary knowledge

The multifarious aspects of overarching word knowledge will be comprehensively assessed in Section 3.2. The present section will explore understanding of Arabic words in relation to particular dynamics, whereby the acquisition of knowledge regarding lexical objects in Arabic is dependent on word pattern and root form understanding. Abu-Rabia (2002) explains that three- and in some instances four-radical consonants comprise the root of almost every Arabic word, which in theory they may be reduced back to. Moreover, almost innumerable comparable word patterns may be explained by words root. For instance, where a word pattern is adopted to signify an undertaker of an activity, one can consider the words NāSiH, ‘advisor’, which clearly follows on from نصح/NSH/, advice, to be related in the same

way that كتب /KTB/, writing, and kāTiB, writer, are related. To guarantee that the Arabic lexicon would be utilized proficiently, identifying what pattern the root has been subjected to and using the pattern to deduce the root, are key. This is because Arabic dictionaries are ordered by word trends and patterns rather than terms being listed alphabetically; thus, KTB will incorporate the entry for KāTiB and other derivations. Moreover, Al-Shuwairekh (2001) explains how verbal roots may not be found for a significant amount of particles or nouns, yet the dictionary will be ordered as if such roots are apparent.

Developing an understanding of Arabic words and acquiring a strong vocabulary are significantly affected by knowledge of morphology, given that strong regimentation of morphology is apparent in the language. Thus, as Ryding (2013) and Asadi et al. (2017) explain, acquiring knowledge of the Arabic lexicon is fundamentally affected by understanding the association between various prepositions, nouns, verb forms, and pronouns, in addition to the attachment of relevant affixes to produce the imperative or present form verb from its past tense. Therefore, according to Boudelaa and Marslen-Wilson (2013) and Gor and Jackson (2013), greater effectiveness of guessing from context when learning vocabulary can result from an awareness of an array of morphological patterns.

Furthermore, it is crucial that individuals who are utilising Arabic lexical items can identify the variations in written and spoken forms of words, in recognition of the diglossic character of Arabic. Younes (1995) explains that mistakes of a sociolinguistic nature may continually occur while utilizing vocabulary, if learners do not understand that certain words should be used only in informal discourse and others for formal writing.

Moreover, to identify Arabic words in the context of reading, a key capability is the use of context to identify the short vowels and thus speak the consonants, as contemporary Arabic writing frequently omits the short vowel symbols, and bearing in mind that the meanings of certain words are derived essentially from the short vowels. In contrast to Arabic words, words

in printed English are read identically by both beginners and proficiency level readers. Vowels are part of the alphabet and are represented by specific letters (Abu-Rabia, 2001). Fundamentally, Arabic varies from English, in that skilled English readers rely on their ability to decode every word, and do not need to rely on the context to facilitate word recognition (Abu-Rabia, 1997, 2001). Therefore, at the most preliminary stage of learning feasible, those for whom Arabic is not their native language should attempt to acquire this capability. Nevertheless, as Al-Juhani (1990) emphasized, this aspect of learning Arabic lexical items is found to be one of the major difficulties faced by students when reading an Arabic text.

Consequently, awareness of an Arabic word signifies that: the root and pattern of the word are comprehended; the context can be utilised to determine the short vowels; the written and spoken terms can be distinguished; and, the morphological principles of the word are understood to produce various forms. The different aspects of understanding Arabic vocabulary depend on these dynamics, in addition to those already outlined in Section 3.2 of Chapter 3.

Gu (1994) has suggested that it is unrealistic to expect that understanding every aspect of vocabulary knowledge will be possible for all students of a second language. As Laufer (1997) and Nation (2001, 2013) explain, certain word characteristics will not be known by students, whereas others will. Furthermore, Nation (2001, 2013) emphasized that the majority of students of second languages – and even individuals speaking it as their first language – may possess only an incomplete understanding of the full connotations of words, with varied comprehension of vocabulary objects typically apparent. Additionally, Fernald and Marchman (2012) observed that regardless of the use of an equivalent learning strategy or text resources, there may be a significant variation in students' vocabulary comprehension.

The two aspects of vocabulary knowledge are active or productive understanding, and passive or receptive understanding. Webb (2009) explains that productive vocabulary concerns the lexical objects that a student is able to suitably and properly utilise in their writing or

speech, whereas receptive vocabulary concerns the listening or reading situation and the objects that are identified and comprehended. Nevertheless, Melka (1997) argued that definite parameters cannot be identified for productive and receptive vocabulary. Moreover, Laufer et al. (2004) have suggested that there has been a lack of investigation regarding L2 students' passive and active vocabulary, as well as the relationship between the two. Compounding the issue is that Arabic students have to contend with two categories of terms, again as a result of the diglossic nature of the language, giving it greater complexity than English. This means that, productively, Arabic second language (ASL) learners have to master the ability to use two types of vocabulary items: one for speaking (in informal conversations), and the other for writing or for formal conversations. Receptively, ASL learners also have to recognize and understand two kinds of lexical items: one for listening (informal forms), and the other for reading (formal forms) (Al-Shuwairkh, 2001).

Because both active and passive vocabulary knowledge can be acquired through varied types of learning strategies, the relevance of such strategies to strengthening this kind of knowledge is clear. Therefore, as Nattinger (1988) explained, understanding of productive vocabulary may be facilitated through metacognitive and cognitive strategies, which necessitate practice, whereas Yang (2017) has suggested that understanding of receptive vocabulary could be acquired through particular approaches, such as guessing meanings. Moreover, passive or receptive knowledge might require fewer strategies and less time than active or productive vocabulary acquisition (Cohen, 2014; Takač, 2008; Yang, 2017).

English and Chinese (L1s) learners of Arabic as a second language (ASL) were selected in the current study for three main reasons: first, they are currently two of the largest groups studying Arabic in the Kingdom of Saudi Arabia; secondly, both languages are radically different from Arabic, and from each other, in terms of orthographic script; and thirdly, the two groups are culturally dissimilar.

A plethora of questionnaire research outcomes reveal that cultural background affects second language learning strategies and use (e.g. Bedell & Oxford, 1996; Harshbarger et al., 1986; Levine et al., 1996; Reid, 1995). Few studies, however, have explicitly focussed on how L2 vocabulary and reading strategies interact with L1 and cultural background to impact test performance. Abbott (2006) indicates that studies examining reading comprehension tests, particularly in the context of ESL (Hill & Parry, 1989, 1992; Purpura, 1997), reveal that learners often focus on low-level linguistic cues, which usually reflect bottom-up as opposed to top-down reading strategies. Abbott (2006) states, “Bottom-up reading comprehension strategies are data-driven, detail-oriented strategies, whereas top-down strategies are conceptually driven, big-picture oriented strategies” (p.635 cited Carrell, 1983).

Cross-linguistic studies suggest language-specific differences correlate with differences in cognitive processing skills and reading strategies (Abbott, 2006; Akamatsu, 2003; Chen, 1992; Fender, 2003; Koda, 1988). Fender (2003), for example, in his cross-linguistic study of ESL reading skills, found Arab ESL learners were more accurate when comprehending and integrating words into longer phrases and sentence units than Japanese learners. Japanese (kanji), like Chinese (Mandarin), is formed by strings of lexical morphemes, called characters, which typically encode language and parallel words and affixes in alphabetic languages (Abbott, 2006; Chen, 1992). Each character occupies a constant, square-shaped area, and is separated from other characters by a space in the text (Chen, 1992).

According to Abu-Rabia (1997), “Arabic is perhaps the only language in the world in which readers must first understand the sentence in order to recognize the word” (p. 480). As vowels are not normally represented in Arabic orthography, Arab readers might consequently be less dependent on cues when reading (Abbott, 2006). Furthermore, this could explain why the Arabic ESL learners in Fender’s (2003) study were more successful integrators than the

Japanese ESL learners; efficiently transferring their well-developed L1 (Arabic) reading methods to L2 reading tasks by relying on higher level contextual cues and strategies.

Chen (1992, p. 176) summarizes the main orthographic and linguistic features of the Chinese language, highlighting differences compared to Indo-European languages with alphabetic systems, according to the following points: (a) characters represent lexical morphemes, and they vary in complexity of construction; (b) character boundaries, but not word boundaries, are indicated by spaces; (c) Chinese words can be formed by one or more characters; (d) Chinese words generally have no inherently marked lexical categories nor inflectional markings to indicate the number, gender, and case for nouns, or the tense and aspect for verbs (Li & Thompson, 1981); and (5) context plays a crucial role in reading and comprehension in Chinese. In regard to the latter feature, Chinese is similar to Arabic which, as previously discussed, is highly context-dependent, even for skilled readers. Based on these Chinese linguistic features, Chen states that a Chinese reader needs to depend more heavily on context than a reader of an alphabetic language (e.g. English). This is the result of four major reasons: (1) the meanings of basic characters are generally not very specific and instead are highly variable; (2) Chinese words are not very well defined, lacking clearly marked boundaries; (3) Chinese words do not usually contain clearly marked syntactic information; and (4) sentence structure and other syntactic devices are not reliable sources of precise and constant grammar information. Consequently, one might predict that Chinese ASL learners, based on their L1 background, would have more diffuse vocabulary/reading strategy, perhaps reliant on context. For example, when learners are exposed to new words through reading, incidental vocabulary learning results in learners paying little attention to individual sentence units or words. In contrast, English ASL learners (as readers of alphabetic language) might have a more focussed strategy, such as paying substantial attention to the specific phonologic, morphologic, syntactic, and the semantic content of each word.

Reading in English requires a greater dependence on: (a) phonological skills for decoding lexical items with regular grapheme-phoneme correspondences; and (b) orthographic processing skills for decoding words with grapheme-phoneme irregularities (e.g. business, cough, iron) (Katz & Frost, 1992). Hence, it is likely that the English and Chinese ASL learners' primary L1 processing skills and strategies that have been developed through exposure to distinct languages and literacy practices will influence the development of their ASL processing skills and vocabulary learning strategies differentially.

The next sections will present the theoretical background of the study, including cognitive theory of learning, dual coding theory, memory and language processing, and strategies and depth of processing.

2.4 Theoretical background

This section will focus on the theoretical background to language learning strategies. It will discuss the role of language learning strategies in cognitive theory, as well as provide information about how knowledge is encoded, processed, and retrieved in short- and long-term memory.

2.4.1 Cognitive theory of learning

The cognitive theory of learning is considered a part of cognitive psychology, and refers to “the study of how people perceive, learn, remember, and think about information. A cognitive psychologist might study how people perceive various shapes, why they remember some facts but forget others, or how they learn language” (Sternberg & Sternberg, 2012, p. 4).

The cognitive theory of learning is based on the theory of human information processing, which emphasizes internal mental processes in learning (McLaughlin, Rossman, & McLeod, 1983). There are two fundamental ideologies underlying this theory: 1) that the best way of explaining behaviour is by referring to how individuals perceive and illustrate their

experiences; and 2) that the way in which individuals process and think of knowledge is similar to the manner in which computers process information (Shuell, 1986, cited in O'Malley & Chamot, 1990). Cognitive theory suggests that languages are learned and processed in the same way as other kinds of learning, although it views second language acquisition as a complex cognitive skill (Ellis, R. 1994). One benefit of viewing second language acquisition as a complex activity is that it implies the possibility of improving language learning capability (O'Malley & Chamot, 1990, cited in Takač, 2008). Cognitive theory does not distinguish between linguistic knowledge and its use; thus, researchers have endeavoured to explain the way in which language knowledge is stored in memory, and how the process of second language acquisition leads to the ability to use it fluently in comprehension and production (O'Malley & Chamot, 1990; Ortega, 2009).

Wittrock (1979, cited in Aljdee, 2008) stressed two main principles of cognitive psychology: individual responsibility and constructed meaning. The first specifies a shift in the responsibility for learning from the teacher to the learner; the latter identifies the mental processes that occur within the brain during learning process. Subsequently, the attention of researchers has shifted from teacher-centred to more learner-centred approaches in which learners are regarded as active processors (Aljdee, 2008). Based on the assumption that individuals are able to build their own strategies for learning different kinds of knowledge in different ways, psychologists and researchers are attempting to discover how individual learners approach learning (Robinson, 2001; Takač, 2008). This indicates that there are *individual differences* amongst learners in the way that they acquire a second language (Robinson, 2001; Takač, 2008; Williams & Burden, 2004). Individual differences are considered to be an influential factor in language learning, and are measured as such. Many variables come under the category of individual differences; these are classified differently by researchers, and encompass language aptitude, motivation, beliefs, age, cognitive style, and

learning strategies (Ellis, R. 1994; Robinson, 2001). Ellis, R. (1994) for example, differentiates between three sets of variables. The first includes beliefs about language learning, affective states (e.g. L2 anxiety, presence of self-confidence), and general factors (language aptitude, motivation, learning style). The second set consists of various strategies that the learner uses in their L2 learning, and the third involves language learning outcomes such as proficiency, achievement, and rate of acquisition. All variables, according to Ellis, R. (1994), interact and influence each other in complex ways.

Unlike linguistic theories of L2 acquisition, cognitive theory sees language learning strategies as one of the central cognitive processes in second language acquisition. Accordingly, L2 acquisition is defined as a mental process that includes the use of strategies that clarify how the L2 knowledge system is developed and used in communication (Ellis, R. 1994). Hence, L2 learners – according to the cognitive approach – are active participants in the learning process, using various mental strategies to organize and monitor their learning (Takač, 2008; Williams & Burden, 2004).

Many cognitivists and researchers assert that the language learning strategies used by L2 learners in fulfilling the requirements of language learning tasks are, to a certain degree, responsible for successful language acquisition. In addition, they also contribute to the development of a general language learning capability (Barcroft, 2009; O'Malley & Chamot, 1990; Takač, 2008). The current study investigates whether the various vocabulary learning strategies selected by L2 learners themselves may create different lexical acquisition patterns in individuals acquiring the same L2 (i.e., English and Chinese learners of Arabic).

This section has identified how the cognitive theory of learning views the acquisition of a second language, and the role of language learning strategies in this theory. The next section will discuss Dual Coding Theory (DCT) as a more specific and relevant theory to the current study.

2.4.2 Dual Coding Theory and vocabulary learning

Dual Coding Theory (DCT) was developed as a contrast to single-code cognitive theories, according to which thinking occurs in the form of internal language alone or stimulation of more abstract mental representations variously called propositions, semantic representations, computational descriptions, and so on (Jared, Pei Yun Poh, & Paivio, 2013). Instead, DCT states that all cognition involves the activation and use of two ‘modality-specific systems’, a verbal system dedicated to representing and processing language in all its forms, including speech and writing, and a nonverbal (imagery) system dedicated to comprehending non-linguistic objects and events. Mental imagery is the principal cognitive form of nonverbal representation (Jared et al., 2013; Paivio, 2006; Sadoski, 2005). According to Sadoski (2005) all knowledge, including knowledge of vocabulary items and their meanings, and memory are comprehended by representation and processing within and between the two codes (verbal and nonverbal cognition) proposed by this theory.

DCT assumes that cognition is composed of internal representational units, called *imagens* and *logogens*, that are triggered when one recognizes, manipulates, or even thinks about words or things (Paivio, 2006). The two systems (i.e., *imagens* and *logogens*) are functionally independent but partly unified so that they can be used and activated separately or together, depending on the demands of the task (Jared et al., 2013; Paivio, 2006). The *imagens* system can increase conscious imagery and can be activated unconsciously to facilitate performance in recognition, memory, language, and other tasks. The *imagens* have varied sensorimotor modalities and dimensions; there are visual, auditory, tactile, and motor *imagens* that are equivalent to objects and their attributes (Jared et al., 2013).

The focus on memory remains a crucial feature of DCT research, since memory is the basis of all knowledge and thought (Paivio, 2006). The significance of DCT and its applications lies in the valuable effects of concreteness and imagery on memory (Jared et al., 2013). In the

case of learning words, lexical items can be described as verbal labels for concepts (Sadoski, 2005). Thoughts and concepts that signify concrete things, actions, and observable qualities are comparatively easy to develop by learners. By contrast, thoughts that signify abstract things, actions, qualities, or relations require greater ability to develop (Ellis & Monaghan, 2002; Sadoski, 2005). Thus, a significant distinction made in DCT is the difference between concrete and abstract language, whereby concrete language has direct sensory referents (e.g., *tree*), whereas abstract language has less contact to nonverbal imagery (e.g., *true*) (Sadoski, 2005). Abstract language depends upon a network of verbal associations for its meaning; for instance, the abstract word *true* is mostly defined by other language units, such as *factual*, *not false*, *real*, *faithful*, and, *exact*. On the other hand, in addition to its ability to evoke a network of language, concrete language also evokes nonverbal images as a form of meaning. Take, for example, the concrete word *tree*, which might include *trunk*, *roots*, *branches*, and *leaves* in a web of verbal associations. Additionally, the word also recalls referent images of various kinds of trees, depending on the reader's own experience (Paivio, 2006; Sadoski, 2005). Thus, concrete language "enjoys a natural advantage over abstract language because it can be more readily represented and processed in two codes (i.e., dual coding)" (Sadoski, 2005, p. 223).

Educators and neuropsychologists (e.g., Jared et al., 2013; Lwin, Morrin, & Krishna, 2010; Paivio, 2006; Sadoski, 2005) have drawn a comparison between the DCT view of concepts and vocabulary and schema theory, or other theories that adopt a single, "deep structure" code. In schema theory, 'schemata' are identified as mental data structures for representing generic concepts stored in memory (Melendez & Pritchard, 1985). Concepts in schema theory consist of abstract and generic data composed of relations between a set of variables that cover many specific examples of a concept (more explanation about schema theory is provided in the following section 2.4.3). Hence, schema theory does not distinguish between abstract concepts and concrete concepts; a familiar abstract word, such as *justice*, is

theoretically recognized in the same way as a familiar concrete word, such *tree*, where both represent an underlying schemata, “a single abstract code” (Sadoski, 2005, p. 223). As such, the single-code theories cannot easily confirm the consistent finding that concrete words are acquired and recalled more easily than abstract words (for reviews see Paivio, 1990, 1991, 2013; Sadoski & Paivio, 2004, 2013).

In DCT, written and spoken words are encoded separately via sense modality (i.e., visual encodings for written language, auditory-motor encodings for spoken words) (Sadoski, 2005; Sadoski & Paivio, 2013). The process of naming words involves associating written word forms that are processed visually with corresponding auditory-motor word forms. These associations lead to phonemic decoding undertaken within the verbal coding in DCT (Sadoski, 2005).

Nonetheless, the meanings and even pronunciations of words are determined by their surrounding context, which is fundamentally dependent on connecting to a range of other verbal and nonverbal representations in DCT (Sadoski & Paivio, 2013). For instance, the word *ring* has a grapho-phonemically regular correspondence that is easily phonemically decoded, but its exact meaning is determined by the verbal context (e.g., *wedding ring*, *boxing ring*, *burglary ring*, *telephone ring*). Additionally, the exact meaning of any word is also dependent on nonverbal world knowledge (Sadoski, 2005). Hence, “word recoding may be a primarily verbal matter in most cases, but word meaning is both verbal and nonverbal, especially in the case of concrete language” (Sadoski, 2005, p. 224).

DCT does make provision for developing and individual differences between learners. For instance, L1 and L2 pupils vary in their reading skills and in their dependence on verbal or imaginal thinking (Paivio, 2013). Evidence for this can be found in their different results for verbal ability measures, including vocabulary tests, tests of spatial and imaginal abilities, and hemispheric preference measures (Brysbaert & Nazir, 2005; Carroll, 1993; Nagy et al., 2000;

Sadoski & Paivio, 2013; Strain & Herdman, 1999). More recently, brain imaging studies have confirmed that verbal and visual information tends to be processed in different areas of the brain (Childers & Jiang, 2008). Neuropsychologists have shown that the left hemisphere of the brain specializes in verbal tasks, whereas the right hemisphere is responsible for completing imaginal tasks (e.g., Gazzaniga, 2000; Paivio, 1990). Thus, thinkers with a left hemispheric preference might be motivated to use more verbal language in thought, whereas right hemispheric preference thinkers may tend to use more mental imagery (Sadoski, 2005). These differences may have an influence on vocabulary acquisition and the selection of appropriate learning strategies in intentional and incidental learning modes.

Reviews of picture impact studies demonstrate that the question around optimal use of pictures in vocabulary learning is still unanswered (e.g., Ceprano, 1987; Filippatou & Pumfrey, 1996; Sadoski & Paivio, 2013). The following paragraphs will review some related key research in the area of vocabulary from a DCT perspective.

Two primary sources of meaningful vocabulary acquisition have been identified: intentional (direct vocabulary instruction), and incidental vocabulary learning from context. The current study will focus on both approaches and modes of learning. Regarding intentional vocabulary learning, word derivation and etymology might serve a useful role in this mode of learning (see Foote, 2017, for a review). Broudy (1988) observed that a loss in general literacy occurs as the potential for imagery declines through a lack of comprehension of the root meanings of words. Broudy (1988, p.316) further claimed that the rich stores of imagery that supply English vocabulary form an “allusionary base”, and Sadoski (2005) states that most abstract concepts have a concrete allusionary base. Lakoff and Johnson (1999, 2003) also supported this view, maintaining that all conceptual knowledge is fundamentally concrete and that abstract concepts are mostly ‘metaphorical’. A clear example of this notion was provided by Sadoski (2005) when referring to the word *true*, which “derives from the word for *tree*, an

allusion to being as firmly rooted as a tree—the *tr* in *true* and the *tr* in *tree* share the same morpheme” (p. 229). Therefore, it may seem difficult to find a word where the roots are not concrete, and, to a degree, all language might thus be considered ‘metaphorical’ (Sadoski, 2005). In the same vein, Sadoski and Paivio (2013) have pointed out that the wide-ranging possibilities for investigating words’ etymologies and the concrete historical origins of lexical items would seem to offer much potential for meaningful vocabulary growth.

One of the principles of DCT is using imagery in the teaching and learning of meaningful vocabulary in experimental studies (Sadoski & Paivio, 2013). Smith, Stahl, and Neil (1987) applied nonverbal (pictorial) and verbal context in meaningful vocabulary learning. They recruited 142 undergraduate students to learn 50 unknown English words, consisting of nouns and other word classes. The researchers investigated whether providing (1) an image representing the definition of the word could help promote more effective learning than (2) simply providing the definition only, or (3) providing the definition and a sentence using the term. The results of the immediate post-test showed no significant differences between the three treatment groups, and all three treatments resulted in high scores. However, a two-week delayed test indicated that the group that had received definition-plus-sentence-plus-visual image performed significantly better than the group receiving only the definition. The researchers concluded that their findings were supportive of DCT in vocabulary instruction.

Two later studies conducted by Smith, Miller, Grossman, and Valeri-Gold (1994) confirmed and extended the above findings. The researchers recruited 166 undergraduates, who were divided into two groups based on a test of hemispheric preference (left/right brain thinkers). Learners were provided with complex nouns, verbs, and adjectives assumed to be unknown to them in one of two conditions: a definition and a sentence using the word in context; or, definition-plus-sentence-plus-visual image illustration. Concrete words were not controlled. In both studies, the results revealed that learners who received definition-plus-

sentence-plus-visual image illustrations scored significantly higher than those who did not receive the picture illustrations. Left-brain preference thinkers, who are likely less motivated, typically, to use imagery in their thinking, benefited significantly more than right-brain preference thinkers from the addition of the images. Psycholinguists have found this point to be in support of the DCT assumption that there are individual differences in verbal and nonverbal (imaginal) thinking (Sadoski, 2005; Sadoski & Paivio, 2013; Smith et al., 1994).

Some DCT psychologists have suggested that combining the keyword method with contextual analysis would be particularly effective in intentional vocabulary learning (Avila & Sadoski, 1996; Rodríguez & Sadoski, 2000), as the keyword method requires learners to create an interactive mental image of the definition of the new word and a familiar, concrete word that shares similar sound elements (Al Qahtani, 2005; Atkinson & Raugh, 1975; Barcroft, 2009). Thus, learning would occur in the two codes (verbal and nonverbal) with potentially additive effects (Levin, Levin, Glasman, & Nordwall, 1992; Sadoski & Paivio, 2013). For examples of and more details regarding the keyword strategy see Section 2.4.4).

In an experimental study, Rodríguez and Sadoski (2000) compared a combined keyword-context method with keyword alone, context alone, and rote memory methods. The target words were concrete English nouns unknown to the Spanish student participants. The results showed that all groups performed well on the immediate retention test; however, at the one-week delayed retention test the keyword-context group performed far better than all of the other groups. The researchers concluded that their findings were consistent with the DCT assumption that verbal and imaginal processes are independent and additive in their effect on memory.

One purely verbal-associative strategy that is used in both intentional and incidental vocabulary learning is morphological analysis of words, in which L2 learners analyse a novel word by separating it into parts, such as roots and affixes, and then recombining to create

meaningful whole words (Foote, 2017). White et al. (1989, cited in Sadoski, 2005) estimated that this strategy would increase the understanding of word parts seen in context almost two-fold when using the context alone. Research that has examined L2 morphological processing in different languages (e.g., Arabic, English, French, German, and Spanish) indicates that learners are sensitive to morphological structure at the lexical level (e.g., Basnight-Brown, Chen, Hua, Kostić, & Feldman, 2007; Baumann et al., 2002; Coughlin & Tremblay, 2015; Foote, 2017; Gor & Cook, 2010; Gor & Jackson, 2013; Rodrigues & Cavar, 2005). The findings of these empirical studies has tended to demonstrate that instruction in morphological analysis produces better outcomes in target words acquisition and transfer to new words both in isolation and in context.

Another technique that is consistent with the DCT approach is a graphical display of semantically related vocabulary. Graphical displays tend to contain both verbal-associative and imaginal-spatial processes in memory (Sadoski, 2005; Sadoski & Paivio, 2013). The number of empirical studies that have been carried out indicates that using a graphical display with the related vocabulary information is superior to the traditional methods, such as word lists (e.g., Bisson et al., 2015; Carr & Mazur-Stewart, 1988; Jared et al., 2013; Smith et al., 1987; Stahl, Burdge, Machuga, & Stecyk, 1992). Carr and Mazur-Stewart (1988) for example, evidently, found that the vocabulary overview guide, a method that includes a graphic display of semantically related vocabulary, was superior to the traditional method of word-list and studying definitions on both immediate and one-month delayed tests.

To sum up, the significance of DCT and its applications lies in the positive effects of concreteness and imagery on memory. Pictures might have value in delivering cues for novel words and meaningful elaboration in the form of nonverbal context. Meaningful vocabulary has traditionally been acquired intentionally through direct instruction and incidentally through contextual analysis. Intentional vocabulary learning strategies that employ imagery, such as

visualizing target words and pictures, illustrations, or the keyword method, have been established to be effective in vocabulary learning (e.g., Al Qahtani, 2005; Barcroft, 2009; Brown & Perry, 1991; Marzban & Amoli, 2012; Moore & Surber, 1992). Thus, using both imagery and verbal contexts in incidental and intentional learning of word definitions could be a highly effective combination (Avila & Sadoski, 1996; Rodríguez & Sadoski, 2000).

Acknowledging that DCT can account for some of the most successful vocabulary learning strategies, Sadoski (2005) pointed out that “there is considerable theoretical value in such an accounting: knowing *what* works in vocabulary learning is one question, but understanding *why* it works is another. The answers to both these questions provide direction for future progress in this important area” (p. 233). Thus, based on the DCT perspective, the current study will seek to further discover *what type* of strategies are more effective for intentional and incidental L2 vocabulary learning, and will explain *why* some strategies might be better than others based on different variables, such as nouns versus verbs, abstract versus concrete nouns, action versus state verbs, and high versus low frequency words. It will do so by extending existing research to the case of L2 Arabic, and by examining not only the strategies used at intentional mode, but also those unconscious strategies used in the incidental mode of vocabulary learning. It is critical to investigate strategies and cognitive processing across a variety of languages, as there is evidence that the extent to which effective strategy plays a role in lexical representation and access may differ cross-linguistically based on the characteristics and richness of the language (e.g., Lehtonen et al., 2006; Schmitt, 1997, 2008a).

2.4.3 Memory and language processing

The cognitive approach views memory as involving two operational stages. The first is the *working* (or *short-term*) memory system, which concerns access (or *processing*), and has limited capacity. A useful definition of working memory in SLA is given in the form of a simple example by Ellis (2005, p. 338): “if I ask you what 397×27 is, you do not look up the

answer from long-term memory, you work it out”. Robinson (1995, as cited in Ortega, 2009, p. 90) describes the working memory as “the workspace where skill development begins ... and where knowledge is encoded into (and retrieved from) long-term memory”. The working memory is where all of the incoming information is processed and organized through interaction with existing knowledge in the long-term memory. However, the working memory is only able to process a small number of information units (five to nine) at one time (Novak & Cañas, 2008). The function of this system is to protect related information from proactive interference (Cowan, 2001), and permit new connections to be shaped between different units of information (Oberauer, Süß, Wilhelm, & Sander, 2007). Hence, building a large volume of knowledge requires an arranged sequence of interactions between working memory and long-term memory as new knowledge is received and treated (Novak & Cañas, 2008). This indicates that working, or short-term, memory requires a conscious effort to recall even modest amounts of information (Takač, 2008).

Furthermore, working memory permits people to attend to ‘goal-relevant’ memories (Shipstead et al., 2014). However, individual variances in working memory capacity are correlated with distinct aspects of cognition, for instance, multi-tasking (Hambrick et al., 2010); emotion regulation (Kleider, Parrott, & King, 2010); hindsight bias (Calvillo, 2012); and vulnerability to stereotype threat (Hutchison, Smith, & Ferris, 2013). Perhaps most noticeable is that working memory capacity shares at least half of its statistical variance with general fluid intelligence, which is the capability to reason with new information (Kane, Hambrick, and Conway, 2005). Consequently, as Shipstead et al. (2014) point out, investigating the mechanisms of working memory capacity may provide the most direct method of explaining the processes involved in human reasoning (Conway et al., 2011; Oberauer et al., 2005).

The second system of storing information is long-term memory, which can be defined as the unlimited storage capacity of the human brain, and is made up of two parts: (1) *declarative (explicit)* memory; and (2) *procedural (implicit)* memory. Declarative memory is responsible for encoding knowledge of facts (semantic knowledge) and events (episodic knowledge) in long-term memory (Squire & Knowlton, 2000; Ullman, 2005). This may be especially significant for learning ‘arbitrary relations’, for example, the fact that Ouagadougou is the capital of Burkina Faso (Eichenbaum & Cohen, 2001). The information learned in declarative memory is at least partially (as opposed to completely) explicit and thus available to conscious awareness (Chun, 2000, cited in Ullman, 2005, p. 143). According to Suzuki and Amaral (1994), the memory system is served by ‘medial temporal lobe regions’ such as the hippocampus, which are associated widely with temporal and parietal neocortical regions. The medial temporal structures consolidate, and feasibly retrieve, new memories (Eichenbaum & Cohen, 2001; Squire & Knowlton, 2000).

In contrast, procedural memory has the ability to store more knowledge than explicit-declarative memory. It is involved in the learning of new motor and cognitive skills, as well as the control of long-established skills and habits, especially those involving sequences (Boecker et al., 2002; Ortega, 2009; Squire & Knowlton, 2000). This system is often referred to as an implicit memory system, since neither the learning nor the remembering of these procedures seems to be accessible to conscious memory (Ortega, 2009; Ullman, 2005). The procedural memory system depends mainly on structures in the left hemisphere of the cerebrum (Heilman, 1997; Rushworth, Krams, & Passingham, 2001). It is deeply rooted in neural circuits that involve the basal ganglia and the frontal lobes, which are subcortical structures strongly linked to the frontal cortex (Ullman, 2005). Evidence suggests that particular neurotransmitters of these circuits, particularly dopamine, underlie aspects of procedural learning (Harrington et al., 1990; Nakahara, Doya, & Hikosaka, 2001; Saint-Cyr, Taylor, & Lang, 1988).

In research into the language acquisition of L1 and L2, an essential distinction is drawn between the memorized ‘mental lexicon’ and the computational ‘mental grammar’ (Ullman, 2001b, 2005). The lexicon comprises of memorized words (i.e. the pairings of phonological forms and meaning). It involves words with ‘arbitrary sound meaning pairings’, words whose sound and meanings cannot be derived from each other; for example, the non-compositional word ‘cat’ (Ullman, 2005, p. 142). It might also include other non-compositional forms, smaller or larger than words: bound morphemes (e.g. the -ed past tense suffix) and intricate linguistic structures whose connotations cannot be gleaned from their parts. For example, idiomatic phrases such as ‘kick the bucket’ (Halle & Marantz, 1993; Ullman, 2001b). This entire lexicosemantic system exists within a neural system that underlies declarative-explicit memory in the temporal lobe (Ullman, 2005). In contrast, grammar (syntactic knowledge) is based on rules, containing operations and constraints of productive sequential and hierarchical combination of lexical forms. These drive and create complicated representations and facilitate the communication of meanings of new and abstract complex forms (Ullman, 2001b, 2005). These rules are an arrangement of mental knowledge, determining one’s individual capacity to yield and understand complex forms (Ullman, 2005). This syntactic knowledge is served by an independent set of neural systems that underlie the procedural memory system in other areas of the brain; specifically, the frontal cortex, basal ganglia, parietal, and cerebellum (Heilman, 1997; Rushworth et al., 2001; Ullman, 2001b). Studies conducted by neuro- and psycholinguists (Ullman, 2001a, 2001b, 2001c; Ullman, 2005; Ullman et al., 2005) have presented a large body of neuroimaging evidence, in support of this proposed independence of lexis and grammar at the level of the brain.

Distinctions such as this one indicate that language processing at dissimilar levels of linguistic analysis are served by the processing and storage in dissimilar regions of the brain. In particular, the difference between knowledge of lexis that includes declarative (explicit)

memory, which is stored in one area of the brain, compared to the knowledge of grammar, which includes procedural (implicit) memory that is stored in other areas. Similar distinctions have been revealed for other types of linguistic knowledge; for instance, phonetic and phonological processing, and the regions of the brain in which they are localized (see Poeppel & Embick, 2017, for further discussion regarding the relationship between linguistics and neuroscience).

Studying the declarative/procedural (DP) model between L1 and L2 learning, Ullman (2005) points out that it makes a dissimilar set of claims and expectations for late-learned L2 than for L1. For L2 acquisition, learning lexical or other linguistic knowledge as part of declarative memory seems to be more accessible than learning grammar in procedural memory, as compared to L1 acquisition (Ullman, 2001a; Ullman et al., 1997). Thus, adult L2 learners depend deeply on the declarative memory system, not only for storing idiosyncratic lexical information, but also for remembering complex forms or ‘rules’ (Ullman, 2001b, 2001c; Ullman et al., 1997). Nevertheless, when learners have adequate experience with a language, the procedural memory system would be able to store more, if not all, of the syntactic information present in the L1 (Ullman, 2005).

Understanding how the human memory works might help researchers to generate more effective ways to teach and learn L2 vocabulary. Neuropsychologists have emphasized that the neural systems in the prefrontal cortex involved in working memory enable attentional selection, perceptual integration, and the consolidation of consciousness. Then, in the hippocampus, other neural systems bind these dissimilar cortical representations into unified episodic representations (Ellis, 2015). According to Ellis (2015, p. 20), “these are the mechanisms by which Schmidt’s (1990) noticing helps solve Quine’s (1960) problem of referential indeterminacy”. In the quote, below Ellis (2015) points out that the interactions and

associations between implicit and explicit language use in the brain impact the progress, and connectivity of different neurological systems:

“Language representation in the brain involves specialized localized modules, largely implicit in their operation, collaborating via long-range associations in dynamic coalitions of cell assemblies representing, among others, the phonological forms of words and constructions and their sensory and motor groundings... The interactions of these networks underlie implicit and explicit language use, and the dynamics of implicit and explicit language use in turn affects the development, consolidation, and connectivity of these neurological systems” (Ellis, 2015, p. 22, cited Paradis, 2004).

Vocabulary knowledge in SLA is reinforced by the schema-based approach to language learning. The schema-based approach highlights the role of background knowledge in language education, adopting a *schema* as a cognitive outline (Khodadady & Hesarzadeh, 2014, cited Carrell, 1984). As has been identified earlier, schemata are abstract mental structures that help acquired knowledge to be stored in memory in a systematic way, assisting learners in organizing and interpreting large volumes of information (Khodadady & Hesarzadeh, 2014; Melendez & Pritchard, 1985). Historically, the schema concept is repeatedly attributed to Bartlett (1932) who hypothesized that one’s understanding and remembrance of events is formed by expectations or prior knowledge; and that these expectations are presented mentally in a schematic fashion. Bartlett’s concept was criticized for being too ambiguous. According to Ajideh (2003), the lack of a specific definition resulted in various conflicting interpretations of Bartlett’s work. Moreover, the impending tide of behaviourism swept aside Bartlett’s ideas, until a return to more naturalistic methods to human memory in the 1970s provided a favourable climate for schema theory revival.

A schema is a kind of framework, plan or script created through previous knowledge and experiences with people, objects, and events in the world (Ajideh, 2003). When one frequently encounters or engages in something, such as an interview, generalization begins to occur. This forms an abstracted, genetic set of expectations about what will be encountered in

an interview. This can be useful, for example, if someone is reporting about a job interview. They do not have to provide all the details of the appointment; being greeted and seated when meeting the interviewers, asked about the reasons for choosing and qualifications required for the job because one's schema for the interview experience can fill in these missing details. Another example of this approach can be found by imagining a child whose schema for 'cat' is a creature with four legs, a tail and two ears; meeting a 'dog' for the first time in life, they may call it a cat to interact with their background. The previously acquired knowledge leads the child to call the dog, a cat. Thus, they must adapt their schema to accommodate the novel information (Khodadady & Hesarzadeh, 2014).

Schemata can be seen as the structured background knowledge, which leads us to expect or predict aspects when explaining discourse. Our memory of discourse, according to Bartlett (1932, cited Ajideh, 2003, p. 4), is not based on straight 'reproductions', but is 'constructive'. This constructive procedure utilizes information from the discourse encountered, together with knowledge from earlier experiences related to the discourse at hand, to build a mental representation (Ajideh, 2003). Schemata can be used to explain the majority of the learned, intellectual skills that people demonstrate. Consequently, knowledge and intellectual skills based on knowledge are heavily reliant on schema acquisition. Schemata manage the basic unit of information and through processing, can interpret a substantial proportion of one's 'learning-mediated intellectual' act (Sweller, 1994).

Cook (1989) states, "The mind stimulated by key words or phrases in the text or by the context activates a knowledge schema" (p.69). Here, Cook indicates that in reality, the mind is dealing with automatic cognitive responses given to external stimuli, and not necessarily with conscious processes. According to Ajideh (2003, p. 5), Cook's view highlights that schemata can be activated in one of two ways:

- 1- New knowledge from the outside world can be cognitively received and related to already known knowledge stored in memory through retrieval or remembering. In this condition, new concepts are integrated into existing schemata which can be changed or expanded.
- 2- New knowledge can be represented by mental structures. In this condition, in absence of already existing schemata, new information builds up new schemata.

Plastina (1997) comments that under both conditions, the individual is piecing information together, attempting to make sense of it. It follows that the main features of schemata are flexibility and creativity. Ajideh (2003) further explains that:

Schemata are flexible in that they undergo a cyclic process within which changes are brought about actively and economically, i.e., information is stored in memory and provided when needed with the least amount of effort. They are creative in that they can be used to represent all types of experiences and knowledge, i.e.; they are specific to what is being perceived (p. 5).

In a review of implicit and explicit learning, Ellis (2015) defines the units of language acquisition according to the usage-based approach to language learning. Usage-based theories “hold that we learn constructions while engaging in communication, and that an individual’s linguistic competence emerges from the memories of the utterances in their history of language use and the abstraction of regularities within them” (p. 3). Learning theory based on the role of cognitive processes and information processing suggests that the information stored in long-term memory can be utilized to improve the learner’s comprehension or retention of the new concepts or ideas by providing relevant information, or ‘schemata’, into which the new ideas can be organized (O'Malley & Chamot, 1990, p. 18). Furthermore, Macaro (2006, p. 326) proposes, “if we accept that working memory interacts with subconscious activity in long-term memory, then strategic action ... must have, at the very least, its origins in working memory”. As has already been noted in the earlier section discussing cognitive learning theory, learner strategies are sensitive to the learning context (i.e., in the way that they are able to solve the

requirements of different language learning tasks), and to the learner's internal processing preferences. The following subsection will explain the notion of *depth of processing* in vocabulary acquisition, and the common memory strategies that facilitate the retention processes.

2.4.4 Strategies and depth of processing

Given that learning may occur intentionally or incidentally, a distinction has often been made between strategies that concern depth of the learning (deep processing) and those that do not concern depth of learning, or do so to a much lesser extent (shallow processing). Craik and Lockhart (1972), in their depth of processing hypothesis, argued that the likelihood that new information will be stored in long-term memory is determined by the depth or shallowness with which it is initially processed, not by the duration of time that it is held in short-term memory. The authors initially suggest several levels of processing depth; for instance, processing the meaning of a new word requires a deeper level of processing compared to processing the phonological form, which occurs at a shallower level. Craik and Lockhart (1972) further provided evidence that processing lexical items semantically resulted in better retention than if they were processed phonologically or orthographically. It has subsequently been indicated by cognitivists and L2 researchers that strategies and activities that require a deeper manipulation of knowledge lead to better learning and retention than those that use surface-level processing strategies (Atkinson & Raugh, 1975; Craik & Tulving, 1975; Ellis & Beaton, 1993; Nemati, 2009). However, research findings regarding the effectiveness of L2 vocabulary learning strategies are contradictory (Fan, 2003), as will be shown in the following paragraphs.

Rote memorization is considered by some to be an outdated technique for learning (Read, 2000). Learning by repetition is the dominant practice involved in the rote memorization technique. Those who criticize it state that it involves learning facts without developing a deep understanding of what they mean (Khoii & Sharififar, 2013). Moreover, their criticising could

be due to the sense that merely remembering a large number of words without context can be boring, and it may therefore be a challenge to make this an enjoyable activity for learners (Folse, 2004, cited in Kasahara, 2011). However, the findings of research relating to word lists or paired-associates learning have indicated that a large amount of vocabulary can be acquired in a short period of time (Fitzpatrick, Al-Qarni, & Meara, 2008; Milton, 2009; Prince, 1996; Webb, 2007). The role of rote memorization strategies is particularly significant in establishing form-and-meaning connections; studies have shown that the use of a word list or paired-associate is more effective than learning words in context, because learners pay greater attention to the new words themselves (Kasahara, 2011). For example, Prince (1996) compared two conditions: L1 to L2 paired-associate learning; and, learning an L2 word in one or two sentences, where the participants had to guess the meaning of the target words from context. The results demonstrated the superiority of paired-associate learning.

In their comparative study of the effects of two cognitive strategies, rote memorization and semantic mapping, Khoii and Sharififar (2013) found no significant differences between the two strategies in terms of resultant vocabulary knowledge. Thus, the researchers suggest that the value of rote memorization in vocabulary learning should be reconsidered and given more prominence in second language settings where access to L2 input is limited in out-of-class contexts.

By contrast, memory strategies (traditionally known as mnemonic devices) have been viewed as more 'desirable' strategies than memorization. Mnemonic devices "are techniques based on cognitive processes which are used to enhance retention of material one would otherwise forget" (Takač, 2008, p. 59). These techniques are assumed to involve learners deeper in the process of learning, and can therefore help them to retain more words than rote memorization and repetition (Fan, 2003). Mnemonic strategies can be categorized into verbal (reduction, elaborated coding, semantic elaboration, rhyme, and rhythm); visual (imagery, the

loci method, method of spatial page organization); and mixed mnemonics (the peg method, the keyword method, association mnemonics, process mnemonics) (Takač, 2008, cited Zarevski, 1994). Over the past few decades, considerable exploration of mnemonics has been carried out by psychologists, focusing principally on the effectiveness of the keyword method compared with other strategies used to learn vocabulary. The reason for this might be that the keyword method uses both sound and imagery links, which is considered to be effective in connecting new words to learners' existing schemata (Oxford & Crookall, 1990; Oxford, 1990). The keyword method is a mnemonic strategy that divides the study of a vocabulary item into two stages. The first is associating the foreign word with a vocabulary item in the learner's L1, or another language that they know (L3), which sounds similar to some significant part of the word in question. This vocabulary item is the keyword. The second stage is connecting the L1 or L3 keyword with a mental image related in some way to the original L2 word (Atkinson & Raugh, 1975). For example, a native English speaker could learn that the Spanish word *mesa* means 'table' by using the English word 'mess' as the keyword and then constructing a mental image or a sentence to connect the keyword (mess) with the L1 word (e.g. a messy table) (Sagarra & Alba, 2006). Another example could be an Arab learner of English learning the English word 'hat' by connecting it with the Arabic word /هات/ haat /, which means 'give me', and then imagining a situation in which they are asking someone to give them a hat (Al Qahtani, 2005).

This multiple-step process requires a considerable depth of processing because it requires learners to create both form relations, through an L1 keyword, and conceptual associations, through the link between the L1 keyword and the L1 translation (O'Malley & Chamot, 1990). Sagarra and Alba (2006) state that the keyword method has emphasized in many studies dedicated to establishing: (a) the effectiveness of this method in comparison to other strategies; and, (b) its applicability to several languages, settings, and learners with

individual differences, such as age and level of proficiency. They also note that more than 50 studies have shown that the keyword method results in better retention of new words than rote memorization or unstructured learning techniques (e.g., Cohen & Aphek, 1980; Ellis, 1995a; Hulstijn, 1997; Pressley, Levin, & Miller, 1982).

Although the keyword method has been shown to support L2 vocabulary learning in many situations and with different L2 learners, there is also evidence that its usefulness does not apply in all situations. For instance, de Groot and Van Hell (2005, cited in Sagarra & Alba, 2006, p. 230) propose five factors that make rote rehearsal a better strategy than the keyword method. First, the long-term benefits of the keyword method found in some studies (e.g., Wang & Thomas, 1995) could be due to the effect of the immediate test as an additional learning practice. Second, the long-term effects of the keyword method may in fact be due to a participant's knowledge of other foreign languages. For example, Beaton et al. (1995) found that a keyword learner who spoke various languages (including French, Spanish, German, and Greek) was able to recall 35% of L2 Italian words 10 years after exposure to the target language. Third, concerning the role of word type, the keyword method is not as effective as simpler word or picture association in teaching and learning cognates or abstract words (Ellis, 1995b). Compared with rote memorization, the keyword method causes a delay in word retrieval processes, as recall of the keyword takes place first (Van Hell & Mahn, 1997; Wang & Thomas, 1999). Fourth, the keyword method is unhelpful in productive recalls. While the keyword method is useful for receptive tests, rote rehearsal is more beneficial for productive tests (Degroot, Dannenburg, & Vanhell, 1994). Finally, although elementary language learners can benefit greatly from the keyword method, advanced learners gain more benefit through rote memorization (Hogben & Lawson, 1994; Moore & Surber, 1992; Van Hell & Mahn, 1997).

However, numerous studies have shown that strategies that require deeper processing or mental manipulation of the new vocabulary items are not popular amongst L2 learners (O'Malley & Chamot, 1990). A study by Schmitt (1997) found that the strategies that include 'elaboration' and a keyword method 31% were the least frequently used by Japanese EFL learners. Gu and Johnson (1996), in their study of vocabulary learning strategies conducted with 850 Chinese university learners of EFL vocabulary, found that metacognitive strategies (e.g. self-initiation and selective attention) and cognitive strategies (e.g. contextual guessing, note-taking, paying attention to word formation, contextual encoding, and intentional activation of new words) resulted in positive gains in vocabulary learning proficiency. By contrast, memorization strategies showed the reverse effect.

Based on the above research findings concerning the drawbacks and difficulties involved in the use of the keyword method, the current study proposes that the use of other strategies (e.g. L2 word-picture association, rote memorization, paraphrasing word meaning, and metacognitive strategies) in intentional and incidental L2 vocabulary learning may result in greater target word recall.

Dictionary use is another favoured strategy amongst L2/FL learners. The findings of L2 vocabulary learning research demonstrate that consulting dictionaries – bilingual or monolingual – can help learners with vocabulary acquisition and with comprehending and creating text (Nation, 2013). Luppescu and Day (1993) examined the effect of the use of a bilingual dictionary on learning vocabulary by reading, and found that Japanese learners using a dictionary achieved high scores and outperformed those who did not use a dictionary. Some scholars have also investigated the use of text and a computer dictionary; Knight (1994), for example, found that learners who had access to a dictionary performed better in terms of learning and retention on immediate and delayed tests (two weeks later) than those who did not have access to the dictionary. However, Hulstijn (1993) found no significant differences

between learners who looked up many words in the dictionary and learners who looked up only a few words. Later, Hulstijn et al. (1996) examined three factors that might enhance the results of incidental vocabulary learning: (1) the frequency of word occurrence; (2) the provision of word meanings in marginal glosses; and (3) the use of the dictionary. They found that the effect of marginal glosses was greater than that of dictionary use, primarily because the learners did not consult their dictionaries. Due to the task requirements in the experiments, the use of a dictionary may take more time than is necessary (Lupescu & Day, 1993; Nation, 2013). According to Nation (2013, p. 432), “dictionary use is a kind of language-focused learning: the deliberate and explicit study of words. It is thus only one of a range of sources of information about words”. Nation (2013, p.433) further states that learning words is a “cumulative process,” and that expectations of the results of learning through consulting a dictionary should not be very high. Consequently, teachers and learners should make an effort to ensure that this knowledge can be added through other encounters with the target word(s). In the same vein, Scholfield (1999) has suggested that dictionaries should accompany the use of other strategies, such as guessing at the same unknown word.

While the strategy of using dictionaries is considered to be an intentional method of learning new lexical items, guessing or ‘inferring’ strategies are closely related to the incidental learning of new words (Fan, 2003; Hulstijn, 1992, 2001; Laufer, 2003; Nation, 2013). Indeed, according to Nation (2001, p. 232), “Incidental learning via guessing from context is the most important of all sources of vocabulary learning”. Read (2000) further promotes inferring as “a desirable strategy because it involves a deeper process that is likely to contribute to better comprehension of the text as a whole and may result in some learning of the lexical item that would not otherwise occur” (p. 53).

Guessing strategies have been examined in many empirical studies (e.g., Hulstijn, 2003; Nagy, 1997; Pulido & Hambrick, 2008; Webb, 2008). However, when comparing the inferring

method to other direct strategies (e.g., the meaning-given method) research findings have indicated that the inferring method does not lead to greater depth of processing, which in turn will not lead to improved long-term retention (Bialystok, 1981; Mondria, 2003). A study by Mondria (2003) made a comparison between inferring only, inferring + verifying (students were told the right answer), and inferring + verifying + memorization. The study found that learning occurred with each method: 6% retention from inferring; a further 9% from inferring + verifying; and a further 32% as a result of memorization. The study also indicated that simply giving learners a chance to memorize new words resulted in greater retention (eight times higher) than when they had the opportunity to infer the meanings of the target words. The analysis of the results for learning time invested showed that students spent more time (27% more) on the meaning-inferred method than on the meaning-given method. Accordingly, Mondria (2003), when discussing the implications for foreign language learning, suggested that, “when the efficiency of the vocabulary acquisition process is the main objective, the meaning-given method is preferable to the meaning-inferred method because less time has to be invested for a similar level of retention” (p. 494).

Based on the findings of studies of incidental vocabulary learning from context, it seems clear that second language learners “should not rely solely on incidental vocabulary learning from context. There needs to be judicious attention to decontextualized learning to supplement and be supplemented by learning from context. Direct vocabulary learning and incidental learning are complementary activities” (Nation, 2013, p. 357). Thus, the current study aims, initially, to identify the strategies most frequently used by L2 learners in intentional and incidental vocabulary learning, and will then compare their effectiveness on word retention in short- and long-term memory.

2.5 Summary of the chapter

The present research on vocabulary knowledge acquisition strategies was undertaken at ITANA, the institute introduced at the start of this chapter. It was explained that two TASL programmes are run by ITANA: an intensive morning programme, and a non-intensive evening programme. Subsequently, the lexicon, morphology and orthography of Arabic were explained, with an emphasis on the diglossic nature of Arabic, in the second section of this chapter. The intricacies of Arabic vocabulary were then outlined. The third section addressed the theoretical background to language learning strategies; it discussed the role of language learning strategies in cognitive theory, DCT and its implication for vocabulary acquisition, especially in relation to abstract and concrete terms, and provided information about how knowledge is encoded, processed, and retrieved in short- and long-term memory based on the strategies and depth of processing.

3 Literature review

3.1 Overview of Chapter Three

This chapter will discuss a number of related issues to establish a better understanding of the main theme of this thesis: the effect of self-selected strategies for intentional and incidental vocabulary learning on immediate and delayed word retention. This literature review will be divided into four sections: the first section will provide an explanation of word knowledge, in terms of defining exactly what constitutes a word and what word knowledge entails. The second section will discuss intentional and incidental vocabulary learning, clarifying their definitions, their relationships to the terms ‘implicit’ and ‘explicit learning’, and their appearance in L2 vocabulary pedagogy. The third section will examine language learning and vocabulary learning strategies in detail, again providing their definitions, characteristics, and taxonomies. The fourth section will review a large number of existing publications in the area of second language acquisition that have focused on the strategies used in intentional and incidental vocabulary learning. It is equally important here to discuss aspects related to eye-tracking and incidental vocabulary acquisition.

3.2 Vocabulary knowledge: what does it include?

There is a consensus among researchers and educators that lexical knowledge is multi-faceted, since there are many things that can be known about a single word, and many degrees of knowing (Harley, 1996; Nation, 2013; Nemat, 2013). ‘Knowing’ a word means more than just recognizing its meaning, as well as its written and spoken forms (Nation, 2001, 2013); the process of learning a word is more complicated than simply making a connection between the meaning and form of the word (Laufer & Goldstein, 2004). For this reason, researchers and educators have suggested various taxonomies for word knowledge. Richards (1976) proposed one of the earliest frameworks, and suggested seven aspects of words knowledge, namely:

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

According to Meara (1996b), Richards' framework may be suitable for guiding classroom instruction, but it still does not offer an adequate theoretical model for defining word knowledge. Henriksen (1999) proposes a three-dimensional framework for vocabulary knowledge. The first dimension is partial versus precise knowledge, which indicates that word knowledge can be partial and exist to a certain degree, and then progresses to different levels to become 'fully known'. The second dimension is the depth of knowledge, which refers to the network's structure. As has been identified in the discussion of memory and language processing in Section 2.4.3, psycholinguists argue that words are stored in networks in the brain (Ellis, 2015; Haastrup & Henriksen, 2000), and that the more learners develop to create stronger and a greater number of links between words (antonyms, synonyms, hyponyms, gradations, and collocations), the more their vocabulary knowledge develops and is stored in long-term memory (Alahirsh, 2014; Craik & Tulving, 1975; Ellis, 2015; Ellis & Beaton, 1993; Gu & Johnson, 1996). Henriksen (1999) further suggested that the term *depth of knowledge* should be used to "describe knowledge aspects of lexical competence" (p. 306). The third dimension is the use of receptive and productive words, which involves questions relating to the control or accessibility aspect of word comprehension knowledge.

Brown and Payne (1994, cited in Hatch & Brown, 1995) have identified five steps in the process of learning vocabulary in a foreign language: (a) having sources for encountering

new words, (b) getting a clear image, either visual or auditory or both, of the forms of the new words, (c) learning the meaning of the words, (d) making a strong memory connection between the forms and the meanings of the words, and (e) using the words. Following from Brown and Payne's five-step framework for the vocabulary learning process, Fan (2003, p. 223) indicated that "all vocabulary learning strategies are, to a certain extent, related to these five steps".

Perhaps the most comprehensive model of word knowledge to date is the classification by Nation (2001). This is an extension of Richards' (1976) taxonomy and involves more components; in particular, Nation (2001) includes a clear distinction between receptive and productive knowledge. Nation (2001, 2013), subcategorizes word knowledge into knowledge of word *form*, *meaning*, and *use*, as shown in Table 3.1 below.

Table 3.1. What is involved in knowing a word? (Nation, 2013, p.49)

Form	spoken	R P	What does the word sound like? How is the word pronounced?
	written	R p	What does the word look like? How is the word written and spelled?
	word parts	R P	What parts are recognizable in this word? What words parts are needed to express meaning?
Meaning	form and meaning	R P	What meaning does this word form signal? What word form can be used to express this meaning?
	concept and reference	R P	What is included in the concept? What items can the concept refer to?
	associations	R p	What other words does this word make us think of? What other words could we use instead of this one?
Use	grammatical functions	R P	In what patterns does the word occur? In what patterns must we use this word?
	collocations	R P	What words or types of word occur with this one? What words or types of words must we use with this one?
	constraints on use (register, frequency ...)	R P	Where, when, and how often would we meet this word? Where, when, and how often can we use this word?

Note: R = receptive knowledge, P = productive knowledge

According to Nation (2001, 2013), knowing the *form* of a word requires knowledge of its spoken and written forms, as well as its parts. Knowing the *meaning* of a word includes knowledge of the connection between form and meaning, and the association between the concepts of meaning and referents. Knowledge of word *use* demands knowledge of its grammatical functions, collocations, and the constraints on its use. Additionally, Nation (2001, 2013), when describing what is involved in word knowledge, highlights various differences between the receptive and productive knowledge that are involved in knowing a word (see Table 3.1). For example, receptive knowledge of the spoken and written form of a word involves knowing what the word sounds like and looks like, whilst at the productive level, it

involves knowing how to pronounce and spell the word. Knowledge of creating links between form and meaning, receptively, requires knowledge of the meaning of a specific word form, and productively, means the ability to select the appropriate word form to convey a specific meaning. All of these various levels of word knowledge are relevant to both L1 and L2 vocabulary learning (Bisson, 2013). Based on this linguistic reality, a question might be asked about how formal and semantic similarities and differences between L1 and L2 vocabulary learning affect how difficult it is to learn a new word (Barcroft, 2015). Nation (2013, p. 44) answers this question, stating that the learning burden of a word, which is “the amount of effort required to learn it,” can indicate how difficult it is to learn the word. That is, “the more a word represents patterns and knowledge that the learners are already familiar with, the lighter its learning burden. These patterns and knowledge can come from the first language, from knowledge of other languages, and from previous knowledge of the second language” (pp. 44-45). Consequently, the effort required to learn L2 words differs depending on the specific learner’s familiarity with the phonology and orthography of the language, the similarity with their L1, and the regularity of the sound and spelling patterns of the words (Nation, 2013). Hence the learning burden for advanced L2 learners is lighter than it is for beginner learners, because they already possess some knowledge of the phonology and orthography of the language; the reverse is true for beginner learners, who lack experience with the L2.

Although recently there has been an increase in research into second language vocabulary acquisition, the field is still lacking coherence (Read, 2000; Schmitt, 2008b). Two of the main aspects that continue to demand further research are issues related to how best L2 vocabulary can be acquired, and what factors affect the acquisition processes (Godfroid & Winke, 2015a). Psychologists and educators have conducted empirical investigations into different aspects of word knowledge to recommend for which aspect the effective mode (intentional or incidental) to learning and the best strategies applies. This is clearly evident in

research from different perspectives across the vocabulary knowledge continuum, starting from the basic level of recognition of the word, and moving to native-like knowledge (e.g., Allothman, 2014; Barcroft, 2009; Godfroid, Housen, & Boers, 2010; Godfroid & Winke, 2015a; Gu & Johnson, 1996; Lawson & Hogben, 1996; Oxford, 1990; Schmitt, 2008b; Takač, 2008; Webb, 2009) (a range of key studies will be reviewed in the following sections).

Nation (2007) and Nation and Yamamoto (2012) have provided and developed a well-balanced language course consisting of four major strands that give equal attention to the different aspects of word knowledge, and have the flexibility to be attached to different learning conditions (i.e., intentional or incidental), techniques, and activities (Allothman, 2014). “These strands can appear in many different forms, but they should all be there in a well-designed course” (Nation, 2013, p. 2). The four strands are: (1) meaning-focused input, which means learning new language items incidentally through reading and listening, where the attention is on the information present in what learners read or listen to; (2) meaning-focused output, which involves developing knowledge of language by communicating through writing and speaking, where the attention is primarily on the information that learners seek to convey; (3) language-focused learning (or form-focused instruction), which implies that language learning can benefit from a usefully focused, direct teaching and learning of language items, in terms of vocabulary learning - this strand means that a course should involve the deliberate teaching and learning of lexical items; and, (4) fluency development, where learners become fluent in using and practising items that are already known (Nation, 2007; Nation, 2013).

However, further investigation of different aspects of word knowledge is still crucial, particularly if there is conflicting understanding of the issue. Researchers have found that several factors affect vocabulary learning. Some of these factors (as has been identified in the above discussion of learning burden) are learning-facilitating factors (e.g., familiar phonemes, phonotactic regularity, fixed stress, derivational regularity, generality, and one form for one

meaning), and some are difficulty-inducing factors (e.g., presence of foreign phonemes, phonotactic irregularity, variable stress and vowel change, derivational complexity, specificity, idiomaticity, and one form with several meanings) (see Laufer (1997), for an overview). According to Laufer (1997), there are other factors that have no clear effect on vocabulary learning, such as, part of speech and concreteness and abstractness of lexical items. Only a small number of studies have explored these factors (e.g., Papathanasiou, 2009), and not all aspects of word knowledge have been investigated. Additionally, in selecting vocabulary learning strategies, the frequency of the occurrence of a word is also relevant; Nation (1994) advises that teaching strategies to learners is particularly important when it comes to low frequency words. Nation (1994) argues that vocabulary can be considered from a ‘cost/benefit’ viewpoint: high frequency words are so fundamental that the ‘cost’ of teaching them is justified by the resulting benefit; however, low frequency words will generally not be encountered frequently enough to be worth individual intentional teaching. Because the teaching time is not justified for low frequency words, Nation (2013) suggests teaching three strategies to help students comprehend them: guessing from context, using mnemonic techniques, and using word parts. Thus, the current study aims to re-examine the potential effects of the aforementioned factors (parts of speech, and concreteness and abstractness of lexical items) in intentional and incidental vocabulary learning, as well as effects of the most frequently chosen strategies upon short- and long-term word retention. To this end, 32 target words were chosen according to specific criteria, and divided into nouns and verbs, and concrete and abstract words - see Section 4.6.2 for more information regarding the selection of the target words. As learning vocabulary involves learning different aspects of knowledge, and it is unlikely that one could acquire all aspects at once, vocabulary learning is considered an incremental process (Schmitt, 2008a). Further research in this area would provide a clearer picture about what aspect of word knowledge should be considered, and which learning strategies are the most

effective in assessing learners' retention of newly acquired vocabulary in intentional and incidental modes of learning. Having introduced the aspects of vocabulary knowledge, the next section will explore the modes or theories of vocabulary learning.

3.3 Incidental and intentional vocabulary learning

3.3.1 Definition of incidental and intentional learning

Scholars have yet to reach a consensus with regard to the definition of both incidental and intentional learning. The Longman Dictionary provides the following definition for incidental learning: “1- happening or existing in connection with something else that is more important. 2- naturally happening as a result of something” (Summers, 2006, p. 775). The American Heritage Dictionary of the English Language provides a similar definition: “occurring as fortuitous or minor concomitant”. In contrast, the Longman Dictionary defines intentional learning as something “done deliberately and usually intended” (Summers, 2006, p. 799), while the American Heritage Dictionary offers two meanings: “1- Done deliberately, intended. 2- Having to do with intention”.

By employing these definitions, researchers have identified two modes of language learning: incidental and intentional. With respect to incidental learning, Gass (1999, p. 320) noted that anything deemed incidental “appears to be something that is a by-product of something else”. Accordingly, the majority of studies concerning memory and L2 acquisition over the last three decades have approached incidental learning as a by-product of another enterprise, such as classroom activities, or extensive reading. Likewise, the studies have considered incidental vocabulary learning to be vocabulary learning that occurs when learners are focused on another activity, such as communication, rather than on the vocabulary items themselves (Laufer & Hulstijn, 2001). Specifically, some studies have identified SLV acquisition as a by-product of reading (Krashen, 1989), and a number of studies during the last

two decades have confirmed that L2 vocabulary can be acquired incidentally through reading (Huckin & Coady, 1999; Pigada & Schmitt, 2006; Webb, 2008).

In practice, “much incidental and intentional learning can simply be distinguished in terms of the use of pre learning instructions that either do, or do not, forewarn subjects about the existence of a subsequent retention test” (Hulstijn, 2001, p. 265). In studies concerning incidental learning, for instance, the learners are often instructed to perform a task that involves processing linguistic knowledge, without knowing that they will be tested on its retention. In this case, the L2 learners might be advised that they will be tested on their comprehension knowledge of a provided text, although in fact they are tested on their knowledge of unknown words within the text (Hulstijn, 2003). Any vocabulary learning achieved in such studies occurs incidentally, as the learners are not explicitly concentrating on learning vocabulary, but on comprehending the text as a whole (Hulstijn, 2003; Hulstijn et al., 1996).

Conversely, in studies regarding intentional learning, the participants are advised in advance that they will be tested on their information recall. In intentional situations, the processing of vocabulary knowledge is deliberate, with the intention being to learn the vocabulary items.

According to this approach, the distinction between incidental and intentional learning depends on whether learners are aware that they will be tested afterwards (Eysenck, 1982; Hulstijn, 2001). These two terms have been employed extensively for almost a century, although the definition of the terms ‘incidental’ and ‘intentional’ learning has changed in the context of L2 pedagogy. Incidental vocabulary learning refers to the learning of vocabulary as the by-product of any activity not explicitly focused on vocabulary learning, while intentional vocabulary learning refers to any activity intended to commit lexical information to memory (Hulstijn, 2001, p. 10). This current study will employ Hulstijn’s (2001) definition of incidental and intentional vocabulary acquisition, since Hulstijn (2001, p. 10) argued that the earlier

definitions “no longer reflect a major theoretical distinction.” What is now considered more important is the way in which new vocabulary is processed elaborately and repeatedly, for example, by paying careful attention to the word’s form, orthography, grammatical category, meaning, and semantic relationship with other words, as opposed to whether learners are advised of an upcoming retention test, or whether learners are instructed of the necessity to memorize novel knowledge.

Applied linguistics research has demonstrated that the terms ‘implicit’ and ‘explicit’ learning accompany incidental and intentional learning, which can engender confusion (see papers in Rebuschat (2015) for an overview). However, certain overlaps exist between incidental and implicit learning, and intentional and explicit learning. In order to address this confusion, the following section will explore the concepts of implicit and explicit learning.

3.3.2 Implicit and explicit learning

According to Ellis (2015)

Implicit learning is acquisition of knowledge about the underlying structure of a complex stimulus environment by a process which takes place naturally, simply and without conscious operations. Explicit learning is a more conscious operation where the individual makes and tests hypotheses in a search for structure (p. 2).

Meanwhile, Schmidt (2001) defined implicit learning as learning without awareness, and explicit learning as learning with awareness. By referring to consciousness and awareness, it is possible to clarify the difference between incidental and implicit learning. Schmidt (1990, 2001, 2012) framed the issue in terms of consciousness as intention, consciousness as attention, and consciousness as awareness. He further claimed that “consciousness as intention is reflected in the distinction between incidental learning, referring to the fact that people can learn things without having any particular intention to learn them, vs. *intentional* (goal-directed) learning” (2012, p. 724). With regard to consciousness as awareness, Schmidt (2012,

p. 725) highlighted the fact that abstract knowledge of grammar “cannot be a prerequisite for learning”, because native speakers, and advanced L2 learners, have some ‘intuitive’ comprehension of the indirect aspects of grammar, rather than the basic ‘rules’ that are taught in language classrooms. Thus, in this instance, psychologists usually employ the term ‘implicit knowledge’, “knowledge that is acquired without conscious effort to learn, without awareness that learning has occurred, and without the ability to describe the acquired information” (Reber, 1993, as cited in Schmidt, 2012, p. 725).

Based on the terms employed by Schmidt (1990, 2001) to describe the frames of consciousness, together with Ellis’s (1994b) definition, Rieder (2003) claimed that if consciousness is associated with intention, then the absence or presence of consciousness will determine incidental or intentional learning. Therefore, if consciousness is considered to be awareness, then implicit learning occurs in the absence of consciousness, and explicit learning in its presence. Hence, incidental learning is associated with ‘un-intentional’, which is to say without any restrictions as to the role of awareness, and the term ‘implicit’ is associated with ‘non-consciousness’, in the sense of ‘unawareness’. Rieder (2003, p. 28) concluded that “incidental learning [is] composed of implicit learning processes (which happens without the learner’s awareness) and/or of explicit learning processes (which takes place without learning intention) but nevertheless involves online awareness and hypothesis formation”.

Laufer and Hulstijn (2001) argued that the notions of incidental and intentional should not be confused with the concepts of implicit and explicit learning, or memory. They stated that explicit learning can occur both incidentally and intentionally, although implicit learning can only occur incidentally, “i.e. without learners’ awareness of an upcoming retention test, or without learners’ deliberate decision to commit information to memory” (p. 11).

Figure 2 blends these terms, so as to illustrate the points of convergence and divergence.

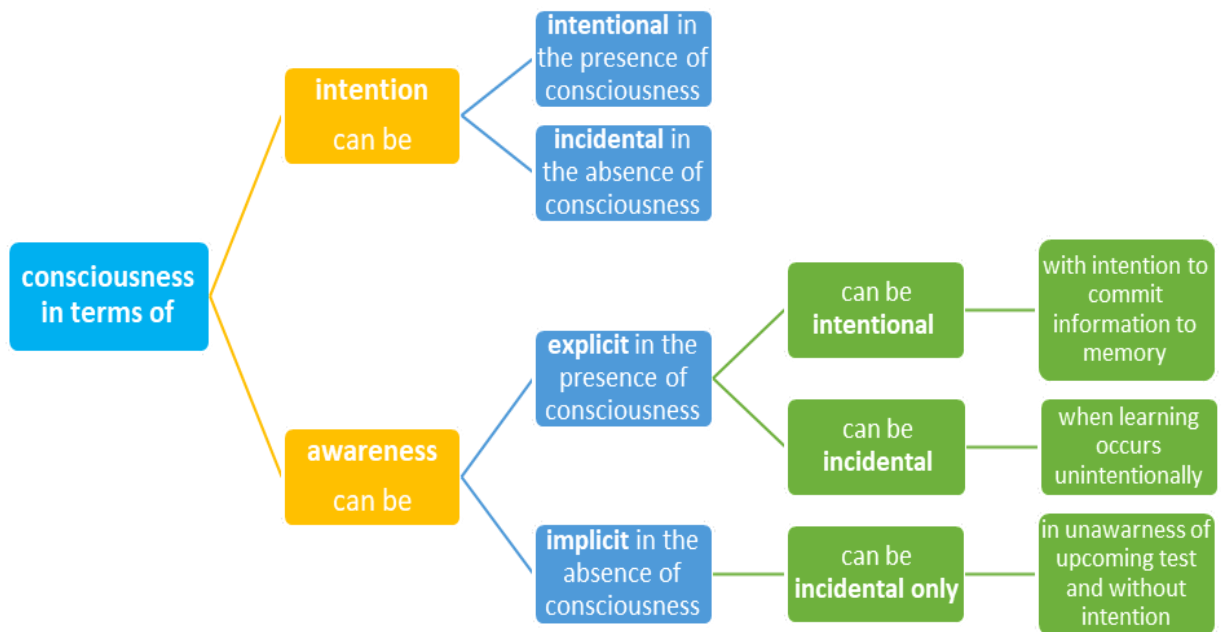


Figure 2. Differences between terms based on consciousness.

With regard to vocabulary learning, it is believed that vocabulary acquisition reflects both implicit and explicit learning processes, and that the acquisition of the phonetic and phonological features, and the articulation of new words, is learned implicitly. Meanwhile, connecting word form and meaning requires attention, and involves explicit and conscious learning (Ellis, 1994b). Similarly, Nation (2001) explained that learning a word involves knowing its form, meaning, and use, and he suggested the most effective types of learning and activities for each of these three dimensions (see Table 3.2).

Table 3.2. Types of vocabulary knowledge, and the most effective methods of learning (Nation, 2013, p. 60).

Kinds of knowledge		Kinds of learning	Activities
Form		Implicit learning involving noticing.	Repeated meetings as in repeated reading.
Meaning		Strong explicit learning.	Depth of processing through the use of images, elaboration, and deliberate inferencing.
Use	Grammar collocations.	Implicit learning.	Repetition.
	Constraints on use.	Explicit learning.	Explicit guidance and feedback.

Nation (ibid.) explained that different types of word knowledge are learned differently: knowledge of word form must be learned implicitly through activities that provide repeated encounters with the form, while word meaning is better learned explicitly through activities that encourage deep processing by using images, elaboration, and deliberate inferencing. According to Milton (2009), Ellis’s (1994b) views have implications for testing and measuring vocabulary knowledge, and if these views are true, then “measurements of vocabulary knowledge made using passive receptive vocabulary size tests would show considerable vocabulary gains from simple language exposure, while exposure would not yield gains if knowledge were measured by a translation test” (p. 219). However, since the focus of this study is on identifying VLSs in two different modes of vocabulary learning, the researcher will use meaning recalling tests, as the main test, to examine the potential effect of VLSs on vocabulary learning.

3.3.3 Incidental and intentional learning in L2 vocabulary pedagogy

Subsection 3.3.1 above has identified that learning L2 vocabulary incidentally refers to acquiring new lexical items from within a context without the intention to do so, in other words, learning new words as the by-product of other activities, without the intention to learn vocabulary. For example, when engaging in activities outside of the classroom, conversation,

and reading a text and processing new words as input by inferring their meanings, or employing the use of a dictionary. In contrast, intentional vocabulary learning refers to those activities that consciously seek to commit lexical information to memory, such as memorizing a list of new words, attempting to study novel words while viewing word picture pairs, or deliberately learning new words through reading a text (Barcroft, 2015; Hulstijn, 2001; Laufer & Hulstijn, 2001). Based on this notion, incidental vocabulary acquisition is sometimes misguidedly assumed to be unattended learning (Nemati, 2013). Laufer and Hill (2000) claimed that there is a growing body of research evidence that L2 learning, and principally adult L2 learning, is impossible without heed to an awareness of input (see Schmidt (2012) for an overview). This description of incidental learning as a ‘by-product’ of other cognitive activities has been criticized by other researchers, as it appears to ignore any active role the learner may play in the acquisition process. It has also been argued that heeding unfamiliar vocabulary is critical for any incidental acquisition to occur (Ellis, 1994a; Gass, Svetics, & Lemelin, 2003; Schmidt, 1990, 2001; Schmidt, 2012). If consciousness is associated with intentional learning, Ellis (1994a, p. 38) claimed that “incidental learning should be used to refer to situations where individuals learn without intent to learn, or when individuals learn one thing when their primary objective was to do something else”.

Another difference between incidental and intentional learning was described by Ellis (1999) as the difference between ‘peripheral’ and ‘focal’ attention. They argued that in the incidental/implicit learning condition, learners pay most attention to understanding the meaning of a message as a whole, although a degree of attention is allocated to focusing on the form. In contrast, in the intentional/explicit learning mode, the learner’s focal attention is deliberately centred on the language, and specifically on creating an association between form and meaning. Similarly, Schmidt (1990) claimed that a certain degree of consciousness is involved in the incidental learning process that occurs when a learner ‘notices’ a new word or

rule in the input. Barcroft (2015, p. 42) further confirmed that lexical input processing “must successfully take place regardless of whether the new word in question is acquired incidentally or intentionally”. Consequently, learning, whether it is intentional or incidental, cannot operate without a degree of attention.

According to Barcroft (2015), the above definition of incidental learning is an operational definition that may be helpful from a research methodology standpoint, however, the two criteria enclosed within the definition, in terms of no direct instructions to attempt to learn a target vocabulary, and no forewarning of upcoming vocabulary tests, do not guarantee that one or more learners may decide to learn the target words intentionally. For this reason, Barcroft (2015) suggested that “a more appropriate term to use in studies that adopt these criteria would be *incidentally oriented vocabulary learning*”. He justified this by explaining that the use of this term acknowledges that although the basic conditions of incidental vocabulary learning may have been met in a specific study, these conditions do not ensure that some learners will not decide to engage in learning vocabulary intentionally. As a result of this clarification, this current study employs the terms ‘incidental’ and ‘incidentally oriented’ interchangeably, for the most part, to avoid potential flaws in terms of the methodological approach. The following paragraphs will explore both the incidental and the intentional modes, illuminating their advantages and disadvantages in L2 vocabulary acquisition.

The focus of the extant literature in this field appears to suggest that the majority of vocabulary learning in both the L1 and the L2 occurs through incidental learning, such as from reading. According to Krashen (1989), an individual acquires their first language via incidental learning, as a result of gradual experience and input, rather than direct instruction. Therefore, some scholars believe that incidental learning accounts for a large part of acquired vocabulary, and only a small amount, perhaps as small as the first few thousand most frequently used words, results from intentional learning (Alahirsh, 2014; Day, Omura, & Hiramatsu, 1992; DeKeyser,

2008; Huckin & Coady, 1999; Nagy, Herman, & Anderson, 1985). The incidental learning of L2 vocabulary is contextual (Huckin & Coady, 1999), and thus can encompass words that cannot be intentionally learned the majority of the time, which can improve other skill areas, particularly reading, which is considered the main skill for increasing learners' lexicon knowledge (Allothman, 2014; Schmitt, 2010b).

Another major benefit of incidental learning is that it strengthens the ability to guess the meaning of a word from its context (Nation, 2007; Nation, 2013). As previously discussed in the context of strategies and depth of processing (see 2.4.4), guessing the meaning of novel words from their context usually involves the deep processing of vocabulary knowledge (Craik & Tulving, 1975), which is believed to improve retention. Read (2000) promoted the practice of guessing as “a desirable strategy because it involves a deeper process that is likely to contribute to better comprehension of the text as a whole and may result in some learning of the lexical item that would not otherwise occur”. In contrast, some scholars have claimed that the intentional de-contextualized learning of vocabulary, such as from a word list or paired-associations, is likely to produce a significant rate of forgetting (Mondria & Wit-de Boer, 1991; Oxford & Scarcella, 1994). These scholars claimed that when guessing, a L2 learner is performing a mental process concerning word form, and is attempting to associate its context with their previous knowledge. Consequently, all of these processes engender a cognitive position (Mondria & Wit-de Boer, 1991). Acknowledging the fact that incidental vocabulary learning is contextualized, Nagy (1997, cited in Allothman, 2014) argued that words with multiple meanings are better understood in terms of context through incidentally orientated vocabulary learning.

However, the incidentally orientated mode of learning vocabulary possesses a number of limitations. Some studies have shown that, in terms of guessing the meaning of new words through incidental learning, not all guessed words are necessarily acquired from reading

‘incidentally’ (Laufer, 2005; Sökmen, 1997). According to Nation (2001, 2013) the amount of incidental vocabulary learning gained from context is small, due to the various reasons reported in the literature, including firstly the fact that context in incidental learning requires ‘variability’ to facilitate learning vocabularies (Nation, 2001). Secondly, to learn a specific word from its context, the frequency of encountering that word should be at least 6 to 20 times (Zahar, Cobb, & Spada, 2001), while according to Nation (2001), 5 to 16 exposures are required. Thus, the context must be rich and informative to allow guessing and learning to occur (Nemati, 2013). Thirdly, learners must possess a good knowledge of guessing strategies, otherwise they are unable to infer the meaning correctly (Schmitt & McCarthy, 1997). Furthermore, due to their inadequate grasp of the target language skills, beginner L2 learners are less effective guessers, and hence less incidental learners of L2 vocabulary (Gu, 2003). If this is also true for intermediate to advanced learners, then guessing from context presents further challenges for beginner L2 learners who do not possess basic language skills in the target language (Gu, 2003; Nemati, 2013).

Another argument that has been advanced in terms of the limitations of incidental learning is that it can be a slow process, particularly when there are long gaps between learned-word to be encountered (Webb, 2008). However, intentional learning involves a deeper engagement and consciousness, which engenders better retention, and a robust and fast learning (Schmitt, 2010b). Therefore, in incidental learning, it may be necessary for L2 learners to spend large amounts of time reading, to acquire vocabulary (Carter & McCarthy, 1988).

According to Ellis (2015), intentional, or explicit, learning is a conscious operation wherein the learner forges and tests hypotheses regarding the words in question. It entails the application of vocabulary learning strategies on the part of the learner (Segler, 2001). The distinction between explicit and implicit learning forms the core of Krashen’s model that allows that both modes of learning occur, but which denies that there is any interference

between the two (Benthuysen, 2003). However, when considering the functioning of the memory system, psychologists and neuroscientists have found that interactions and associations exist between implicit and explicit memory systems, which in turn affects the development, consolidation, and connectivity of language learning (Ellis, 2015; Paradis, 2004).

Focused attention is one significant defining characteristic of intentional vocabulary learning (Barcroft, 2015), and the more attention a learner pays to morphological, orthographic, prosodic, semantic, and pragmatic features, the more likely it is that the new lexical knowledge will be retained (Hulstijn, 1993). It therefore appears that intentional vocabulary learning is a fundamental approach, while some explicit and deliberate vocabulary learning might be necessary as a prerequisite for acquiring L1 and L2 vocabulary incidentally through reading and listening (Schmitt, 2000). It has been suggested that certain intentional learning is crucial for L2 learners to achieve a vocabulary ‘threshold’ that enables vocabulary learning to occur incidentally through reading (Schmitt, 2000). Grabe and Stoller (2013) recommended that any explicit word activity should focus on the 2,000 to 3,000 most frequently-used words in a language to create an essential foundation for the automaticity of word-recognition. According to Nielsen (2006), at the early stages of language development, ‘de-contextualized’ vocabulary learning has been found to be more effective in building a central vocabulary than contextualized reading. Thus, he suggested that the teaching and learning of L2 vocabulary should include a greater amount of de-contextualized vocabulary instruction in the form of word lists, and that this amount should be gradually evolved towards a more context-based form of vocabulary learning as the language ability of the learners develops.

In summary, learners at later stages of their language development are expected to be more capable of learning vocabulary incidentally than beginners, and also more able to guess words within authentic contexts. However, according to Allothman (2014), “this [belief], unfortunately, may have resulted in the limiting of the use of explicit teaching of vocabulary

to advanced students” (p. 55). From the experience of the author of this thesis in teaching Arabic as L2, if this situation is true of the English language, it is also true of Arabic. Moreover, textbooks may not provide sufficient opportunities for repeated encounters with vocabulary (Matsuoka & Hirsh, 2010; Milton, 2009). Hence, there is a lack of cohesive opinion regarding the effective modes of learning vocabulary for advanced L2 learners (Allothman, 2014; Nation, 2013), and it appears that some intentional focus is essential to develop skills and strategies, even for advanced L2 learners, such as guessing from the context of the word, which will empower the learners to progress their language learning successfully (Nation, 2013). Furthermore, it has been suggested by many scholars that incidental learning should not be employed as a central approach for learning L2 vocabulary, as it does not appear to be a practical method by itself; rather, it should be accompanied by a degree of intentional learning, and both learning modes should be considered to enhance the other (Alahirsh, 2014; Nation, 2013; Schmitt, 2008a).

In the following section and subsections, vocabulary learning strategies (VLS) will be discussed, including definitions of language learning strategies (LLS) in general, together with their features. This will be followed by a review and discussion of the common taxonomies of LLS and VLS, and a critical debate of LLS and VLS taxonomy.

3.4 Vocabulary learning strategies

VLS are considered to be a sub-class of LLS. The status of VLS within the group of LLS is reflected in the fact that the majority of LLS are VLS, including all of the memory strategies in Oxford’s (1990) LLS taxonomy. Therefore, the following paragraphs will discuss the definitions, characteristics, and categories of general LLS.

3.4.1 Definition of LLS

It is difficult to define LLS, since there is a lack of consensus regarding the definition of the term ‘learning strategies’(Ellis, R. 1994). This demonstrates the complexity of the concept of learning strategies, and the dissimilar ‘perspectives’ that researchers adopt in defining the phenomenon, according to the context of their own research (Nemati, 2013; Takač, 2008). Table 3.3 provides a sample of the definitions that have been employed for the term ‘language learning strategies’ illustrating the differences between them.

Table 3.3: Definitions of LLS.

<i>Source</i>	<i>Definition</i>
Bialystok (1978, p. 71)	Optional means for exploiting available information to improve competence in a second language.
Tarone (1983, p. 67)	Attempts to develop linguistic and sociolinguistic competence in the target language.
Weinstein and Mayer (1986, p. 315)	Behaviors and thoughts that a learner engages in during learning that are intended to influence the learner’s encoding process.
Chamot (1987, p. 71)	Techniques, approaches, or deliberate actions that students take to facilitate the learning and recall of both linguistic and content area information.
Rubin (1987, p. 29)	The process by which information is obtained, stored, retrieved, and used.
Wenden (1987, p. 6)	Language learning behaviors learners actually engage in to learn and regulate the learning of a second language.
Willing (1988, p. 7)	Specific mental procedure for gathering, processing, associating, categorizing, rehearsing, and retrieving information or patterned skills. It is, in short, an act of learning viewed at the micro-level. It is the basic unit of learning.
O’Malley and Chamot (1990, p. 1)	The special thoughts or behaviors that individuals use to help them comprehend, learn, or retain new information.
Oxford (1990, p. 8)	Specific actions taken by the learner to make learning easier, faster, more enjoyable, more self-directed, more effective, and more transferrable to new situations.
MacIntyre (1994, p. 185)	Techniques to facilitate language learning that are deliberately chosen by the learner.

Cohen (1998, p. 5)	[They] constitute the steps or actions consciously selected by learners either to improve the learning of a second language, the use of it, or both.
Purpura (1999, p. 6)	Conscious or unconscious techniques or activities that students invoke in language learning, use or testing.

The focus of the early definitions, such as those of Bialystok (1978) and Tarone (1983), concerned the outcome of the use of LLS, which is to say, linguistics or sociolinguistics, whereas recent definitions have emphasized the characteristics and processes of LLS. Some definitions are very broad, while others are more specific. The definition offered by Wenden (1987), for instance, is very general, as it includes the different decisions, behaviours, and actions in which learners engage to acquire L2 languages. Some definitions employ human cognitive processing theory to define LLS as a form of information processing technique that can govern the learning, comprehension, and storage of knowledge of a language (Chamot, 1987; O'Malley & Chamot, 1990). The definitions of LLS presented in Table 3.3 also reflect a number of problematic issues regarding the terminology used, and the type of processing and consciousness involved (Al-Shuwairkh, 2001). In order to achieve an operationalization for this study, these issues will be discussed briefly in the following sub-sections.

3.4.1.1 Terminology

In the extant research concerning LLS, several terminologies have been employed to define the construct 'strategy'. For example, techniques, tactics, approaches, behaviours, and actions. Two of these terms, 'technique' and 'tactic', have particularly been used with regard to learning strategies. Stern (1986) distinguished between techniques in terms of them being learners' specific actions employed in learning, and learning strategies as general approaches. Likewise, Goh (1998) differentiated between tactic and strategy in terms of tactic referring to a specific action, and strategy as a general approach to language learning. According to Cohen (1998) it is more appropriate to use the term 'strategy' to refer to all of the activities employed in learning, since it allows for the emphasis to shift from general categories to more specific

strategies. Currently, researchers employ the terms ‘tactic’, ‘technique’, and ‘learner strategy’ interchangeably (Takač, 2008).

3.4.1.2 Kind of processing

There is also a lack of certainty regarding whether LLS are behavioural or mental activities, or both. According to Oxford (1990, p. 11) LLS are “specific actions or behaviours” employed by learners to enhance their learning. For example, note-taking, planning for a language task, and self-evaluation. Oxford (ibid., p.11) explained that LLS are beyond mental cognition or functions, such as mental processing and the manipulation of the new language, as they also involve metacognitive strategies, such as “planning, evaluating, and arranging one’s own learning; and emotional (affective), social, and other functions as well”.

3.4.1.3 Consciousness

The issue of consciousness and LLS remains controversial. Consciousness in LLS constitutes the backbone of the current theses, and reveals the precise differences between intentional and incidental vocabulary learning strategies. Many researchers appear to agree that learning strategies are intentional and conscious actions, (e.g. Chamot, 1987; MacIntyre, 1994). However, like any other skill or behaviour, the use of learning strategies can become ‘automatic’, or subconscious (Oxford, 1990; Purpura, 1999).

In summary, it seems safe to conclude that the majority of LLS are conscious, potentially conscious, or subconscious, depending on individual learners, and the type of tasks in which the learners engage (Takač, 2008).

Due to these problematic issues in the defining of LLS, O’Malley and Chamot (1990) suggested that, for the purpose of conducting research, specific strategy terms and operational definitions to describe strategic processing should be employed. Accordingly, Willing (1988, p. 7) definition of LLS was adopted for the current study, as it concerned the “specific mental procedure[s] for gathering, processing, associating, categorizing, rehearsing, and retrieving

information or patterned skills". This definition involves both cognitive and metacognitive strategies, and suited the objective and purpose of this study, as it sought to identify the strategies employed by L2 learners during intentional and incidentally-oriented vocabulary acquisition. Furthermore, the focus of this study concerned both the deliberate and the incidental actions that are utilized by L2 learners to acquire vocabulary.

Oxford (1990, pp. 9-13) summarized the features of LLS in the following 12 key points:

- 1- Contribute to the main goal, communicative competence;
- 2- Allow learners to become more self-directed;
- 3- Expand the role of teachers;
- 4- Are problem-oriented;
- 5- Are specific actions taken by the learner;
- 6- Involve many aspects of the learner, not just the cognitive;
- 7- Support learning both directly and indirectly;
- 8- Are not always observable to the human eye;
- 9- Are often conscious, however, like any other skill or behaviour, the use of learning strategies can become automatic;
- 10- Can be taught;
- 11- Are flexible;
- 12- Are influenced by a variety of factors.

Some of these points require clarification, particularly those numbered five, six, seven, eight, and nine, which relate directly to the purpose of the current study, and contributed to the formulation of its methodology. LLS allow L2 learners to be self-directed, by selecting an appropriate strategy based on the task requirements. Many aspects of LLS should be included, such as memory, cognitive, metacognitive, and social learning strategies. These aspects of LLS allow learning to occur both explicitly and implicitly. The vast majority of LLS are conscious

and intentional, however, some the consciousness of some are not observable by the human eye. In addition, certain automatic ‘unconscious’ strategies exist that require special techniques to observe. This inspired the drawing of a comparison between intentional and incidental methods of learning in the current study, and an examination of those strategies employed in incidental learning modes, by utilizing the eye-tracking technique.

3.4.2 Taxonomies of VLS

As a result of the emergence of the concept of LLS, researchers have attempted to connect these strategies with other aspects of language, such as vocabulary. Studies such as that conducted by O'Malley and Chamot (1990) confirmed that most LLS are also employed for vocabulary tasks. Similarly, all memory strategies based on Oxford's (1990) taxonomy can be employed for vocabulary learning tasks, the effect of which motivated Schmitt (1997) to base his VLS taxonomy on Oxford's LLS classification.

Since the current study concerned the effectiveness of learner-selected strategies on short and long-term word retention in both intentional and incidental vocabulary learning, the researcher selected two models of VLS taxonomies to classify the participant-selected strategies. The first referred to research conducted by Schmitt (1997), and the second related to research conducted by Nation (2001, 2013). Reference was also made to the research conducted by Rubin (1987), O'Malley and Chamot (1990), and Oxford's LLS classification, as these are frequently cited in the extant literature, and represent the basic approach to VLS taxonomies.

3.4.2.1 Rubin's (1987) taxonomy of LLS

Rubin (1987) provided one of the earliest classification system of LLS. Her taxonomy system consisted of two broad categories: direct contributory strategies to language learning, and indirect contributory strategies to language learning. These two categories were further divided into three primary categories: learning strategies under the direct category, and

communicative and social strategies under the indirect system of learning. As illustrated in Figure 3 below, the direct strategies involve learning strategies that can be divided into cognitive and metacognitive strategies. In contrast, the indirect strategies involve communicative and social strategies.

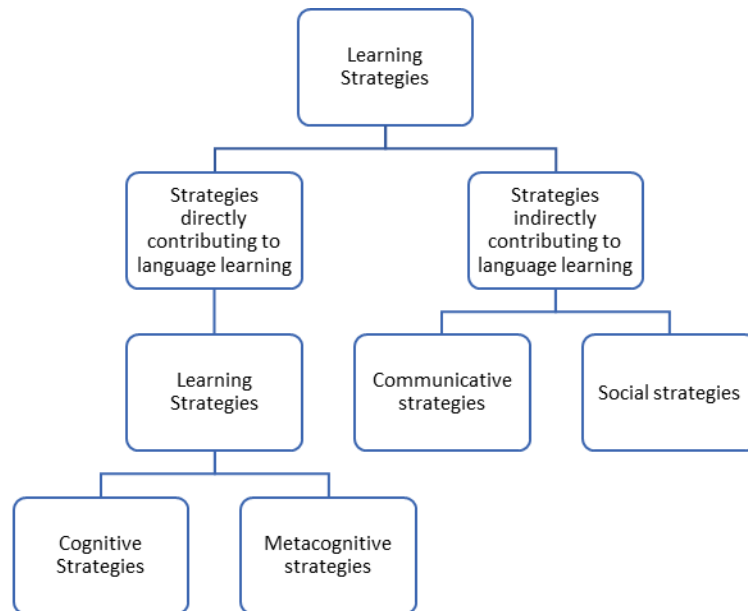


Figure 3. Rubin’s classification of LLS (Source: Rubin, 1987).

Learning strategies are those that “contribute to the development of the language system which the learner constructs and affects learning directly” (Rubin, 1987, p. 23). These involve two categories: cognitive and metacognitive strategies.

1- Cognitive strategies concern the mental steps or actions employed in learning or problem solving that require analysis, transformation, or a synthesis of learning materials. Rubin suggested six cognitive learning strategies:

- **Clarification/verification** is the process of attempting to clarify and confirm the rules and regulations being learned in the target language;
- **Guessing/inductive inferencing** is the use of prior knowledge and available information to infer the meaning of new items;

- **Deductive reasoning** is the process of seeking more general rules, such as finding organization and patterns in the target language;
- **Practice** refers to strategies such as repetition, imitation, and rehearsal that contribute to the storage and use of language, focusing on accuracy;
- **Memorization** is similar to practice, but focuses on storage and retrieval, rather than accuracy;
- **Monitoring** is thought to be a combination of cognitive and metacognitive strategies in which the learner directs their attention to linguistic and communicative errors, and then affects decisions about them.

2- **Metacognitive strategies** are related to knowledge concerning language learning, and the regulation of strategies involving self-directed learning through planning of learning, thinking about the learning process, monitoring of performance and comprehension, and the evaluation of results and the learning process.

- **Communicative strategies** include using one's linguistic and communicative knowledge to maintain continuity in a conversation. They involve, for example, the use of synonyms, cognates, gestures, circumlocution, and repetition utterances. Employing communicative strategies may be helpful for learning, although they do not specifically contribute to direct learning, since their focus primarily concerns better communication, and they therefore simply assist learning.

- **Social strategies** allow learners to practise and expand their knowledge of the target language. They involve creating various opportunities to initiate communication in the target language, using facilities such as TV and radio, reading books, and attending parties where it is possible to practice. As with communicative strategies, social strategies do not contribute to direct learning, and instead are employed to create a suitable environment for practising language.

3.4.2.2 O'Malley and Chamot's (1990) taxonomy of LLS

Another frequently used LLS taxonomy is that developed and refined by O'Malley, Chamot, and their colleagues (Chamot, 1987; Chamot & Kupper, 1989; O'Malley & Chamot, 1990; O'Malley, Chamot, Stewner-Manzanares, Kupper, & Russo, 1985) through a series of studies involving strategy instruction, think-aloud procedures, interviews, and classroom observation. O'Malley and Chamot (1990) developed three types of strategies: (1) cognitive strategies; (2) metacognitive strategies; and (3) social/affective strategies.

1- **Cognitive strategies** are mental operations for storing and retrieving information. They comprise repetition, resourcing, translation, grouping, note-taking, deduction, recombination, imagery, auditory representation, keyword method, elaboration, transfer, and inferencing;

2- **Metacognitive strategies** relate to self-management procedures that involve planning, directed attention, selective attention, self-monitoring, problem identification, and self-evaluation;

3- **Social/affective strategies** involve interacting with other people, or employing effective control to assist learning, and include asking questions for purposes of explanation, cooperation, and self-talk.

3.4.2.3 Oxford's (1990) taxonomy of LLS

Based on a series of research projects, Oxford (1990) produced the most comprehensive and detailed classification of learning strategies, known as the Strategy Inventory for Language Learning (SILL), which is a method for assessing learning strategies. This inventory has been used in a considerable amount of research in SLA. According to Oxford and Burry-Stock (1995), the SILL has been employed as one of the central data collection instruments in at least 40 to 50 major studies, involving approximately 8,000 to 8,500 language learners. This learning strategy system includes two major classes of direct and indirect strategies. Each class involves

three groups: the first main class contains memory, cognitive, and compensation strategies, and the second main class contains social, metacognitive, and affective strategies.

Memory strategies consist of approaches that help to process, store, and relate new material to an existing knowledge system. Examples of these strategies include grouping, applying images and sounds (keyword method), and structured reviewing.

Cognitive strategies concern the common function of manipulation or transformation of the target language by the learner. Examples of these strategies are practising by repeating, using resources for receiving and sending messages, translation, and taking notes.

Compensation strategies involve different ways of compensating for missing knowledge. For instance, guessing intelligently by employing linguistic clues, switching to the mother tongue, and selecting the topic.

Metacognitive strategies involve a conscious overview of the learning process; decisions are made with regard to planning, monitoring, or evaluating the best ways to study. Examples of this group of strategies include paying attention, organizing, seeking practice opportunities, and self-monitoring.

Affective strategies exhibit how to manage one's emotions, attitudes, and motivation in language learning. Among the affective strategies are making a positive statement, using a checklist, discussing feelings with someone else, using mediation, and rewarding oneself.

Social strategies involve learners using their interactions with others help to facilitate their learning, and to develop cultural understanding. Examples of these strategies include asking for clarification or verification, asking for correction, cooperating with others, and becoming aware of others' thoughts and feelings.

The direct and indirect strategies within this taxonomy correspond to those of Rubin (1987). With regard to the nature of the present study, which concerns short- and long-term

memory retention in both intentional and incidental vocabulary learning, it was possible to adopt two groups of direct strategies: memory and cognitive strategies.

Having discussed the most popular taxonomies of LLS, the following section focuses on specifically on VLS classification.

3.4.2.4 Schmitt's (1997) VLS taxonomy

Schmitt (1997) claimed that the lack of attention given to VLS is due to the lack of a comprehensive list, or taxonomy, of VLS, and he therefore compiled a list of VLS, based on the following sources. First, vocabulary reference books and textbooks were examined to provide the majority of the initial strategies. Second, Japanese intermediate level students were asked to report on their methods of studying English vocabulary words. Third, several teachers were asked to review the list, and to add any strategies they had become aware of through their own experience. Schmitt's taxonomy was then organized according to both Oxford's (1990) system, and Cook and Mayer's (1983) discovery and consolidation strategies. However, Schmitt only adopted four strategy groups from Oxford's classification: social, memory, cognitive, and metacognitive, arguing that no category in Oxford's system adequately described the kinds of strategies employed by individuals when discovering a new word's meaning, without consulting other people. As such, he added the category of 'determination strategies' to the taxonomy.

The updated version of Schmitt's taxonomy of VLS contained six large categories, incorporating 58 individual strategies. These were divided into discovery strategies, and consolidation strategies. Discovery strategies included (1) determination strategies, or *discovery-determination*, which analyse parts of speech by checking for L1 cognate, and guessing from textual context, word lists, and flash cards; and (2) social strategies, or *discovery-social*, which involve asking the teacher for L1 translations, asking classmates for meanings, and discovering meaning through group work activities. Consolidation strategies

involve (1) social strategies that employ group work to learn or practice vocabulary. In other words, the social context enhances the motivation of the participants, while cooperative learning may involve preparing the participants for ‘team activities’ outside the classroom, where they have more time to use the manipulated language. Consolidation strategies also involve (2) memory strategies, which constitute relating the word to be retained with previously acquired knowledge, often employing some form of imagery, or grouping of pictures, related words, unrelated words, or orthographical forms; (3) Cognitive strategies, which encompass those similar to memorization, although they do not focus specifically on manipulative processing, instead employing repetition and mechanical means to study vocabulary, including word lists, flash cards, and note-taking; and (4) Metacognitive strategies, which involve the use of language media, self-administered words tests, using spaced word practice, skipping new words, and continuing to study new words over time. Table 3.4 presents the final versions of Schmitt’s VLS taxonomy.

Table 3.4: Schmitt's VLS taxonomy (Source: Schmitt, 1997, pp.207-208).

<i>Strategies for discovering a new word's meaning</i>	
DET	Analyse part of speech.
DET	Analyse affixes and roots.
DET	Check for L1 cognate.
DET	Analyse any available pictures or gestures.
DET	Guess from textual context.
DET	Bilingual dictionary.
DET	Monolingual dictionary.
DET	Word lists.
DET	Flash cards.
SOC	Ask teacher for an L1 translation.
SOC	Ask teacher for paraphrase or synonym of the new word.
SOC	Ask teacher for a sentence including the new word.
SOC	Ask classmates for meaning.
SOC	Discover new meaning through group work activities.
<i>Strategies for consolidating a word once it has been encountered</i>	
SOC	Study and practice meaning in a group.
SOC	Teacher checks students' flash cards or word lists for accuracy.
SOC	Interact with native speakers.
MEM	Study the word with a pictorial representation of its meaning.
MEM	Image the word's meaning.
MEM	Connect the word with personal experience.
MEM	Associate the word with its coordinates.
MEM	Connect the word with its synonyms and antonyms.
MEM	Use semantic maps.
MEM	Use 'scales' for gradable adjectives.
MEM	Peg Method.
MEM	Loci Method.
MEM	Group words together to study them.
MEM	Group words together spatially on a page.
MEM	Use new words in sentences.
MEM	Group words together within a storyline.
MEM	Study the spelling of a word.
MEM	Study the sound of a word.
MEM	Say new word aloud when studying.
MEM	Image word form.
MEM	Underline initial letter of the word.
MEM	Configuration.
MEM	Use keyword method.
MEM	Affixes and roots (remembering).
MEM	Part of speech (remembering).
MEM	Paraphrase the word's meaning.

MEM	Use cognates in study.
MEM	Learn the words of an idiom together.
MEM	Use physical action when learning a word.
MEM	Use semantic feature grids.
COG	Verbal repetition.
COG	Written repetition.
COG	Word lists.
COG	Flash cards.
COG	Take notes in class.
COG	Use the vocabulary section in text book.
COG	Listen to tape of word lists.
COG	Put English labels on physical objects.
COG	Keep a vocabulary notebook.
MET	Use English-language media (songs, movies, newscasts, etc.).
MET	Test oneself with word tests.
MET	Use spaced word practice.
MET	Skip or pass new word.
MET	Continue to study word over time.

Since the present study concerned intentional and incidental L2 vocabulary learning within short- and long-term word retention, the most relevant strategies available to the participants were memory and cognitive strategies.

3.4.2.5 Nation's (2001, 2013) VLS taxonomy

Nation (2001) distinguished among the strategies relating to (1) the *planning* of vocabulary learning, including word choice, aspects of word knowledge strategies, and planning repetition; (2) the *sources* for finding information about words, including word analysis and context, consulting a reference source in L1 or L2, and using parallels in L1 or L2; and (3) *Process* strategies as ways of establishing vocabulary knowledge, including noticing, retrieving, and generating. Table 3.5 displays Nation's VLS taxonomy.

Table 3.5: Nation's VLS taxonomy (Source: Nation, 2001, p.218).

General class of strategies	Type of strategies
Planning: choosing what to focus on and when to focus on it.	Choosing words.
	Choosing the aspects of word knowledge.
	Choosing strategies.
	Planning repetition.
Sources: finding information about words.	Analysing the word.
	Using context.
	Consulting a reference source in L1 or L2.
	Using parallels in L1 and L2.
Processes: establishing knowledge.	Noticing.
	Retrieving.
	Generation.

A close examination of the third general class of Nation's VLS classification processes strategies enabled the observation that these strategies appear to be the most closely related to the participants of the current study. Furthermore, an examination of the three sub-strategies of processing strategies of noticing, retrieving, and generating, revealed that these strategies may relate to the cognitive strategies included under the classification of consolidation strategies groups in Schmitt's (1997) VLS taxonomy. According to Nation (2013), repetition is the first step toward deeper information processing. Moreover, both retrieval and generation can take several forms, for instance, receptive/productive, oral/visual, hidden/open, and contextualized/decontextualized, all of which engender better target word recall, and thus may refer, in part at least, to the memory and cognitive strategies classified by Schmitt (1997).

3.4.3 Criticism of LLS taxonomies

While the taxonomies of LLS, as well as those of VLS, have been criticized by some researchers, the fact that O'Malley and Chamot based their taxonomy of LLS on the information-processing model of learning developed by Anderson (1980) has strengthened their classification system, since the theory was based on empirical evidence obtained from a series of studies (Al-Shuwairkh, 2001; Erten, 1998). However, this system of classification has attracted a certain amount of criticism from researchers, and it has been argued that certain

classifications, such as ‘selective attention’, and ‘directed attention’ are very similar, and thus produce overlapping and coding errors (Young, 1996).

Meanwhile, Kayaoglu (1997) claimed that Oxford’s (1990) LLS taxonomy is very systematic, in that its individual strategies, as well as its strategy groups, are connected with each of the productive and receptive skills, such as writing, speaking, reading, and listening. Hence, it aims to provide information not only about the type of strategy, but also about the type of task and setting in which the strategy might be employed. Furthermore, issues have been raised in the related literature concerning Oxford’s classification system. O’Malley and Chamot (1990), argued that Oxford’s SILL has no cognitive-theoretical basis, and contains overlapping sub-categories. In response to this criticism, Oxford (1992, p. 20) claimed that her system “is based on the theory that the learner is a ‘whole person’ who uses intellectual, social, emotional, and physical resources and is therefore not merely a cognitive/metacognitive information-processing machine”. Tseng, Dörnyei, and Schmitt (2006) also criticized Oxford’s SILL, arguing that, since the items of the SILL are behavioural, a linear relationship cannot be assumed between the score of each item, and the total score. For instance, one can be inactive in using cognitive strategies in general, while obtaining high scores in certain items in the cognitive scale. “Thus the scales in the SILL are not cumulative and computing mean scale scores is not justifiable psychometrically” (p. 82). This criticism can also be applied to Schmitt’s (1997) taxonomy, which was based on Oxford’s (1990) taxonomy. Furthermore, in Schmitt’s VLS taxonomy, as in most LLS taxonomies, there is a degree of overlap between the categories, for example, cognitive and memory strategies, which engenders difficulty in differentiating between them (Aljdee, 2008).

Therefore, in terms of results and interpretation, the current study considered not only the broader categories of VLS, but also with each individual strategy used, as being a most frequent strategy. However, since the current study sought to identify the most frequent

strategies selected by L2 learners themselves in intentional and incidental vocabulary learning, the participants were not provided with a list of strategies to choose from, rather they were instructed to complete a self-reporting questionnaire regarding the strategies they employed when attempting to learn new vocabulary. The researcher selected Schmitt (1997), and Nation's (2001, 2013) models of VLS taxonomies to merely classify the participant-selected strategies in the present study, since these two models have been widely employed in many research studies to assess and classify VLS, for example, (e.g. Al-Shuwairkh, 2001; Aljdee, 2008; Barcroft, 2009; Fan, 2003).

3.5 Review of studies of intentional and incidental vocabulary learning

The purpose of this section is to review the related research that has been conducted with regard to VLS, to effectively position this present study in its proper research context. The studies are described according to four main sets: 1- key research regarding VLS in general; 2- key research regarding learner selected strategies in intentional vocabulary learning; 3- research regarding incidental vocabulary learning; and 4- research using the eye-tracking technique to investigate vocabulary learning. The research reviewed included that which was designed to identify and assess the VLS utilized by L2 learners, which was the focus of this present study. This section presents an evaluation of the studies, and their relevance to the context of the present study, together with highlighting the implications of various studies for the same. The extant research was reviewed in terms of the following:

- The language of the study;
- The participants, together with their first languages and ages;
- The types of strategies investigated;
- How the relationship between the strategy use and success in vocabulary learning was explored;
- The results and data-gathering techniques for each study.

Having investigated the effects of the various strategies that can be employed for vocabulary learning in terms of learners' acquisition of new vocabulary items, this section highlights the influential and fruitful pedagogical implications regarding how best to teach, learn, and acquire new lexical items. In this context, Barcroft (2009, p. 74) categorized the previous studies, and their contributions to the development of the taxonomies of VLS as follows:

(1) Research clarifying the strategies used by L2 learners over time (Sanaoui, 1995; Schmitt, 1997; Schmitt & Schmitt, 1993);

(2) Research revealing the positive relationship between several strategies and vocabulary learning performance (Ahmed, 1989), and the relationship between explicit strategies and vocabulary proficiency (Fan, 2003; Gu & Johnson, 1996);

(3) Research on the effects of mnemonic strategies, such as the keyword method, on intentional vocabulary learning (Atkinson & Raugh, 1975; Brown & Perry, 1991; Ellis, 1995a); and

(4) Research on the strategies selected by learners themselves during intentional vocabulary learning (Barcroft, 2009; Lawson & Hogben, 1996).

However, the focus of such studies has remained narrow, targeting only intentional VLS. Therefore, it appeared that a need existed to investigate those VLS used and selected by L2 learners themselves, during both intentional and incidental learning modes, along with their impact on immediate- and delayed post-tests retention, which was the focus of the current study.

3.5.1 Studies concerning VLS

3.5.1.1 Ahmed's (1988) think-aloud study

Ahmed's (1988) study was one of the first to address LLS. It explored VLS with 300 Sudanese students learning English as a foreign language in both private and public schools at

Al-Khartoum University. The author collected data through the use of observation, think-aloud protocol questionnaires, and interviews, to investigate strategy use, and its relationship with vocabulary performance at each individual educational level, and to discover whether any differences existed between successful and underachieving learners in their strategy use. Through this approach, Ahmed sought to identify the categories and range of use of VLS by learners of English at all levels of education in Sudan, to describe them qualitatively, and to explore the relationship between certain aspects of strategy selection and use. He identified and classified five macro strategies and 38 micro strategies, defining macro strategies as general learning behaviours involving information sources, dictionary use, memorization, practice, and note taking, while micro strategies were defined as specific examples for conducting the former type, such as employing the use of a newly learned word by writing a letter.

Ahmed's study indicated that, at the macro strategy level, there was little evidence for a distinction between successful and underachieving learners. The majority of his subjects employed macro strategies, and the main difference between the learners was found to lie in the choice of the specific micro strategies adopted within each macro strategy. Another finding revealed by this study was that the three macro strategies of using sources to obtain information about new words, memorization, and note taking, appeared to be common to all of the participants, while practice strategy was the only macro strategy that distinguished the successful from the underachieving learners.

Overall, the findings of Ahmed's study concluded that successful learners not only employed more VLS than underachieving learners, but also depended heavily on different strategies. The successful learners also seemed to be more aware of what they could learn about new lexical items, and more aware of the significance of context in vocabulary learning. In contrast, the underachieving learners demonstrated little awareness of what they could learn regarding new words, and also did not display any interest in learning vocabulary in context.

These findings appear to concur with the results of other research, such as that conducted by Gu and Johnson (1996), Lawson and Hogben (1996), and Sanaoui (1995), as discussed below.

The type of VLS identified in Ahmed's study may share some general similarities with the findings of the current study, regarding the selection and use of strategies in intentional and incidental learning. However, Ahmed did not examine the effect of the strategy use on vocabulary delayed retention at intentional, or incidental, modes of learning, which this study has addressed.

3.5.1.2 Sanaoui's (1993, 1995) diary study

An important addition to the literature was Sanaoui's (1995) research, in which she conducted three series of longitudinal studies (1990, June; 1992; 1993, April). First, an exploratory inquiry examined the approaches to vocabulary study employed by 50 advanced and beginner learners, registered on an intensive English as a second language (ESL) programme. Second, case studies of four ESL learners' approaches to vocabulary learning, and mnemonic procedures were conducted in the context of the same language programme. A third investigation involved eight case studies of adult learners of French as a second language. These three studies sought to answer two questions: how do adults learning a second language approach the task of vocabulary learning? And what mnemonic procedures do they employ to help themselves retain the lexical items they are learning? As part of the exploratory study, the participants were asked to monitor and document daily the approaches they adopted for learning vocabulary during a six-week vocabulary course, and they were also asked to discuss their strategies with other participants. Similar procedures for data collection were utilized for the second and third studies, which were followed by interviews based on the information that the participants recorded in their diaries. The results of these studies identified two distinctive approaches to L2 vocabulary learning: a structured approach, and an unstructured approach. The two approaches differed in terms of five aspects:

- 1) The extent to which the learners engaged in independent study;
- 2) The range of self-initiated learning activities in which the learners engaged;
- 3) The extent to which the learners recorded the vocabulary items they were learning;
- 4) The extent to which the learners reviewed such records;
- 5) The extent to which the learners practised using vocabulary items outside of their language classes.

Considering the above outcomes, Sanaoui concluded that while some adult students were capable of independently and actively managing their own learning, others required far more support to develop learning strategies, and to increase their self-awareness. Meanwhile, in terms of the mnemonic strategies, the participants reported employing the following: writing the lexical items, immediate repetition, spaced repetition, using the word, contextual associations, linguistic associations, imagery associations, discussing the lexical item with another person, drawing a pictorial representation of the word, and performing the word. These strategies appeared to be consistent with those reported in other vocabulary strategy research, such as that conducted by Ahmed (1988) and Schmitt, (1997).

The results also indicated that the learners' approaches to vocabulary learning contributed significantly to their lexical learning, as measured by vocabulary tests, in which the participants who employed a structured approach performed significantly better than those who employed an unstructured approach. See Table 3.6 for further details, and the differences between the structured and unstructured approaches to vocabulary learning.

Table 3.6. Features of a structured and an unstructured approach to vocabulary study (Source: adapted from Sanaoui (1995, p. 24).

Structured approach	Unstructured approach
Opportunities for learning vocabulary.	
Self-created.	Reliance on course.
Independent study.	Minimal independent study.
Range of self-initiated activities:	
Extensive.	Restricted.
Records of lexical items:	
Extensive (tend to be systematic).	Minimal (tend to be ad hoc).
Review of lexical items:	
Extensive.	Little or no review.
Practice of lexical items:	
Opportunities in and outside the classroom.	Reliance on course.

Sanaoui also found that the learners' level of proficiency, and the type of instruction they received, did not affect their learning of vocabulary. On the basis of these findings, Sanaoui concluded that the learners' approaches to vocabulary study were a central factor in predicting the outcome of their vocabulary learning. Thus, she suggested that helping learners to govern their own learning of lexis is an important step in vocabulary learning and teaching in L2 classrooms. However, Sanaoui (1993, 1995) did not report on which specific strategies possessed the strongest effect on vocabulary performance. Additionally, the simple structured and unstructured classification might conceal a variety of differences among the learners (Al-Shuwairekh, 2001; Kojic-Sabo & Lightbown, 1999). Accordingly, when considering the two groups of participants in terms of English and Chinese, from different backgrounds, engaged in the different modes of vocabulary learning of intentional and incidental, the current study not only identified further types of strategy, such as memory and cognitive, but also presented the potential effects of these strategies with regard to the acquisition and retention of L2 lexical items.

3.5.1.3 Stoffer's (1995) questionnaire study

Stoffer (1995; 1997) directed a study involving 707 English speakers from different age groups, including both young adults and adults, enrolled in French, German, Japanese, Russian,

and Spanish classes in the USA. Her study assessed foreign language learners' use of VLS in relation to the variables of individual differences, such as proficiency level, previous language learning experience, previous instruction in VLS, age, and gender. From the findings of her pilot and main studies, she was able to develop the Vocabulary Learning Strategy Inventory (VOLSI), which included a questionnaire containing 53 items designed to evaluate VLS. She employed a factor analysis to classify these categories, resulting in an inventory consisting of the following nine categories:

- 1- Strategies involving authentic language use;
- 2- Strategies used for self-motivation;
- 3- Strategies used to organize words;
- 4- Strategies used to create mental linkages;
- 5- Memory strategies;
- 6- Strategies involving creative activities;
- 7- Strategies involving physical actions;
- 8- Strategies used to overcome anxiety;
- 9- Auditory strategies.

The inventory was developed based on the Oxford's SILL (1990) (see Section 3.4.2.3 for more details concerning Oxford's classifications).

Stoffer's study also demonstrated that the most significant factors affecting strategy use were previous training in how to use VLS, followed by previous language learning. When the learners faced difficulties in the target languages, such as Japanese and Russian, they reported using a higher number of strategies. The most frequently employed set of strategies for learners of German, French, and Spanish was creating mental linkages, such as learning related topics together, and sound association, whereas learners of Russian reported employing memory strategies, such as oral repetition, and using flash cards, most frequently. This outcome justifies

the suggestion emphasized in the current study that the target language being learned, which was Arabic in this case, and its distance from the LI of English and Chinese, may have an influence on the learners' approach to the learning strategy they employed. Consequently, learners of Arabic as a second language (ASL) may utilize different patterns of strategies from those reported by Stoffer's participants, or those reported by the other subjects who participated in the research studies reviewed in this chapter.

The findings of Stoffer's study also revealed that learners' language proficiency level appeared to affect the strategy they employed, and unpredictably, the beginners reported the highest degree of strategy use. This result contradicted other studies, such as that of Ahmed (1989) and Cohen and Apeh (1980), which found that advanced learners employ more strategies than beginners, but concurred with the findings of Payne (1988, cited in Al-Shuwairekh 2001). Stoffer referred this outcome to the lack of beginner learners' experience, which entailed a tendency for them to employ a number of strategies, or to assume that all strategies are effective because they have not yet utilized them (Stoffer, 1997).

3.5.1.4 Gu and Johnson's (1996) questionnaire study

A seminal study in the field of VLS was the work of Gu and Johnson (1996), who conducted a large-scale study of 850 Chinese EFL university students, to explore learners' different VLS, and to examine the effect of the chosen strategy on the learners' general language proficiency and vocabulary size. They employed a questionnaire to elicit the learners' beliefs concerning vocabulary learning, and their self-reported VLS, together with two tests to measure the learners' vocabulary size, and general proficiency in English. The questionnaire comprised 91 VLS identified from the literature, and the findings revealed that certain strategies were ranked the highest in terms of the strategies used, such as metacognitive regulation, guessing from the reading context, using a dictionary, and note-taking. Meanwhile, other strategies, such as rote memorization, mnemonic devices, and semantically-based

strategies were ranked the lowest in terms of the strategies employed. In addition, the strategies of guessing from a textual context, consulting dictionaries, note-taking, paying attention to the word form, and the intentional activation of newly learned words, were positively correlated with the learners' vocabulary test scores. In contrast, the strategies of memorization, mnemonic devices such as keyword method, and visual repetition such as word written repetition, were negatively correlated with both the students' vocabulary size, and their language proficiency. This finding did not conform to the prototypical profile of Asian learners as employing rote memorization more frequently than other strategies (Atherton, 1995; Politzer & McGroarty, 1985). This result in particular is significant, since it supports the hypothesis of the current study in terms of the fact that many strategies exist besides mnemonic strategies (i.e., the keyword method), that can positively affect short and long-term memory retention in intentional and incidental L2 vocabulary learning. The pros and cons of the mnemonic strategies, and of the keyword method in particular, are discussed at length under the section concerning strategies and depth of processing (see Section 2.4.4). Furthermore, this finding also confirmed that, in many cases, learners may behave in dissimilar ways from those anticipated by language teachers and researchers. Therefore, it is expected that different types of strategies/behaviours will be found in dissimilar contexts with dissimilar participants, and hence the research outcomes gained in some Western countries should not be assumed more generally, and should not be generalized to cover other environments in contexts such as Teaching Arabic as a Second Language (TASL).

With regard to the study undertaken by Gu and Johnson, to gain a clear picture of the relationship between the independent and depended variables, the researchers ran multiple regression analyses simultaneously, the results of which revealed that metacognitive regulation strategies were the best predictor of students' vocabulary size, while visual repetition, imagery encoding, and believing in memorization appeared as negative predictors. Gu and Johnson's

study also confirmed a finding that concurred with other research (e.g., Ahmed, 1989; Hill, 1994; Kelly, 1992; Lawson & Hogben, 1996), which concluded that actively employing a wide range of both direct and indirect strategies, and combining these strategies, rather than using individual strategies, engendered better vocabulary acquisition. Thus, when examining strategies through two different modes of vocabulary learning (intentional and incidental), the present study sought to identify a wide range of different VLS, together with providing more detail concerning the direct and indirect strategies employed.

In their questionnaire, Gu and Johnson (1996) provided the learners involved in their study with a list of 91 strategies from which to select, and then examined the effect of these strategies on an immediate vocabulary test. In contrast, the current study focused on identifying those strategies reportedly used by L2 learners themselves with regard to intentional and incidental vocabulary learning, and examined the effect of these strategies on immediate and delayed word retention.

3.5.1.5 Al-Shuwairkh's (2001) questionnaire and interview study

Al-Shuwairkh's (2001) research is one of the most relevant studies to the present study, since it sought to identify the VLS that have been applied to Arabic language. Al-Shuwairkh's study consisted of two parts. The first part explored the relationship between vocabulary strategy use and learning success, through the use of diaries, and interviews with 10 ASL learners divided into two groups: five successful, and five less successful learners, based on their grade level of A or D, and on their teachers' judgement. The comparison between the two groups of learners was conducted by examining their strategies in relation to seven aspects of vocabulary learning: (1) non-dictionary strategies for discovering the meanings of new words; (2) dictionary use; (3) note-taking; (4) memorizing new lexical items; (5) practising newly learned words; (6) planning and evaluating the process of vocabulary learning (metacognitive strategies); and (7) expanding lexical knowledge.

In the second part of his research, Al-Shuwairakh employed a questionnaire survey to examine the variations in the use of a number of the VLS reported by 162 students learning Arabic as second language in Saudi Arabia. This aspect sought to answer the research question of whether the use of VLS varied significantly according to the following factors: 1- individual factors, such as first language, proficiency level, and level of achievement; 2- situational factors, such as course type, and variety of Arabic used out of class; and 3- social factors, such as religious identity.

With regard to the results of the first part of the research concerning the relationship between vocabulary strategy use and success, Al-Shuwairakh (2001) found that the successful learners reported a larger quantity, and wider variety of VLS, than the less successful learners. This finding was consistent with other findings in the literature (e.g., Ahmed, 1989; Gu, 1994; McCarthy, 1990; O'Malley & Chamot, 1990). Al-Shuwairakh claimed that an explanation for this result was the amount of vocabulary learned by the successful group, since “this large quantity of new items makes it likely that these items have different features which probably require the employment of various learning strategies” (Al-Shuwairakh, 2001, p. 250). The current study investigated this explanation in particular by examining the effects of VLS on different features of lexical items, such as the words’ part of speech (noun versus verb), concreteness versus abstractness, and action versus state verbs.

In his analysis of the relationship between vocabulary strategy use and success, Al-Shuwairakh identified significant differences between the successful, and the less successful learners in the following factors:

- 1- The successful learners appeared to employ deeper processing vocabulary learning strategies through combining two or more strategies, for example, guessing from the textual context, asking the teacher, then referring to the dictionary. Employing more than one source to obtain information regarding the target words requires more mental effort, and hence

engendered a depth of mental engagement (Al-Shuwairekh, 2001, cited Craik & Tulving, 1975);

2- The successful learners appeared to be more independent, engaging in many activities outside of class to gain and learn new vocabulary items, a result that concurred with other findings (e.g., Gu & Johnson, 1996; Pauwels, 2015; Sanaoui, 1995);

3- The successful learners tended to read extensively in the target language of Arabic, and appeared to be aware of the importance of reading for enhancing proficiency in a second language. This was a similar finding to that of Gu and Johnson (1996);

4- The successful learners made more use of guessing as the main source of discovering the meanings of new lexical items, a result that concurred with the findings of other research, including that of Ahmed (1989), Gu (1994), Gu and Johnson (1996), Papalia and Zampogna (1977), and van Parreren (1992);

5- The successful learners were more systematic in their learning in many ways. For instance, the successful students appeared to be systematic in the organization of their vocabulary notes, and in their application of the strategy of regular revision of the previously acquired items. This confirmed the findings of other vocabulary strategy research, such as that of Kayaoglu (1997) and Sanaoui (1995);

6- The successful learners were consistent in their strategy of preparation, and employed this strategy regularly, a finding that confirmed consistency of approach as one of the important features of successful learners, as identified elsewhere in the literature, including Ahmed (1989) and Lawson and Hogben (1996);

7- The successful learners monitored and evaluated their learning, seeming better able than their less successful peers to identify their learning difficulties, and to find solutions. Through the use of the strategy of self-testing, the successful learners were able to evaluate their vocabulary learning regularly;

8- The successful learners paid more attention to the new lexical items encountered in the classroom, a finding that was consistent with that in other studies (e.g., Ahmed, 1989; Kayaoglu, 1997).

In terms of the results of the second part of Al-Shuwairekh's study, concerning the relationship between the use of VLS and certain individual factors, such as the first language, proficiency level, and level of achievement; situational factors, such as the course type, and the variety of Arabic used out of class; and social factors, such as religious identity, the results revealed the following:

1- With regard to the individual factors, the results of the survey indicated no significant variation in the learners' overall VLS, according to their first language, proficiency level, and level of achievement. However, with regard to the proficiency level factor, the category of note-taking varied significantly, with low-proficiency students reporting a greater use of note-taking strategies than high-proficiency students. This result contrasted with the findings of Chamot and Kupper (1989), and Al-Qarni (1997), who found that advanced learners employ a wider range of strategies than beginner learners. However, it supported the findings of other studies, such as those of Payne (1988) and Stoffer (1997), that beginners employing more VLS than advanced learners;

2- In terms of the situational factors, the results of the survey demonstrated that the overall use of VLS varied significantly with course type, in that morning-course students reported employing more vocabulary strategy use than evening-course students. Al-Shuwairekh referred this finding to the fact that learners on the two courses differed in their goals, motivation, background and career position, and orientation. Regarding the second situational factor, the results also displayed significant variation in the learners' overall reported vocabulary strategy use, according to the variety of Arabic used out of class. The

analyses revealed that the learners who employed standard Arabic reported greater vocabulary strategy use than the learners who used colloquial Arabic;

3- With regard to the social factor of religious identity, the results of the survey revealed that the total use of VLS did not vary significantly, although Al-Shuwairekh found that the two vocabulary strategy categories of *non-dictionary* and *expanding lexical knowledge strategies* varied significantly with religious identity, since Muslim students reported greater strategy use in these two categories than non-Muslims.

In his comparison between the successful and less successful learners, Al-Shuwairekh (2001) found that advanced successful learners tended to engage in incidental learning through reading a variety of Arabic materials, and they combined indirect strategies with intentional direct strategies. Thus, he suggested that “both approaches are necessary to vocabulary learning and probably complement each other. Researchers should, thus, focus on both approaches when investigating vocabulary acquisition” (p. 282). This suggestion was addressed in the present study, through conducting a comparison between the two modes of vocabulary learning, intentional and incidental, and identifying the vocabulary learning strategies the L2 learners themselves reported that they employed at each mode.

Although, Al-Shuwairekh’s study enhanced understanding of the relationship between the use of VLS and learning success, one limitation lay in the fact that he did not investigate the direct, or potential, effects of the reported VLS on L2 word retention in immediate or delayed vocabulary tests. Such an investigation would undoubtedly contribute to reflections on the direct impact of VLS on the short and long-term retention of words, and was therefore addressed in the present study.

3.5.1.6 Alemi and Tayebi (2011)

Alemi and Tayebi (2011) conducted one of the most recent studies regarding intentional and incidental vocabulary teaching and learning, along with the influence of VLS, particularly

reading strategies, on vocabulary acquisition. They divided their study into two parts: Part A examined the differences between learning vocabulary intentionally and incidentally among 30 Iranian students of EFL, and Part B explored the relationship between strategies and vocabulary achievement among 59 Iranian students of EFL.

The participants in the study were taught two chapters of an English book. The reading text and vocabulary sections of the two chapters were taught using different modes of learning: intentional and incidental. The main test administered by the researchers addressed 18 target words, distributed as follows: six intentional meaning-based words, six intentional etymology-based words, and six incidental words. The meaning-based intentional words were taught explicitly, with each word set in boldface in the text, and accompanied by a marginal gloss, while the etymology-based intentional words were taught by presenting their meaning at the end of the text, and dividing them into their prefixes, roots, and suffixes. Conversely, to suit the condition of incidental learning, the meaning of each incidental target word was taught indirectly by explaining and emphasizing the overall meaning of the text. The participants were told in advance that they would only be tested on the boldface words, and accordingly focused on the intentional vocabulary, with their attention diverted from the rest of the unknown words, which is to say, those words not typed in boldface, towards an understanding of the entire text through incidental learning. However, despite the original instructions, the participants were also tested on the incidental words.

Alemi and Tayebi found that the mean score of the participants' meaning-based intentional vocabulary learning was the highest when compared to that of the incidental words, and etymology-based intentional words. However, a t-test indicated no significant difference between the three modes of vocabulary acquisition. There was also a weak correlation between vocabulary proficiency and the strategies used, with a Spearman correlation indicating that

vocabulary strategy use, and the acquisition of new vocabulary, were weakly correlated ($r=0.006$).

The authors identified two factors affecting these findings. First, according to Griffiths (2006, cited in Alemi & Tayebi, 2011, p. 88), direct observation of VLS can be difficult. Therefore, the authors suggested that “instead of just measuring the participant’s use of vocabulary learning strategy... by asking them to fill out the self-report questionnaire, one or more ways of measuring the use of this construct [should] be used, such as observations, interviews, and the like” (Alemi & Tayebi, 2011, p. 88). Second, a number of learning variables, such as motivation, belief, culture, gender, and age can affect the outcome of language acquisition, and produce unpredictable results. These two factors were considered in the development of the present study’s methodology. First, the eye-tracking technique was utilized to explore the behaviours of the L2 learners involved in the study from an incidental versus intentional perspective. Thus, the participants in the present study were instructed to read an adaptive short story, containing novel words, while an eye-tracker recorded their eye movements (Godfroid, Boers, & Housen, 2013a). Hence, the present study focused on whether incidental exposure to new vocabulary can result in the creation of new memory representations. Regarding the second factor, the present research recruited two different groups, related to different backgrounds: English, and Chinese learners of Arabic. Additionally, it analysed the effect of culture and learning style on the approach to selecting VLS.

Alemi and Tayebi (2011) did not examine the strategies employed by the L2 learners themselves. Instead, the participants were asked to choose from strategies listed in a self-reporting questionnaire that employed the Language Strategy Use Inventory, developed by Cohen, Oxford and Chi (1990). This inventory “makes use of four Likert-type responses for each strategy item ranging from 1 to 4” (p. 86). Moreover, Alemi and Tayebi did not examine

the effect of these strategies on the participants' short- and long-term retention of new lexical items in intentional and incidental learning. When addressing these issues, the current study investigated the potential effects of the strategies personally selected by the L2 learners on immediate- and delayed vocabulary retention in intentional and incidental vocabulary learning.

3.5.2 Studies concerning learner-selected strategies and intentional vocabulary learning

Various studies have explored the impact of the keyword method on intentional vocabulary learning (see the critical discussion of the keyword method under Section 2.4.4). However, few studies have addressed the impact of other *self-selected* strategies on the deliberate learning of L2 vocabulary. Examples of such studies include Lawson and Hogben (1996), and Barcroft (2009), which are discussed below.

3.5.2.1 Lawson and Hogben's (1996) think-aloud study

Lawson and Hogben (1996) observed the behaviour of 15 university students in Australia, with experience in Italian, as they attempted to learn the meanings of new Italian words. The researchers employed a think-aloud procedure, and a vocabulary post-test to examine the efficiency of the strategies selected by the learners during an intentional L2 vocabulary learning task. The participants were asked to attempt to learn new L2 target words presented on index cards. These were accompanied by examples of sentences composed of the target words that appeared on one side of the card, with translations and related words on the other. During the study phase, the participants were asked to report on their thoughts and discussions while attempting to learn the target words. The majority of the procedures employed by the participants involved 15 categories of strategies that were grouped into four higher-level categories: repetition, word feature analysis, simple elaboration, and complex elaboration. Lawson and Hogben (1996) found that participants employed the following strategies, see Table 3.7.

Table 3.7: Strategies used in Lawson and Hogben's (1996) study.

Category	Strategy	Frequency of use
Repetition	reading of related words	156
	simple rehearsal	137
	writing of word and meaning	45
	cumulative rehearsal	15
	testing	5
Word feature analysis	spelling	16
	word classification	9
Simple elaboration	sentence translation	66
	simple use of context	36
	appearance similarity	18
	sound link	5
Complex elaboration	complex use of context	42
	paraphrase	28
	mnemonic	7

The researchers also found that the more often a strategy was used, the more it contributed to word learning. A strong positive correlation between the frequency of strategy use and the target word recall was revealed, as well as a positive correlation among the target word recall and simple rehearsal, mnemonic, appearance similarity, sound link, and paraphrase.

3.5.2.2 Barcroft's (2009) self-reporting study

Barcroft's (2009) study expanded upon that of Lawson and Hogben (1996) by examining the relationship between strategy use and vocabulary learning performance during intentional word-picture vocabulary learning, with the inclusion of new methodological provisions. The research was conducted with 93 English-speaking Spanish students as they studied new Spanish words, while viewing word-picture pairs. Barcroft selected the word-picture vocabulary learning paradigm "to focus on the strategies and cognitive activity in which learners engage when they are given access to each target word form and its referent" (Barcroft, 2009, p. 78). The participants answered questions concerning the strategies they employed. Two kinds of word recall test followed the learning phase: (1) a picture L2 recall test, which was a productive test that required the participants to write the target Spanish words when presented with pictures; and (2) a L2-L1 recall test, which was a receptive test that required the

participants to translate the target Spanish words when presented only with those words. All of the strategies were coded according to the participants' written responses to questions one and two, after which the author and an assistant collaborated on the strategy coding.

The results of Barcroft's study reported on the 12 most frequently-used strategies, which included L2-picture association, L2-L1 association, L2-L1 translation, and repetition. He found that some strategies, such as mnemonic, self-generated target words, and visualized target words and pictures resulted in a higher target word recall than others. Similar findings were discovered in Lawson and Hogben's (1996) study concerning significant positive correlations between the numbers of strategies that learners reported using, and their target word recall. However, neither study examined the effects of intentional or incidental learning strategies on long-term word retention. Therefore, the present study examined the potential effects of VLS in terms of both intentional and incidental learning, on both immediate- and delayed word retention, and identified the relationship between these strategies, and vocabulary learning performance. The examination of the long-term effects enabled the categorization of the most frequently-used learning strategies that influence the effectiveness of L2 vocabulary presentation and practice methods.

3.5.3 Studies concerning incidental vocabulary learning

This section concerns a review of certain key studies regarding incidental vocabulary acquisition from reading, due to their relevance to the present study.

In the field of second and foreign language vocabulary acquisition, many studies have investigated the incidental acquisition of vocabulary through reading (e.g., Brown et al., 2008; Horst, 2005; Hulstijn et al., 1996; Kweon & Kim, 2008; Pellicer-Sánchez & Schmitt, 2010; Pigada & Schmitt, 2006; Rott, 1999; Vidal, 2011; Waring & Takaki, 2003). As previously discussed, this mode of learning is often referred to learning from context, since the meaning of the new lexical items should be inferred from the cues, and the meaning of the surrounding

words, and from the context of the sentence. As is evident in this review, these studies explored the effect of the number of exposures to the new words, which varied from one exposure to more than 20 exposures. For example, Hulstijn et al. (1996) examined incidental vocabulary learning under three conditions: (1) marginal glosses; (2) dictionary use; and (3) reoccurrence of unknown words in the reading text. The authors divided the participants, who were 78 advanced Dutch learners of French, into three groups: (1) Marginal glosses; (2) Dictionary; and (3) Control. The participants in the marginal glosses group received L1 translations of the new target words, those in the dictionary group were allowed to use a dictionary while reading, while those in the control group received neither a dictionary, nor marginal glosses. The reading text provided to the participants was a short story, the text of which was modified for the marginal glosses group by adding marginal glosses for the 16 target words in the right-hand margin, along with glosses for 16 additional words. According to the researchers, the additional 16 words were included “to render the marginal glosses for the 16 targeted words less salient” (Hulstijn et al., 1996, p. 330).

In the learning phase, the participants were instructed to spend 25 minutes reading the text. In order to meet the conditions of incidental vocabulary learning, the participants were told in advance that they would be tested only on their comprehension of the text, and not on their knowledge of unfamiliar words. Accordingly, the participants focused on the meaning of the entire text, rather than on the new vocabulary. However, the participants were later unexpectedly tested on these unknown words. Following the learning phase, Hulstijn et al. (1996) administered three post-tests, the first of which was a recognition and recall test containing a list of 32 words, which included the 16 target words, and 16 words from outside the reading text. The second test examined the students’ pre-knowledge of the target words, while the third test assessed the target words in their contexts. The findings revealed that the frequency of target words present in the reading text, from one to three times, significantly

supported incidental learning in all three groups: marginal glosses, dictionary, and control. The study also found that the effect of marginal glosses was greater than that of dictionary use, primarily because the learners did not consult their dictionaries.

However, one limitation of the study was that it did not examine the learners' pre-knowledge of the target words before conducting the learning phase through reading, which may have engendered some previous knowledge of the target words. Thus, to avoid this limitation, the present study tested learners' previous knowledge of the target words before conducting the incidental learning session to ensure that the participants possessed no prior knowledge of the target words. Moreover, Hulstijn et al. (1996) did not investigate long-term uptake knowledge in their study, or the vocabulary learning strategies employed during incidental learning, issues that were investigated by the current study

Meanwhile, Rott (1999) conducted a study involving 67 intermediate German language learners studying at a university in the USA. In preparing the reading materials, Rott composed a set of short paragraphs of four to six sentences each, involving new words that the L2 learners were to read once per week. Using a between-subject design, the subjects were assigned to two treatment groups, and each group was exposed to one set of the target words, with six target words in each set. Each treatment group was further divided into three sub-groups, to examine the effect of exposure frequency on the acquisition of the target words in terms of either two, four, or six times. Before commencing the reading session, Rott ran a pre-test to ensure that the target words were unfamiliar to the participants, employing a checklist format containing 50 words, including the 12 target words, along with 38 distracters. The subjects were asked to provide the meaning of the words they knew, and to skip those that were unknown to them.

Aiming to assess the participants' knowledge of the target words, Rott employed two post-test formats, a productive vocabulary test of supply-definition, and a receptive vocabulary test of select a definition. The findings obtained from this study revealed that two exposures

could engender significant target word acquisition, since the scores for the items from two exposures were significantly higher than the scores for a control set of items to which the participants had not been exposed. However, the participants who were exposed to target words six times outperformed the participants who had only been exposed to target words two or four times. In addition, Rott's research indicated that incidental learning can occur through a few exposures to new words in meaningful context. This study holds significance for the present study, since similar procedures to that used by Rott, in terms of the preparation of the reading materials, and conducting a productive vocabulary test, were employed.

Meanwhile, Waring and Takaki (2003) conducted a seminal study concerning incidental L2 vocabulary acquisition by examining the vocabulary learning and retention of 15 intermediate Japanese college learners of English. The participants were asked to read and enjoy a graded book, which was at a lower level than their language ability. According to Waring and Takaki (2003), the motivation behind providing the learners with an easy text was to ensure that the adjacent words were familiar enough to assist in inferring the meaning of the target words. Aiming to govern the learners' previous knowledge of the target words, the researchers changed the forms of the 25 words that were used in the text into non-words, for example, changing *house* into *windle*, and *window* into *bettle*). The target words were varied in terms of frequency of occurrence in the text from one to 18 occurrences.

Unlike other studies that employed only one type of test, for example, a multiple-choice test, Waring and Takaki used three different types of measurements: a simple *yes* or *no* sight-recognition test, a standard multiple-choice test, and a meaning translation test into the first language. Their study investigated the effect of frequent exposure to new words in a reading text, on the words' acquisition and retention over time, and was the first study to investigate word retention of incidental vocabulary acquisition over time (Alahirsh, 2014). The three tests

were administered three times over the course of three months: (1) immediately after the participants had finished reading; (2) after one week; and (3) after three months.

The results demonstrated that incidental vocabulary learning from reading occurred at several levels, and the scores obtained varied between the test types. From the 25 target words, there was a gain score of 15.3 words on the form recognition test, while in terms of meaning recognition via a multiple-choice test, the mean score was 10.6. However, the meaning translation test yielded a lower mean score of 4.6. The results obtained from the post and delayed tests showed that approximately half of the word knowledge gained from the reading was lost after three months. Furthermore, the study indicated that there was a robust relationship between word frequency in a text, and its retention. However, Waring and Takaki concluded that even with the words that occurred more than 18 times, the chance of retaining their meaning after three months was only between 10 and 15%. Additionally, the results also showed that there was no instance of words being retained if they were encountered fewer than eight times, although this result in particular conflicted with findings of Rott (1999), and Hulstijn et al. (1996), in the way in which incidental learning can occur through a limited number of exposures of one to three times in meaningful context. However, Waring and Takaki's findings were supported by those of other studies, such as Brown et al. (2008) and Pigada and Schmitt (2006).

Waring and Takaki (2003) is of significance to the present study in the way that they employed more rigorous methodological procedures, as the authors used more sensitive tests, by running three vocabulary testing formats over the course of three months. The word meaning translation test appeared to be the most demanding test, since it provided more information regarding whether the answers in the multiple-choice test were the result of the subjects making inferences, or of actual learning of the assessed words (Alahirsh, 2014). The findings of this study encouraged the researcher of the present study to adopt a word meaning

translation test as the main test for this research, making it possible to measure the learners' productive vocabulary knowledge resulting from employing different types of strategies more precisely.

Waring and Takaki's (2003) study also suffered from certain limitations. For example, while they examined word retention of incidental learning over time, they did not examine the strategies behind this type of learning mode, focusing only on the effect of the number of exposures to the target forms. Furthermore, the study also failed to investigate the effect of other aspects of word knowledge in incidental learning, such as the words' type of speech, in terms of noun versus verbs, and the effect of concreteness and abstractness on word retention within the incidental mode of learning. Another issue requiring consideration is the use of non-words as experimental target words, and the question of whether it is ethically appropriate to require participants to learn such words, in terms of whether the participants were aware of the fact that they were non-words, and whether this affected their incidental learning in some way.

In a further study, Pigada and Schmitt (2006) examined the incidental learning involved in extensive reading in terms of different aspects of word knowledge: meaning, in the sense of form meaning relationship; form, in terms of spelling; and grammatical behaviour, or use. This research involved a case study with a Greek native speaker studying French, who was given one month of extensive reading before measuring his incidental acquisition of the target words. For the reading materials, the 'Lectures CLE en Français facile' graded readers (Level 1) were employed, according to the learner's lower intermediate level in French language. Then, to examine his knowledge of 133 target words, a one-to-one interview with the participant was undertaken before and after the reading. The target words consisted of 70 nouns and 63 verbs, and were divided into six frequency groups of one, two to three, four to five, six to 10, 10 plus, and 20 plus occurrences). The participant was not aware of the aim of the study, or of the post-test that occurred after the reading session. There were two test types, a pre- and post-test,

which were taken over two days, a spelling test on the first day, and meaning and grammatical use on the second day. The subject was given an irrelevant task to perform after completing the spelling test, which “served to flush the target words from [the subject’s] immediate memory” (2006, p. 11), so that the researchers could guarantee that no additional intentional learning of these words would occur after the session. Additionally, the researchers changed the word order in the meaning and grammatical use tests, to avoid parallelisms in the test form.

The findings revealed that the participant displayed a 65% improvement in at least one of the knowledge aspects of the target words, and the participant’s spelling knowledge improved meaningfully, from 37% to 60% in the post-test. Another interesting finding was that the participant’s knowledge of nouns was better enhanced for all six frequency groups in comparison with their knowledge of verbs, which showed no increase in the six to 10, and 20 plus verb occurrences groups. In general, the participant’s knowledge of words’ meaning was improved considerably in all frequency groups, however, only a small amount of learning was reported for nouns occurring once or two to three times. Similarly, there was no learning of verbs that were encountered only once in the texts. These results concurred with Waring and Takaki’s (2003) findings, but contrasted with those of Rott (1999), in that incidental learning can occur through a small number of exposures to new words in a meaningful context. Nevertheless, it is worth noting that Rott composed the reading material specifically for the study, and hence each encounter with the target words would likely have been in a very clear context, which may have facilitated incidental acquisition. Overall, Pigada and Schmitt (2006) results demonstrated that the understanding of approximately half of the target words (49.6%) improved in one knowledge aspect, 10% in two knowledge types, and 7% in all three knowledge aspects. Although the studies of Pigada and Schmitt (2006) and Rott (1999) confirmed the occurrence of incidental learning through reading in long and short texts

respectively, neither investigated the reasons or strategies that cause such a learning to occur, nor did they investigate delayed retention, a matter that the present study has addressed.

In a more recent study of incidental vocabulary learning, Pellicer-Sánchez and Schmitt (2010) required their participants to read a 150 page novel, including 34 unknown target words. The target words were divided into 5 frequency bands, with the exposure to the words in the story altering from one to 28 occurrences. When the participants had completed the novel, the researchers employed four types of tests to measure their vocabulary knowledge: spelling recognition, word class knowledge, meaning recognition, and meaning recall tests. The results revealed that knowledge gains were found in nine of the target words, and it also revealed the effect of frequency of exposure, in terms of the fact that the learners had significantly more knowledge across all the tests regarding the words that appeared 10 or more times in the novel, compared with the words that appeared eight times, or fewer. This result concurred with the findings of other studies, such as Pigada and Schmitt (2006) and Waring and Takaki (2003).

As with a number of the studies concerning the orientated incidental learning mode previously reviewed, Pellicer-Sánchez and Schmitt (2010) did not examine the precise reasons or strategies that caused incidental learning to occur through reading. Furthermore, they only focused on the effect of the number of exposures, and did not investigate word retention over time, or the influence of other aspects of word knowledge.

In summary, investigating the cognitive processes/learners' behaviours that are considered to constitute a significant aspect underlying the acquisition of vocabulary reflects the significance of the present study in contrast to other incidental learning studies that have focused only on the effect of frequency, or meanings inferred from the context. Moreover, many studies in the field of applied linguistics and psycholinguistics have exposed the impact of other aspects of words, such as the word's part of speech, and concreteness and abstractedness, on vocabulary acquisition and retention (for further information, see dual

coding theory in Section 2.4.2). However, only very few studies have investigated the impact of these aspects of words on vocabulary acquisition in incidental learning, including Pellicer-Sánchez and Schmitt (2010). Therefore, this study sought to investigate these issues, not only in immediate post-tests, but also in delayed post-tests, making it possible to examine their effect on a word's retention over a long period of time.

3.5.4 Eye-tracking and vocabulary learning

With the objective of understanding how second or foreign language vocabulary is acquired, psychologists and educators have promoted an understanding of the cognitive processes, which are a significant aspect underlying the acquisition (Ellis, 1995b, 2005; Gass et al., 2003; Ortega, 2009; Schmidt, 2001; Sternberg & Sternberg, 2012). For some time, a number of methodologies have been employed to investigate these cognitive processes (see e.g., Ellis, 1994b, 2015; Hulstijn & Ellis, 2005; Rebuschat & Williams, 2012; Schmidt, 2012). One of current preferred methodologies is the recording of eye movements while learners read, or listen to language (Godfroid & Winke, 2015a). This methodology is commonly referred to as *eye-tracking* (Godfroid & Winke, 2015a; Godfroid, Winke, & Gass, 2013), and there has recently been a growing interest in the use of the technique in applied linguistics studies. Furthermore, since eye trackers are known to be user-friendly, increasing numbers of researchers are employing the eye-tracking methodology to investigate different aspects of second language processing, particularly in reading research (Godfroid & Winke, 2015a; Pellicer-Sánchez, 2016; Pellicer-Sánchez & Schmitt, 2010; Rayner, 2009), since eye movements are “an inherent behavioural manifestation of the reading process in action” (Radach & Kennedy, 2004, p. 4).

The following subsections discuss the nature of eye-movement recordings, and the potential advantages of using the methodology when investigating questions concerning the

VLS employed in incidental vocabulary learning, together with presenting a review of the studies that have utilized eye-tracking in incidental language processing.

3.5.4.1 The nature of eye-movement recording

Eye-tracking is the online registration of a contributor's eye movement behaviour during reading (Godfroid, Boers, et al., 2013a). This registration falls into one of two general categories, the first of which concerns the readers' *eye fixations* when they process the visual input, in terms of where, and for how long a reader focuses, while the second concerns the eye movements or *saccades*, in which eyes move from one text location to another to provide the cognitive system with new visual information (Brysbaert & Nazir, 2005; Godfroid, Boers, et al., 2013a; Godfroid & Winke, 2015a; Rayner, 2009). When engaged in reading, a reader returns to re-read parts of the text that have already been read 10% to 15% of the time, which is to say, (i.e., they make a regression; Rayner, 2009). The *eye fixation duration*, or the time between two saccades, is a significant class of dependent variable (Godfroid & Winke, 2015a). In the examination of eye movements, a distinction has been made between temporal measures, such as fixation duration, which is believed to be an indicator of load processing, and spatial measures, such as fixation position and saccade extents, which are indicators of the direction, and the sequence of processing (Radach & Kennedy, 2004). Pellicer-Sánchez (2016, p. 102) highlighted that some of the most frequently used measures for processing time include:

- *First fixation duration*, or the duration of the first fixation on a word, or region of interest;
 - *First pass reading time* or *gaze duration*, which is the sum of all fixations made on a word, or region of interest, before exiting the area, or word, either to the left or to the right;
 - *Fixation count*, or the number of all fixations made on a word, or region of interest;
- and

- *Total reading time*, or the sum of all fixation durations made on a word, or region of interest.

Evaluating which measure is the most appropriate for processing reading time is a controversial issue, particularly when the unit of analysis is a single word (Rayner, 1998, 2009). Thus, to draw reasonable inferences about the reading processes, Rayner (1998, cited in Pellicer-Sánchez, 2016, p. 102) recommended employing several measures, instead of only a single measure of processing time per word. In this context, gaze duration, and the earlier measures of first fixation duration, are believed to reflect the initial lexical access, while total reading time, and the later measures of the number of fixations, are believed to access higher order processes, such as semantic integration (Libben & Titone, 2009).

Readers are unaware that they skip words during reading, although they do so (which they do for about 15% of the content words and 65% of the function words; Rayner, 2009, p. 1461). High-frequency words are skipped more frequently than low-frequency words (Rayner, Sereno, & Raney, 1996), while short words are skipped more frequently than longer words (Rayner & McConkie, 1976). Moreover, if words are not fixated on, this does not mean that they are not processed (Rayner, 1998). It has also been acknowledged that there is no useful information acquired during saccades, due to the speed that characterizes eye-movements, and that readers acquire information during fixations (Wolverton & Zola, 1983, cited in Pellicer-Sánchez, 2016, p. 103). Fixation durations are based on the difficulty, or ease, with which words in a text are understood (Rayner, 1997, 1998; Rayner, Sereno, Morris, Schmauder, & Clifton Jr, 1989). When readers encounter a new word, they spend more initial processing time on those new words than on familiar words (Chaffin, Morris, & Seely, 2001; Godfroid, Boers, et al., 2013a; Pellicer-Sánchez, 2016; Williams & Morris, 2004).

In reading research, several lexical factors appear to influence fixation durations. These factors are considered to be low-level, or visual, and high-level, in terms of cognitive or

linguistic (Godfroid et al., 2013a; Godfroid & Winke, 2015b). The most common lexical variables are occurrence, length, and predictability of the fixated word (e.g., Godfroid & Winke, 2015a; Kliegl, Grabner, Rolfs, & Engbert, 2004; Kliegl, Nuthmann, & Engbert, 2006); word frequency (e.g., Rayner, 1998; Rayner et al., 1996); word familiarity (e.g., Williams & Morris, 2004); lexical ambiguity (e.g., Rayner & Frazier, 1989); and age of acquisition (e.g., Juhasz & Rayner, 2006). Overall, increased regularity and familiarity, higher predictability and frequency, as well as shorter length, have been found to engender shorter fixation durations, and fewer fixations (Godfroid & Winke, 2015b; Pellicer-Sánchez, 2016).

The use of eye-tracking methodology in measuring reading processes has advantages over other methods, such as the self-paced reading in Juffs (2005), in that eye-tracking recordings offer investigators more “fine-grained” information concerning the processing time (Frenck-Mestre, 2005, cited in Godfroid & Winke, 2015, p. 326). In addition, the eye-tracking technique does not require the text to be fragmented into segments (Keating, 2013), since educators can utilize software programmes to define “regions of interest”, such as target words, independently of how the text appears on a screen, to obtain many different measures with a single region of interest (Godfroid & Winke, 2015a, p. 327).

In psychological terms, using eye-tracking in SLA research is based on the assumption of an “eye-mind link” (Pollatsek, Reichle, & Rayner, 2006, p. 4), which is the existence of a close association between the eyes and the mind (Godfroid et al., 2013a). Under this assumption, ‘overt attention’, as manifested by the exact eye location, and ‘covert attention’, or mental focus, are strongly connected, and cognitive processing is considered to be a main cause of when, and where, the eyes move during the performance of complex tasks, such as reading (Godfroid, Boers, et al., 2013a; Rayner, 2009; Rayner et al., 1989). Based on this assumption, the current study employed eye-tracking methodology to investigate the L2 word uptake effects of the strategies and cognitive activities employed by learners when they were

instructed to read a text for the purpose of a comprehension test in incidental vocabulary learning. The study was established to identify the cognitive activates, or strategies that underlie the acquisition of vocabulary, through triangulating eye movements, verbal reports, and stimulated recall protocols, to gain insight into the participants' subjective experience of the mental activities involved when encountering unknown words incidentally (see more details concerning the procedures involved in the data collection in the methodology chapter). According to Godfroid and Winke (2015b, p. 338), “the proposed triangulation of eye movements and verbal reports — which could be concurrent, consecutive or retrospective — seems a productive way forward to study questions of implicit and explicit processing”.

3.5.4.2 Studies using eye-tracking in incidental vocabulary learning

The eye-tracking technique has been used to investigate a number of phenomena in L1 and L2 reading, such as the processing of formulaic language (e.g., Siyanova-Chanturia, Conklin, & Schmitt, 2011), sentence processing (e.g., Altarriba, Kroll, Sholl, & Rayner, 1996), and observing corrective feedback (e.g., Smith, 2012). However, only a few studies have employed the eye-tracking technique to investigate the process of vocabulary learning from reading.

Chaffin et al. (2001) investigated L1 readers' eye movements when learning the meanings of new words from sentence contexts, discovering that the readers spent longer initial and total reading times on novel words, compared with high-familiarity words. Nevertheless, they did not conduct any vocabulary post-test to measure whether the participants had learned the meaning of these new lexical items.

Williams and Morris (2004) examined the effects of different measures of word familiarity on eye-fixation times through reading. One of their experiments recruited 24 native English-speaking students to read 48 target sentences in their L1. All of the experimental sentences were generated to ensure the target words were preceded by a neutral introduction,

and followed by a context that was highly informative to the target words' meaning. The target words were categorized as familiar, less familiar–high knowledge, less familiar–partial knowledge, or unfamiliar (new) words. Following the reading session, the participants were required to select the correct meaning of the new words from two possibilities, in an unexpected vocabulary post-test. Overall, the results showed a systematic relationship between online processing patterns, and vocabulary post-test performance. Williams and Morris (2004) found that the readers spent less initial processing time, in other words, a shorter gaze duration, on those target words whose meaning they later identified correctly. However, reanalysis, as measured by the second pass time, was connected positively with post-test accuracy. This unexpected relationship between first pass reading time and vocabulary performance, has been explained as a possible effect of other confounding factors, such as word length (Godfroid et al., 2013a). The data regarding the first fixation duration, gaze duration, and spill over, which was calculated in this study as the duration of the fixation immediately following a reader's first pass fixation on the target word, revealed that the readers spent less time on familiar words than on the less familiar conditions. However, Williams and Morris's study only investigated reading in short sentence contexts, and since word learning was only a secondary focus of the study, it was measured by means of a two-choice synonym recognition test.

Meanwhile, Godfroid, et al. (2013a) used the eye-tracking technique to measure the extent to which advanced L2 learners' attention to new words during reading, which was gaged by their eye-fixation durations, predicted their ability to recognize these words in a surprise post-test. In total, 28 EFL learners read 20 short paragraphs in English, with a length of between 83 and 122 words, while an eye-tracker recorded their eye movements. As a strategy to control for prior word knowledge, Godfroid, et al. (2013a) employed 12 pseudowords, such as *paniplines* for boundaries, as learning targets in their paragraphs. Following the reading task, the participants completed a multiple-choice gap-filling exercise. They were then presented

with the experimental paragraphs they had encountered in the reading task, with the difference that the target pseudoword had been removed. Their task was to fill the gap with one of the 18 options provided. The results revealed that the total fixation time was a significant predictor of the probability of post-test recognition, with longer reading times being associated with better recognition scores. One limitation of this study was the use of invented items, or pseudowords, as experimental targets words, which may not represent a natural context for L2 reading and guessing from context. Thus, the present study employed real L2 Arabic words to represent the reading situations in which the L2 learners were able to acquire a new concept. Although the participants and the materials of the current experimental study differed from those of Williams and Morris (2004), and Godfroid, et al. (2013a), it was of interest to discover whether or not the processing times collected for the present study's sample predicted learning gains in a similar fashion.

Pellicer-Sánchez (2016) combined online measures of eye-tracking, and offline vocabulary tests to examine the incidental acquisition of knowledge of unknown items from reading; the role of the frequency of exposure to unknown vocabulary, with each target word repeated eight times in the participants' reading; and the online reading of those items in context. She compared the reading behaviour of 23 L2 learners of English, from various language backgrounds, and 25 L1 English speakers. The participants read a short story containing six pseudowords, or unknown words, and six control words, or actual words, while their eye movements were recorded. Following the reading, three vocabulary tests were employed: form recognition, in the form of a multiple-choice test; meaning recall, which was conducted by means of an interview, enquiring as to the meaning of the target words; and meaning recognition, in a multiple-choice test. The three vocabulary tests were repeated after two weeks for the L2 learners only. The results of the offline measures showed no significant differences between the behaviour of the advanced L2 and L1 readers, demonstrating the fact

that the advanced L2 readers appeared to benefit from the reading activity in the same way as L1 readers. Meanwhile, the results of the online reading of the unknown items in context revealed that both the L1 and L2 participants initially spent a longer time reading the unknown items, and accordingly, as the number of encounters increased, the reading times and the number of fixations for both the L1 and the L2 readers decreased. Pellicer-Sánchez's study also revealed a relationship between longer reading times and learners' ability to recall the meaning of words, supporting the results of previous studies, such as that conducted by (e.g., Godfroid et al., 2013a). However, employing invented items, or pseudowords, can be considered a limitation of Pellicer-Sánchez's study, since, as mentioned previously, this might not represent a natural context for L2 reading, and may not allow learners to guess from the context. In addition, only six concrete nouns were used as target items in Pellicer-Sánchez's study, and nouns have been found to be easier to learn than other parts of speech (Macaro, 2003). To avoid these limitations, the current study employed 32 real L2 Arabic words, which were included in a short story to identify the cognitive processes involved during incidental vocabulary learning. Additionally, the 32 experimental target words were divided equally into nouns and verbs, abstract and concrete, and high versus low frequency words to examine the acquisition of other parts of speech, and the potential effects of word features (see section 4.6.2 for more details of the criteria involved in selecting the experimental target words).

From the studies discussed above, which employed the eye-tracking method, and from the studies concerning incidental vocabulary learning in general, it is clear that no study has yet investigated the strategies employed by L2 learners in incidental vocabulary acquisition. Hence, the research question that was addressed by this current experimental study sought to fill this research gap by identifying the strategies that L2 learners apply to learning unknown words during reading, and whether or not the learners' behaviours, or strategies, applied to those words positively influenced the likelihood of their retention.

This thesis has previously discussed the matter of the significance of noticing in intentional and incidental learning, as the “necessary and sufficient condition for the conversion of input to intake” (Schmidt, 1990, p. 129); that is, the novel linguistic material, such as novel words, that are not represented mentally in the input, or which become intake, unless it is noticed by the L2 learner (Godfroid et al., 2013b). “Intake is the representation of a stimulus in long-term memory, however temporary, and is a prerequisite for further processing and integrating the newly represented language material into the interlanguage system” (Godfroid, Boers, et al., 2013b, p. 484, quote Wong & Simard, 2000). By employing a combination of online measures of eye-tracking, offline vocabulary tests, and stimulated verbal reports interviews, the present study examined both the incidental acquisition of knowledge of unknown items from reading, and the cognitive processes used during the online reading of those items in context. The participants were required to read a story containing 32 unknown items of vocabulary, while their eye movements were recorded. So as to explore the role of cognitive processes/strategies in the participants’ incidental learning of unknown vocabulary, following the learning phase, the participants completed a vocabulary test to assess their knowledge of the unknown vocabulary, then responded to questions regarding the strategies they employed while reading the text.

3.6 Summary of the chapter

This literature review in this chapter was divided into four sections. The first section provided an explanation of word knowledge, in terms of defining precisely what constitutes a word, and what word knowledge entails. The second section illuminated intentional and incidental vocabulary learning, clarifying their definitions, their relationships with the terms ‘implicit’ and ‘explicit’ learning, and their appearance in L2 vocabulary pedagogy. The third section addressed in detail LLS, and VLS, providing their definitions, characteristics, and their taxonomies. The fourth section reviewed a number of significant publications in the field of

second language acquisition, that were concerned with the strategies employed in intentional and incidental vocabulary learning. The chapter concluded with a discussion of aspects related to eye-tracking and incidental vocabulary acquisition, providing information concerning the nature of the eye-tracking method, and reviewing the studies that have employed eye-tracking in vocabulary learning.

4 Methodology

4.1 Overview of Chapter Four

This chapter sets out the methodology used in this study, and is divided into six sections. The first section presents an overview of the purpose of the study, and a description of the main research questions used in three types of experimental study: intentional vocabulary acquisition, incidental vocabulary acquisition, and eye-tracking. In the second section, an attempt is made to justify the combination of quantitative (vocabulary tests and the report of strategies used) and qualitative (interviews and stimulated recall interviews) research methods adopted, and to present the rationale for employing multiple data collection approaches in this study. Then, a discussion of the retrospective reporting and stimulated verbal recall is provided, followed by a clarification of the general data analysis procedure and the ethical considerations. The third section describes the general design of the pilot study and then addresses in depth the first and second pilot experimental studies, on intentional and incidental vocabulary learning respectively, including participants, tasks and data collection methods, and debates regarding coding strategies and reliability analyses. This is followed by a discussion of the analyses and results of the two pilot experiments; intentional and incidental respectively. The fourth section addresses the conclusions and limitations of these two pilot studies. The fifth section uses the findings of the pilot studies to clarify the methodology for the main study; this includes the main study design and the selection criteria for target words for all experimental studies, as well as the subjects, data collection and data analysis procedures for the three experiments: intentional, incidental, and eye-tracking.

4.2 Purpose of the Study

As mentioned in the introduction chapter, this research seeks to identify VLSs and the most frequent strategies (e.g. picture association, rote memorization, and cognitive and metacognitive strategies) for intentional and incidental vocabulary learning, and to explore the effects of these strategies on the short- and long-term word retention of English and Chinese L2 learners of Arabic. Below is a report of two pilot studies conducted on these topics. For the main study, the researcher modified the pilot design and materials based on the pilot results and further explored any individual differences between learners, and also examined in depth the strategies and behaviours utilized for incidental vocabulary acquisition through eye-tracking and stimulated verbal recall.

The key issues investigated in the main study were as follows:

- The range, type, and frequency of vocabulary learning strategies (VLS) selected and used by English and Chinese learners of Arabic in intentional and incidental vocabulary learning;
- The effects of the most common strategies on word retention in immediate and delayed vocabulary tests;
- how individual differences -between groups- can affect the choice of VLSs. As well as, the possible reasons behind choosing and employing some specific type of strategies.

Various studies on intentional learning have examined the effect of the keyword method on vocabulary acquisition; however, very few – namely Barcroft (2009) and Lawson and Hogben (1996) – have examined the effects of other L2 vocabulary learning strategies in the intentional mode. Moreover, neither Barcroft (2009) nor Lawson and Hogben (1996) examined the effects on delayed word retention. Accordingly, Barcroft (2009) suggested that future studies should investigate the extent to which the positive relationship between vocabulary

proficiency and the use of a variety of strategies (e.g. Ahmed, 1989) endures over an extended period. Alemi and Tayebi (2011) could not find any significant difference between incidental and intentional vocabulary learning. In their discussion of study limitations, they suspected that some awareness of the supposed incidental vocabulary may have existed. However, Alemi and Tayebi (2011) only targeted eighteen words (see Section 3.5.1.6 for further review). Thus, the current research is expected to have clearer outcomes because it compares two different groups exposed to two methods of learning, involves a larger target vocabulary, and includes different aspects of vocabulary knowledge.

Moreover, from the discussion and review of studies conducted on incidental vocabulary learning in Sections 3.5.3 and 3.5.4.2, it is clear that no study has covered the strategies used by L2 learners in incidental vocabulary acquisition. Hence, the general research question addressed in the second and third experimental studies (incidental vocabulary learning and eye-tracking) to cover this research gap can be used to identify the cognitive processes/strategies that L2 learners implement to learn unknown words during reading and whether or not these behaviours (strategies) positively influence the likelihood of word retention

To address these issues, this study has been designed to determine whether strategies used by L2 learners can positively affect short- and long-term retention in intentional and incidental L2 vocabulary acquisition. To answer the research questions, the analysis draws comparisons between:

- Incidental and intentional vocabulary learning;
- Initial uptake of knowledge and retention of knowledge;
- Types of strategies used in intentional and incidental learning;
- Types of strategies used by English and Chinese learners.

The research questions generally used for intentional and incidental vocabulary acquisition experiments are as follows:

- 1) What strategies do L2 learners use in general and most frequently during intentional and incidental L2 vocabulary acquisition?
- 2) Do L2 learners' immediate and delayed retention results differ between intentional and incidental vocabulary acquisition?
- 3) What is the relationship between the number of strategies used and the uptake of new vocabulary?
- 4) Is there a difference depending on L1 background?
- 5) In incidental learning, is there a difference between learning words in context and in isolation?
- 6) What is the effect of frequency of strategies and uptake of target-words based on type (noun/verb) and subtypes (concrete/abstract noun and action/state verb)?

The research questions generally used for eye-tracking and incidental vocabulary acquisition experiment are as follows:

- 1) What strategies (or cognitive processes) do L2 learners use most frequently during incidental L2 vocabulary acquisition?
- 2) Does the duration of L2 learners' eye fixation on novel words during incidental learning predict their recognition of these words in an unannounced vocabulary post-test?

To address these research questions in the main study, three experiments were conducted using a number of different methods for data collection, as discussed in the followed section. For the pilot studies reported below, the researcher used vocabulary tests, and a retrospective report of strategies and interviews. As noted above, the main study implemented methods to assess individual differences between L2 learners, and the eye-tracking method as a means of eliciting data regarding the cognitive processes/strategies used in incidental vocabulary acquisition.

4.3 Mixed Methods

Since some language learning strategies are generally internal or mental processes, designing an accurate study to assess strategy use can be something of a challenge. Nevertheless, the exploration and development of research techniques for investigating LLS has progressed, and different research methods have been used for investigating learners' use of LLS and VLS. The list of available research methods includes questionnaires (Gu & Johnson, 1996; Oxford, 1990; Schmitt, 1997), concurrent reporting (think aloud procedures) (Lawson & Hogben, 1996), retrospective reporting (Barcroft, 2009; Cohen & Apeh, 1980), observation (Ahmed, 1989; Rost & Ross, 1991), and interviews (Gu, 1994). In this study, a mixed methods approach was employed for data collection. That is, quantitative (vocabulary tests and retrospective reporting of strategies) and qualitative (interviews and stimulated recall interviews using eye-tracking) methods were used to identify participants' VLS and to measure their effects on word retention. Learning strategy research has suggested that a mixed methods approach should be adopted in data collection procedures, because each method might lead to different findings (O'Malley & Chamot, 1990; Oxford & Crookall, 1989). In the same vein, Matsumoto (1993) recommended that a multiple methods approach is "strongly encouraged, if we are to obtain more accurate, valid data on learners' cognitive processes as well as compensate for the problems inherent in each method" (p. 46).

Thus, achieving a valid and accurate description of learners' VLS is the main rationale for utilizing a multiple methods approach in this research. Furthermore, triangulating the data for this study by using different successful strategy research methods (vocabulary tests, retrospective reports, interviews, and eye-tracking techniques) can be methodically justified as each method compensates for the limitations of the other. The use of these different data collection methods in this study was useful for two reasons. First, this combination showed that the type of information obtained can be affected by the learning mode

(intentional/incidental) or the instrument used. By using verbal reports and vocabulary tests, useful information about vocabulary learning strategies, in terms of quantity, variation and the whole picture of strategy use, was obtained, although important information about strategy combinations, strategy order, depth of processing, and the links between strategies may have been missed (Al-Shuwairekh, 2001). On the other hand, detailed and in-depth information on these latter aspects was obtained through eye-tracking and stimulated verbal recall.

4.3.1 Retrospective reports and stimulated verbal recall protocols

Over the last three decades, researchers in second languages and educational research (e.g., Barcroft, 2009; Cohen & Aphek, 1980; Lawson & Hogben, 1996; Renkl, 1997) have generally applied two types of verbal reports – concurrent reports and retrospective reports – to obtain information that enables conclusions to be drawn about the cognitive processes underlying problem-solving behaviours (Van Gog, Paas, Van Merriënboer, & Witte, 2005). With the method of concurrent reports, participants are asked to think aloud and to verbalize all thoughts that come to mind during the time of working on a task (i.e. online). In retrospective reports, participants are instructed to report their thoughts and what they have done on a task immediately after completing it (i.e. offline) (Camps, 2003; Ericsson & Simon, 1993). The information gained through concurrent reporting is generally about actions and their outcomes, whereas information revealed by retrospective reporting refers to strategies that control the problem-solving process and elicit a specific response (Taylor & Jean-Paul, 2000).

To ensure that conclusions about the cognitive processes (or strategies) underlying task performance (e.g. vocabulary learning) are valid, verbalization instructions and prompts are essential only “when the instructions and prompts are worded in such a way that the evoked responses do not interfere with the cognitive processes” (Van Gog et al., 2005, p. 237). In this case only, the two types of verbal reports can be conducted in verbal protocol that reflect the

reported cognitive processes (Ericsson & Simon, 1993). Thus, the concurrent reporting method has been criticized because participants' responses may hinder their ongoing cognitive processes (Schwarz, 2007). Indeed, the method can cause a number of difficulties for participants because it forces them to verbalize ongoing cognitive processes during the problem-solving task, which might be subconscious. This may lead participants to report what they believe they employed, and cannot be guaranteed as a true indication of the real cognitive processes or strategies used (Ball, Eger, Stevens, & Dodd, 2006). Accordingly, retrospective reporting was adopted in the main study as the primary method for collecting data about vocabulary learning strategies and was implemented immediately after completion of the vocabulary knowledge uptake task. The retrospective reporting questions were delivered after participants completed the vocabulary knowledge uptake task to avoid influencing the learners and their methods of choosing learning strategies. This approach also enables more objectivity, as participants can report information, without interruption or interference, about the strategies they have used to acquire new lexical items (Barcroft, 2009). Nation (2013) described this method of data collection regarding VLS as having "the advantage that the reporting does not interfere with or influence the learning, and is based on very recent performance" (p. 339).

However, since the retrospective reporting method requires the retrieval of episodic memories from long-term memory, it has been criticized for only being valuable in the case of short tasks, whereas in longer tasks there is a risk of information omission and reports can be forgotten. (Taylor & Dionne, 2000). Therefore, some researchers (e.g., Rayner, 1998; Van Gog et al., 2005) proposed a method that combines the advantages of concurrent reporting (i.e. more action information) and retrospective reporting (i.e. more why, how, and metacognitive information) and can avoid their disadvantages. The result was a stimulated verbal recall protocol (or *cued retrospective reporting*), which is based on a retrospective report and a combined record of eye-movement and mouse-keyboard operations (Van Gog et al., 2005). In

stimulated verbal recall, participants are instructed to report retrospectively on their task performance while they are shown a record of their actions or behaviours during the task to stimulate their memories of their cognitive processes (Ehmke & Wilson, 2007). Thus, researchers have stated the significance of this method in the way that it leads to more and better results and is less affected by forgetting than basic retrospective reporting (Someren, Barnard, & Sandberg, 1994).

In the present study, stimulated verbal recall was used in the incidental vocabulary learning investigations to elicit more information about the cognitive processes or strategies that participants consciously or unconsciously employed for learning vocabulary through reading, and to link these cognitive processes/strategies to participants' incidental vocabulary knowledge. Thus, each participant was interviewed while watching their reading behaviour/performance regarding the text and the target words. The researcher used a set of guiding questions to extract more verbal information from participants, such as:

- What is happening here?
- What were you thinking at this point?
- Why did you return to this word?
- Why did you spend a longer time on this target word?

Other questions were related to what participants reported regarding the strategies they used, for example:

- Could you explain how you connect the target word to the context?
- How did you connect the word to its root?
- How did context help you in guessing the meanings of the target words?

The data that was extracted from the stimulated verbal recall in this study through eye-tracking, was of great significance in revealing the L2 learners' strategies for processing the target words during incidental vocabulary learning through reading. Research on vocabulary

acquisition from reading has shed light on the quantity and quality of words that are acquired incidentally from reading (Pellicer-Sánchez, 2016). By combining both online (eye-tracking) and offline (vocabulary tests and strategy reports) measures, it is possible to investigate in depth the strategies that enable L2 learners to recognize and learn unknown vocabulary incidentally. The combination of both methods of assessment should provide a fuller account of L2 learners' reading strategies and of their incidental vocabulary acquisition from reading.

4.3.2 The general procedure of data analysis

Scoring and coding the data: All the data from the three experimental studies – intentional, incidental, and eye-tracking – were itemized and transformed into numerical codes and input into Excel tables to allow easy conversion into R and SPSS statistical packages using mixed effect models. Each correct response from each test was given '1' and each incorrect or missing answer was given '0'. Learners were expected to make some spelling errors in the productive vocabulary retention tests and all the papers were reviewed manually for a provisional analysis before the item entry of the data and the decision of the marking scheme was set. Two types of spelling errors found in learners' answer sheets were included: minor error – where missing or misspelling vowels occurred, or major error – where the word was read with difficulty or was found to be confused with another word. Only the minor errors were accepted as correct answers (given 1). Others were given 0.

The data analysis: The data collected was analysed according to the aims and objectives of the study. Several data analysis steps were carried out to produce the following results:

- General means, maximum and minimum scores, and standard deviation of the three experiments (intentional, incidental, and eye-tracking)
- Correlations between the scores of different tests.
- Rate of decrease (difference) between immediate and delayed tests.
- Difference between the gains of the two learning groups (English and Chinese).

- Correlation between the strategies used and the level of vocabulary retention.

The R statistical package was mainly used for the data analysis to produce the descriptive and correlation results mentioned above. Mixed effects models were run on the data with the dependent variable *post test scores*, and the fixed factors *learning mode* (intentional/incidental), *number of strategies*, *test time* (immediate/delayed), and *group* (Chinese/English), with random factors *subjects* and *items*. Another mixed effects model was run on the data with the dependent variable *number of strategies*, and the fixed factors *learning mode* (intentional/incidental), *test time* (immediate/delayed), and *group* (Chinese/English), with the random factor *subjects*. Any t-value exceeding 1.96 was considered statistically significant at an alpha level of $p < .05$ (Leal, Slabakova, & Farmer, 2016).

4.3.3 Ethical considerations

A number of ethical considerations were taken into account for this study to ensure the integrity and quality of the research. The researcher provided sufficient information for all the participants to decide whether they would like to take part in the study (see Appendix A (A1) for the ethics committee approval confirmation, consent information sheet and consent form). All participants were aware of their rights regarding confidentiality and access to their data. Although writing their names on the vocabulary tests sheets was optional, they were encouraged to do so for the purpose of the study, which was to compare data between their immediate and delayed vocabulary tests and their strategies. However, during the analyses, names were replaced by numbers based on groups (e.g. English group G1S1, Chinese group G2S1). They were assured that their personal data would be accessed for research purposes only, and that neither the school administration nor their teachers would have access to the data. In addition, the researcher obtained their informed consent before collecting the data.

4.4 The Pilot Studies

Two pilot studies were run; the first was an intentional vocabulary learning experiment, the second was an incidental vocabulary learning experiment. These pilot studies were designed according to the nature of the research questions and to the scope and aim of the study: investigating the effects of the most frequent strategies used for intentional and incidental vocabulary acquisition on L2 word retention in immediate and delayed post-tests.

In the intentional learning experiment, twenty-six Chinese and English learners of Arabic as a second language (13 in each group), were introduced to fourteen Arabic words while viewing word-picture pairs in a learning session. In the learning session, the word-picture pairs and the meanings of the abstract words were displayed on a screen for six seconds each. All the target words were presented in this manner twice, in the same order each time. To meet the conditions of intentional learning, the participants were informed that they would be tested on the fourteen experimental words after the learning phase. The participants then completed two tests: an immediate test was conducted immediately after the learning phase and a delayed test was conducted a week later. During this time, the participants answered questions regarding the strategies they used. Their responses were coded to identify the strategy most frequently used by each participant.

For the incidental learning experiment, the same participants read an Arabic short story with marginal glosses. On completion, two tests were conducted. The first test assessed the knowledge uptake of [a] words in isolation, and [b] words in context; for this, fourteen target words were presented in short sentences taken from the original text. This test was repeated one week later to address the question of delayed word retention; again for [a] words in isolation, and [b] words in context. During both of the assessments participants answered questions regarding the strategies they used. Their responses were coded to identify the strategy most frequently used by each participant.

In the main study, the researcher added a third experimental study which employed eye-tracking with stimulated verbal recall. See Section 3.5.4 for more details about the eye-tracking and Section 4.6.5 for details about the design and procedure of experiment three.

4.4.1 Experiment 1 (pilot): Intentional vocabulary learning

The aims of the pilot study were: firstly, to use the results obtained to develop the vocabulary test and questionnaires to be used later in the main study; and secondly, to assess the usability and practicality of the three instruments (tests, questionnaires, and interviews) and of the data collection and data analysis techniques used for each one. The uptake, immediate and delayed vocabulary learned and the effect of the strategies used were examined by comparing Chinese and English learners of Arabic.

Research questions

The research questions for the pilot intentional learning experiment were as follows:

- 1- What strategies do L2 learners use most frequently during intentional L2 vocabulary acquisition?
- 2- Is there a difference between the immediate and delayed retention results?
- 3- Is there a difference depending on L1 background?
- 4- What is the relationship between the number of strategies used and the uptake of new vocabulary?

4.4.1.1 Participants

The participants were thirteen English and thirteen Chinese learners of Arabic as a second language studying at the Institute of Teaching Arabic Language (ITAL), which is affiliated with Al-Imam Muhammad Ibn Saud Islamic University in Riyadh, Saudi Arabia. Based on the grading standards of the ITAL – which can be used as an indicator of students' proficiency levels – the participants' general level of Arabic language in both groups was advanced. Participants were aged from twenty-two to twenty-nine. All participants were rewarded with £7 each. Based on the result of the experimental words determination test (see

next section), six participants of each group were excluded due to their familiarity with some experimental words.

Table 4.1. Overview of information about the learners participating in intentional and incidental learning

Participants' Group	Number	Proficiency level	Age average
English	13	advance	25.4
Chinese	13	advance	24.9

4.4.1.2 Materials

Fourteen words were chosen for the intentional vocabulary learning (Table 4.2). These fourteen words were selected because an experimental words determination test revealed that they were unknown by all the participants. To ensure that every participant was unfamiliar with the experimental words used in the intentional learning, the participants completed an experimental words determination test. This test included a list of forty Arabic words with a mixture of abstract and concrete meanings. The researcher selected thirty of these words based on the strong probability of the participants' unfamiliarity with them, as they are of low frequency in Arabic. The remaining ten words were used as control words based on their presumed relative familiarity.

The participants were instructed to write the meaning next to any of the forty Arabic words that they knew or thought they knew. This experimental word determination test identified twenty-eight words that were unknown by all the participants. Of these, fourteen (four of which were abstract words) were chosen for the intentional vocabulary learning, and the remaining fourteen were used in the incidental vocabulary learning.

Table 4.2: Experimental words for intentional learning

Experimental words and their English translations	
Experimental words for intentional learning	
Arabic Words	English translation
مرساة	Anchor
سلسلة	Chain
فطر	Mushroom
نبته القرع	Pumpkin
مبرد	Chilled
جُنْدَب	Grasshopper
مزهرية	Vase
منخل	Sieve
مجرفة	Shovel
مهد	Cradle
رَوَّج	To promote
اجتّاح	To invade
مُواكِبَة	Keeping pace with
وَتِيرَة	Manner

4.4.1.3 Tasks and Procedures

The participants completed three tasks: a learning task and two assessment tasks. These two assessment tasks were administered to evaluate intentional learning, the first focusing on immediate knowledge uptake and the second on delayed knowledge retention.

Learning task

The learning task was modelled after a study conducted by Barcroft (2009) which explored the effects of different learning strategies used by L2 learners on intentional vocabulary acquisition. In his study, Barcroft used a word-picture vocabulary-learning paradigm “to focus on the strategies and cognitive activity in which learners engage when they are given access to each target word form and its referent” (p. 78). The participants in Barcroft’s study answered questions about the strategies they used to acquire new words. Nation (2013, p. 339) described this method of data gathering concerning VLS as having “the advantage that the reporting does not interfere with or influence the learning, and is based on very recent performance”.

Immediate knowledge uptake test

This test also followed a test implemented in Barcroft's (2009) study and was conducted by the researcher immediately after the learning task to assess the participants' immediate uptake of vocabulary knowledge. This test consisted of two parts: the first was a picture-to-L2 recall test, in which the participants were asked to write down the target Arabic words that matched the pictures, and for abstract words to provide the meaning in Arabic. The participants then undertook a questionnaire, which asked them about the strategies they used in the learning task. The questionnaire contained two items:

- 1) Please list and describe the strategies that you used when attempting to learn the fourteen Arabic words.
- 2) Which strategy did you use most frequently? Why?

These items were located after the short-term knowledge uptake task to avoid influencing the learners and their methods of selecting learning strategies. This approach also enables more objectivity, as participants can report information, without interruption or interference, about the strategies they have used to acquire new lexical items intentionally (Barcroft, 2009; Nation, 2013).

Delayed knowledge retention test

This test was the same as the short-term knowledge uptake test but was conducted a week later.

Procedures of the learning task

The two groups of participants were gathered together in one classroom and information regarding the task was explained by the researcher (e.g. the project outline, procedures, and participation). At this point, the participants were able to ask any questions relating to the task. The participants then signed the consent forms and moved on to the tasks (see the consent form and tasks in Appendix A).

In the learning task, word-picture pairs and the meanings of the four abstract words were displayed on a screen for six seconds each. All the target words were presented in this manner twice, in the same order each time to help those who missed any of the slides. To meet the standards of intentional learning, the participants were informed that after the learning task they would be tested on fourteen experimental words in the immediate knowledge uptake test. The hypothesis was that the students would pay more attention if they were given access to each target word's form and its picture or meaning (Barcroft, 2009). This approach also allowed the researcher to measure the number of strategies used by participants.

Procedures of the testing tasks

After the learning task, the participants started the initial uptake of new vocabulary assessment which consisted of two parts: a test and questionnaire. In the test part (picture-to-L2 recall), the participants were asked to write down the target Arabic words that matched the pictures and provide the meanings of the abstract words. At the end of the test, the participants were instructed to do the second part, which was to answer the two questions about the strategies they had used during the learning task.

The test and questionnaire were provided to the students together but participants were asked to complete the test first followed immediately by the questionnaire. It is worth mentioning here that the two questions (the meaning of 'strategies' in particular) were clearly explained to the participants by the researcher. The researcher clarified that 'strategy' means the method, technique, or action that a learner uses to acquire new vocabulary. The researcher also gave some example strategies, such as connecting a new word with its picture as in the L2 word-picture association strategy.

A week later, the same test and questionnaire task was carried out to assess the participants' delayed knowledge retention. It included the same two questions from the end of the previous test regarding strategies.

4.4.1.4 Strategy Coding, Reliability Analysis, and Assessment of Vocabulary tests.

This section provides details of the way the vocabulary learning strategies were coded, and the reliability analysis of this coding. It furthermore gives clarification about the assessment of vocabulary tests.

4.4.1.4.1 Strategy Elicitation and Coding

The strategies used in this study were coded based on the participants' responses to questions 1 and 2 in each test. During this process, the researcher worked with an assistant. Every strategy mentioned in the responses to question 1 was recorded. For question 2, the most frequently used strategies were coded based on the students' responses. Some strategies were used in both modes of vocabulary learning (intentional and incidental), whereas others were mode-specific.

The following presents examples of some codes used in this process:

- *Self-generate target word*: 'I memorized the target word myself without looking to the word'. The same strategy was reported in Barcroft's (2009) study, where participants closed their eyes and attempted to evoke words from memory.
- *L2 word-picture association*: 'I try to link the word with its picture'.
- *Focus on the beginning of the word*: 'I try to remember the first letter of each word, to recall the word'.
- *Verbal repetition*: 'I repeat the word many times'.
- *Written repetition*: 'I write the word many times'.
- *L2-L1 translation*: 'I write the words and their translation into my language [English or Chinese]'.
- *Paraphrase the word's meaning*: 'I try to link the word's definition with the context'. This strategy was specific to incidental vocabulary learning.
- *L2 word-context association*: 'I try to remember the text or sentence that words appeared in'.
- *Visualize target word and picture*: 'I try to visualize the pictures of new words in my mind'. This imagery strategy was particularly common for long-term vocabulary retention.

Finally, some participants used mnemonic strategies, which included different types of associations and involved recording L2 forms into L1 forms and creating a pictorial situation to combine the words. Table 4.3 illustrates a list of all vocabulary learning strategies (VLS) used by L2 learners in the two pilot experiments of intentional and incidental vocabulary learning.

Table 4.3: Displays All Vocabulary Learning Strategies used at both experiments

All Strategies used at Intentional and Incidental vocabulary Learning
L2 word–picture association
Visualise target word and picture
Self-generate target words
L2–L1 association
L2 word–referent/use association
L2–L1 translation
Focus on presentation order
Note taking
Word feature analysis
Study and practice meaning in a group
Word-written repetition
Use spaced word practice (expanding rehearsal)
Connect word to a personal experience
Use words in sentences
Monolingual dictionary
Bilingual dictionary
Rote memorization
Group words together with a storyline
Keyword method
Connect word to its synonyms
Connect word to its antonyms
L2 word-context association
Reading for general understanding
Reading for thorough understanding
Guess from textual context
Paraphrase the word meaning
Self interest in the remembered words
Remembering the storyline
Associate the word with its coordinates
Associate words to a strange sight or sense that cannot be forgotten

4.4.1.4.2 Reliability analysis of strategy coding

Three criteria were followed to achieve a reliable strategy coding scheme: (1) the researcher employed common taxonomies of VLS (Nation, 2013; Schmitt, 1997); (2) the researcher worked with an assistant (a specialist in L2 VLS) on the process of coding the strategies, which was based on a scheme of thirty-four strategies; and (3) the strategies described by the participants in questions 1 and 2, along with their coding, were submitted to

an independent evaluator (a university-level second language acquisition and research methodology tutor). This evaluator was asked to read the participants' descriptions of their strategies and match them to the researcher's scheme using three Likert test choices: agreement, partial agreement, and disagreement. The reliability analysis results indicated 98% agreement and 2% disagreement, which indicates a high degree of reliability for the strategy coding.

4.4.1.4.3 Assessment of Vocabulary tests:

As described at the beginning of this chapter, all the data from the three experimental studies – intentional, incidental, and eye-tracking – were itemized and transformed into numerical codes and put into Excel tables to allow easy conversion into R and SPSS statistical packages using mixed effect models for the data analysis. Each correct response of each test was given '1' and each incorrect or missing answer was given '0'. Learners were expected to make some spelling errors in the productive vocabulary retention tests, and all the papers were reviewed manually for a provisional analysis before the item entry of the data and the marking scheme was set. Two types of spelling errors found in the learners' answer sheets were included: minor error – where missing or misspelling vowels occurred, or major error – where the word was read with difficulty or was confused with another word. Only the minor errors were accepted as correct answers (given 1). Others were given 0.

4.4.1.5 Results

This section presents the methods of analysis, and describes the results of the analyses.

4.4.1.5.1 Analyses

The results of the intentional learning experiment were based on four sets of analyses according to the research questions. First, the descriptive results for the most frequent strategies were determined by counting the number of participants in each group who used each strategy

most frequently. Second, the potential effect of the most frequent strategies on vocabulary learning was assessed based on the participants' intentional vocabulary acquisition performance.

Third, to determine the differences between the groups (English vs. Chinese) regarding short- and long-term word retention, a between-subjects ANOVA was conducted of the within factor *retention* (immediate vs. delayed) and the between-subjects factor *group* (English vs. Chinese).

Finally, to investigate whether there was a relationship between the number of different strategies used and the accuracy of immediate and/or delayed recall, two Pearson product-moment correlation coefficients were computed, one per L2 group.

4.4.1.5.2 1st RQ: What strategies do L2 learners use most frequently during intentional L2 vocabulary acquisition?

Column 1 in Table 4.4, below, displays the strategies most frequently used in each L2 group (English and Chinese). Columns 2 and 3 display the number of participants who reported using each strategy, and the mean frequency scores of each strategy used in the immediate word retention test. Finally, columns 4 and 5 display the number of participants in each group who reported using strategies during the delayed retention test and the mean frequency scores for each strategy used. Clearly, some strategies were used by both groups during the immediate and delayed tests. The most frequent strategies reported by English learners in the immediate retention test were L2 word-picture association, L2-L1 translation, rote memorization, and keyword method. The most frequent strategies reported by Chinese learners in the initial uptake (immediate) test were L2 word-picture association, rote memorization, and self-generate target words. In delayed recall test, the most frequent strategies reported by the English learners were L2 word-picture association, rote memorization and note taking, whereas the Chinese learners

tended to use memory strategies more often, such as visualize target word and picture, L2 word-picture association, and rote memorization.

Table 4.4: Frequencies and recall means of the strategies most frequently used for intentional immediate and delayed retention (SEs in parentheses)

Strategies most frequently used by English group	immediate retention		delayed retention	
	Freq.	Mean	Freq.	Mean
L2 word-picture association	2	13.00 (1.00)	5	6.40 (1.36)
L2-L1 translation	3	8.00 (1.00)	--	--
Rote memorization	4	8.25 (1.70)	--	--
Keyword method	2	9.50 (0.50)	2	4.50 (0.50)
Visualize target word and picture	1	4.25 (0.00)	1	2.25 (0.00)
Word-written repetition	1	5.00 (0.00)	--	--
Note taking	--	--	2	3.50 (0.50)
Strategies most frequently used by Chinese group	Short-term retention		Long-term retention	
	Freq.	Mean	Freq.	Mean
L2 word-picture association	5	9.40 (1.47)	5	5.80 (1.06)
Rote memorization	4	12.00 (1.08)	5	7.20 (1.53)
Visualize target word and picture	1	4.25 (0.00)	3	8.33 (0.33)
Self-generate target words	2	10.50 (1.50)	--	--
Word-written repetition	1	5.00 (0.00)	--	--
Note taking	1	10.50 (0.00)	--	--

4.4.1.5.3 2nd RQ: Is there a difference between the immediate and delayed retention results? and 3rd RQ: Is there a difference depending on L1 background?

In terms of the differences between the groups (English vs. Chinese) with regard to short- and long-term vocabulary retention, the Chinese learners were more accurate than the English in vocabulary uptake both immediately after the learning phase (short-term: 76% vs. 61%) and one week post learning (delayed-phase: 50% vs. 29%), as shown in Table 4.5.

Table 4.5. Mean accuracy scores per group, for short- and long-term uptake.

		% correct short-term		% correct long-term	
		Mean	Standard Deviation	Mean	Standard Deviation
Group	English learners (n=13)	60.99	22.52	29.12	20.92
	Chinese learners (n=13)	76.37	18.76	49.45	18.78

The results of the between-subjects ANOVA of the within factor *retention* (immediate vs. delayed) and the between-subjects factor *group* (English vs. Chinese) supported this finding, with a significant main effect of *group* ($F(1, 24)=5.837; p = 0.024$). Despite this overall difference between the groups, the pattern of accuracy for both groups was the same: dropping quite dramatically after a week. This was supported by the results, which found a main effect of *retention* ($F(1, 24)=98.275; p < 0.001$) but no interaction between *retention* and *group* ($p > .4$).

4.4.1.5.4 4th RQ: What is the relationship between the number of strategies used and the uptake of new vocabulary?

To investigate whether there was a relationship between the number of different strategies used and the accuracy of immediate and/or delayed recall, two Pearson product-moment correlation coefficients were computed, one per L2 group. The results revealed no correlation for the Chinese group for either immediate and delayed retention accuracy ($p > .4$). However, for the English group, there was a significant positive correlation between the number of strategies employed and delayed retention of vocabulary ($r = .653, n = 13; p = 0.016$), indicating that the greater the number of different strategies the English learners used, the better their delayed vocabulary retention was.

4.4.2 Experiment 2 (pilot): Incidental vocabulary learning

The aims of this pilot study were: firstly, to use the results obtained to develop the vocabulary test and questionnaires to be used later in the main study; and secondly, to assess the usability and practicality of the three instruments (tests, questionnaires, and interviews) and of the data collection and data analysis techniques used for each one. The researcher examined the uptake, immediate and delayed vocabulary learned and the effect of the strategies used by comparing Chinese and English learners of Arabic.

Research questions

The research questions for the pilot incidental learning experiment were as follows:

- 1) What strategies do L2 learners use most frequently during incidental L2 vocabulary acquisition?
- 2) Is there a difference between the immediate and delayed retention results?
- 3) Is there a difference depending on L1 background?
- 4) Is there a difference between learning words in context and isolation?
- 5) What is the relationship between the number of strategies used and the uptake of new vocabulary?

4.4.2.1 Participants

The learners who participated in this pilot experiment were those who had participated in experiment 1, because the researcher had employed a completely different experimental words for this incidental vocabulary learning (see Section 4.4.2.2). More data about participants can be found in Section 4.4.1.1.

4.4.2.2 Materials

The materials were modelled after (Hulstijn et al., 1996) who chose a story with low-frequency words and selected a number of target words from the text to assess incidental vocabulary learning (see more details about Hulstijn et al.'s study in Section 3.5.3). The incidental experiment included an Arabic short story from which a number of low frequency

words were extracted to be used for the testing tasks (the immediate knowledge uptake task delayed retention task). The researcher selected fifteen low frequency words from the story as target words based on their presumed level of unfamiliarity according to the results of the experimental word determination test (Section 4.4.1.2). One target word was excluded following the results of this test, and the remaining fourteen low frequency Arabic words were chosen for the incidental vocabulary learning assessment (Table 4.6).

Table 4.6: Experimental words for incidental learning

Experimental words for incidental learning	
Arabic Words	English translation
أَسَفًا إِسْفَافًا	Bathos
عَرَاكَ	Inflict you
يَخْبُو	Fades
مَا أَخَالِي	What I suspect
أَرْبِعْ عَلَيْكَ	Take it easy
أَرْعَيْتَنِي	Scared me
عَمِدْتُ	Proceeded
إِسْتَنْفَدْتُ	Exhausted
رُكَّامٌ	Moraine
يُصْنَعِي	Listen
تَتَوَّءُ بِي	Overwhelmed me
مَدَارِكُهُمْ	Their Cognitive
يَهْدِي	Raves
يَسْتَنْجِدُ	Seeks help

4.4.2.3 Tasks and procedures

The participants completed two tasks, a learning task and a vocabulary uptake task, the latter to assess incidental learning. As in the intentional learning study, participants undertook the test task twice: once immediately after the learning phase (to test short-term uptake) and then again one week later to test delayed word retention.

4.4.2.3.1 Learning task

The learning task involved an Arabic short story titled ‘The Story of a Teacher’, by Ali Attantawi which contained many low-frequency words. The text was a total of 802 words in length (see appendix A4). The story was combined with marginal glosses for the selected

fourteen target words as well as for additional twenty words from the story – following Hulstijn et al. (1996) – to reduce the salience of the fourteen target words. The marginal glosses for these words (with their Arabic meanings) were printed in bold and placed on the right side of each page (see the text in appendix A4). This task was timed, with thirty minutes allowed for reading the story and its marginal glosses. This learning task was incidental in that the participants were not informed that they would be tested on the meaning of any of the words in the text.

Vocabulary uptake task

The task was conducted by the researcher immediately after the learning task to assess the participants' immediate uptake of the experimental vocabulary. This task consisted of two parts, the first investigated whether learners could provide the meanings of the target words in isolation and the second explored whether they could do so in context (in the context of the words as they appeared in the original text), as research has shown that guessing from context may play a significant role in incidental vocabulary learning (Hulstijn et al., 1996). The purpose of the second part was also to determine whether any relationship existed between the learners' methods of guessing and how well they could use guessing to recall new vocabulary items in the long-term.

As in the intentional study, a questionnaire about the strategies the participants used in the learning task was administered, containing the same two questions:

- 1) Please list and describe the strategies that you used when attempting to learn the fourteen Arabic words.
- 2) Which strategy did you use most frequently? Why?

The reason why these questions were delivered after the initial (short-term) uptake task is explained in experiment 1, Section 4.4.1.3.

Delayed knowledge retention

The same vocabulary uptake task was carried out a week later to assess delayed knowledge retention.

Procedures of the learning task

The two groups of participants were gathered together in one classroom where the researcher explained the requirements of the task and answered any questions the participants had. The participants then signed the consent forms and moved on to the tasks.

At the beginning of the learning task, the participants were told that they would be given thirty minutes to read a text and then answer questions regarding the meaning of its content (i.e. text comprehension). They were also informed that they would not have the text at hand when answering the questions. As noted above, to meet the standards of incidental vocabulary learning the participants were not told in advance that they would be tested on their knowledge of unknown words. Thus, they focused on understanding the whole meaning of the text (while reading) rather than the meanings of the unknown words (Hulstijn et al., 1996; Hulstijn, 2001, 2003).

Procedure of the testing task

After the learning task, the participants completed the vocabulary uptake task and then the questionnaire investigating their vocabulary learning strategy use. To test their vocabulary uptake, the participants were asked to provide the meanings of the fourteen target words [a] in isolation, and [b] in context – for which the target words were presented in short sentences taken directly from the original text. For example, presenting the word “يَخْبُو”/yahkpo/fades in its original sentence (فإن سراج حَيَاتِي يَخْبُو). At the end of each word recall test, the participants were instructed to complete the second part of the task, which was to answer the two questions about the strategies they had used during the learning task.

These tests and questionnaire were provided to the students together but they were asked to complete the test first followed immediately by the questionnaire. The two questions (the meaning of ‘strategies’ in particular) were clearly explained to the participants by the researcher (see Section 4.4.1.3 for more details).

A week later, the delayed knowledge retention test was performed in the same way as the initial (short-term) uptake task. It included the same two questions from the end of the previous tests regarding strategies.

4.4.2.4 Strategy coding

The same procedures used in experiment 1 were used in this experiment for strategy coding, and reliability analysis, and the assessment of the vocabulary tests (see Section 4.4.1.4).

4.4.2.5 Results and discussion

This section describes the methods of analysis used in this experiment, followed by a presentation of the results.

4.4.2.5.1 Analysis

The results of the incidental learning experiment were based on four sets of analyses according to the research questions. First, the descriptive results for the most frequent strategies were determined by counting the number of participants in each group who used each strategy most frequently. Second, the potential effect of the most frequent strategies on vocabulary learning was assessed based on the participants’ performance in the immediate and delayed vocabulary uptake tasks.

Third, to determine differences between the groups (English vs. Chinese) regarding immediate- and delayed word retention in isolation and in context, a 2 x 2 ANOVA was run on the mean accuracy scores with the within factors *retention* (immediate vs. delayed) and *context* (+/-), and the between-subjects factor *group* (English vs. Chinese).

Finally, to investigate whether there was a relationship between the number of different strategies used and the accuracy of immediate- and/or delayed recall of words tested in isolation and in context, four Pearson product-moment correlation coefficients were computed, two per L2 group.

4.4.2.5.2 1st RQ: What strategies do L2 learners use most frequently during incidental L2 vocabulary acquisition?

Column 1 in Table 4.7, below, displays the strategies most frequently used in each group. Columns 2 and 3 display the number of participants who reported using each strategy and the mean recall scores for each strategy used in the incidental immediate uptake of isolated words recall test. Columns 4 and 5 display the number of participants in each group who reported using each strategy during the incidental immediate uptake of words in context recall test, and the mean recall scores for each strategy used. Columns 6 and 7 display the number of participants in each L2 group who reported using each strategy and the mean recall scores for each strategy used in the incidental delayed recall of isolated words test. Columns 8 and 9 present the number of participants who reported using each strategy in the incidental delayed recall of words in context test and the mean recall scores for each strategy used.

A variety of frequent strategies were used by each L2 group to recall newly-acquired vocabulary in both the incidental immediate- and delayed retention tests. Table 4.7 presents the strategies reported most often by each group. The strategies used most frequently by English learners in the immediate uptake of words in isolation test were monolingual dictionary, L2 word-context association, and paraphrase the word meaning. When they were tested on their immediate uptake of words in context, the English participants preferred to use guessing the meaning from context most frequently. On the other hand, the Chinese learners used rote memorization most frequently, as well as the same strategies used by English learners, to recall words in the immediate uptake of words in isolation test. In addition, guessing

from textual context was reported nine times by the Chinese learners as a strategy frequently used in the immediate uptake of words in context test.

The strategies reported most often by the English learners for delayed retention of words in isolation were L2 word-context association and remembering the storyline. In the delayed retention of words in context test, English learners tended to use two strategies most often: L2 word-context association and guessing from textual context. In contrast, the strategies reported most often by Chinese learners for delayed recall of words in isolation were L2 word-context association, monolingual dictionary, and rote memorization; and for delayed recall of words in context, eleven participants used guessing from textual context most frequently.

These results show that some of the frequently used strategies resulted in higher target word recall than others. The L2 word-context association strategy produced the highest rate of target word recall when used by English learners for recalling words in isolation or in context in both immediate and delayed retention tests. However, this strategy (L2 word-context association) only produced the highest rate of target word recall for Chinese learners when they were recalling words in isolation, again in both immediate and delayed retention tests.

Table 4.7: Frequencies and recall means of most frequently used strategies on incidental immediate- and delayed memory recall tests (SEs in parentheses)

Most frequently strategies used by the English group	Freq.	Mean Incid Sh-No-Con	Freq.	Mean Incid Sh-Con	Freq.	Mean Incid Lo-No-Con	Freq.	Mean Incid Lo-Con
Monolingual Dictionary	2	6.50 (1.50)						
Rote memorization	1				1		1	
Connect Word to its Synonyms	1				1			
L2 word-context association	2	6.50 (1.50)	2	9.00 (4.00)	4	4.25 (1.65)	2	13.50 (0.50)
Reading for General Understanding	1				1			
Guess from textual context	1		10	8.90 (1.10)			7	7.57 (1.32)
Paraphrase the word Meaning	2	5.00 (2.00)					1	
Remembering the story line					2	5.50 (2.50)	1	
Visualise target word and picture					1			
Most frequently strategies used by the Chinese group	Freq.	Mean Incid Sh-No-Con	Freq.	Mean Incid Sh-Con	Freq.	Mean Incid Lo-No-Con	Freq.	Mean Incid Lo-Con
Monolingual Dictionary	2	5.00 (2.00)	2	5.50 (0.50)	2	2.00 (1.00)	1	
Rote memorization	2	6.50 (1.50)	1		2	6.00 (3.00)		
L2 word-context association	2	10.50 (2.50)	1		4	6.25 (2.25)		
Reading for General Understanding	1							
Guess from textual context	1		9	8.00 (0.98)			11	7.55 (1.06)
Paraphrase the word Meaning	3	3.67 (0.88)						
Remembering the story line					1			
Connect word to a personal experience					1			

4.4.2.5.3 2nd RQ: Is there a difference between the immediate and delayed retention results? 3rd RQ: Is there a difference depending on L1 background? and 4th RQ: Is there a difference between learning words in context and isolation?

Regarding the question of differences between the groups (English vs. Chinese) in terms of immediate and delayed retention, Table 4.8 and Table 4.9 show that both groups of learners were more accurate in the short-term conditions than when they were tested one week later (immediate vs. delayed), and both groups were more accurate overall when the words were tested in context versus when they were tested in isolation.

Table 4.8. Mean accuracy scores per group for immediate and delayed uptake of words tested in isolation.

	% correct short-term with no context		% correct long-term with no context	
	Mean	SD	Mean	SD
English	30.26	19.36	26.67	18.66
Chinese	35.38	21.50	28.72	21.50

Table 4.9. Mean accuracy scores per group for immediate and delayed uptake of words tested in context.

	% correct short-term with context		% correct long-term with context	
	Mean	SD	Mean	SD
English	61.03	23.55	54.87	24.97
Chinese	52.82	18.55	47.18	23.80

The results of a 2 x 2 ANOVA with the within factors *retention* (immediate vs. delayed) and *context* (+/-) and the between-subjects factor *group* (English vs. Chinese) was run on the mean accuracy scores. The results supported the descriptive patterns noted above. There was a significant main effect of *retention* ($F(1, 24)=8.243$; $p < 0.01$) and *context* ($F(1, 24)=139.320$; $p < 0.001$). The groups patterned in the same way, as shown by the fact that even though numerically the English group performed slightly better than the Chinese, there was no main effect of *group* ($p > .4$). However, there was a significant interaction between *context* and *group* ($F(1, 24)=6.076$; $p < 0.05$). This interaction was caused by the greater difference between the

English learners' accuracy scores for the words in isolation and those tested in context (28% vs. 58%: $t(12)=-11.393$; $p < 0.001$) than the Chinese learners' scores (32% vs. 50%), although this latter comparison was also significant ($t(12)=-5.756$; $p < 0.001$).

4.4.2.5.4 5th RQ: What is the relationship between the number of strategies used and the uptake of new vocabulary?

In order to investigate whether there was a relationship between the number of different strategies used and the accuracy of immediate and/or delayed recall of words tested in isolation and those tested in context, four Pearson product-moment correlation coefficients were computed, two per L2 group. For the Chinese learners, the only significant correlation observed for the number of strategies used was with the accuracy scores for the immediate retention of words in isolation, indicating that, for the Chinese learners, the greater the number of strategies used, the higher the accuracy achieved ($r = .607$, $n = 13$; $p = 0.028$). For the English group, the number of strategies used was positively correlated with all accuracy scores (immediate, in context: $r = .636$, $n = 13$; $p = 0.019$; delayed, in isolation: $r = .708$, $n = 13$; $p = 0.007$; delayed, in context: $r = .773$, $n = 13$; $p = 0.002$), except the immediate retention scores for words tested in isolation.

4.5 Conclusion and limitations of the pilot studies

4.5.1 Conclusion

The main study was designed to identify the effect of strategies used during intentional and incidental vocabulary learning on immediate- and delayed word retention and to measure the relationship between the use of strategies and vocabulary learning performance. It also aimed to compare the two modes of learning vocabulary – intentional and incidental, and to investigate

individual differences amongst learners in terms of strategy use and vocabulary uptake. The results of the two pilot experiments reported above informed the design of the main study. For intentional learning, twenty-six advanced Chinese and English students of Arabic as a second language were introduced to Arabic words while viewing word-picture pairs. The participants then completed two tests: an immediate test was conducted immediately after the learning, and a delayed test was conducted a week later. For incidental learning, the same participants read an Arabic short story with marginal glosses. Upon completion, two tests were conducted in two phases. The first test assessed [a] words in isolation, and [b] in context; for this, fourteen target words were presented in short sentences taken from the original text. This uptake task was repeated a week later to investigate delayed vocabulary knowledge retention. During the assessments, participants answered questions regarding the strategies they used for word learning. Their responses were coded to identify the strategies used most frequently by each participant.

The results of the pilot studies revealed that a substantially varied number of strategies were reported as used most frequently by each group (English and Chinese) during both intentional and incidental learning. Some strategies from each test stood out as being self-selected most frequently in intentional and incidental vocabulary learning. The strategies most frequently selected in the intentional short-term test were L2 word-picture association, L2-L1 translation, and rote memorization; the strategies most frequently selected in the intentional delayed test were L2 word-picture association and rote memorization. The strategies most frequently reported in the incidental immediate recall of words in isolation test were monolingual dictionary, rote memorization, L2 word-context association, and paraphrasing the word's meaning. In addition, when examining incidental words, learners guessed meaning based on

textual context. The strategies most frequently reported in the incidental delayed retention of words in context test were rote memorization, L2 word-context association, and remembering the storyline. Once again, learners also guessed meaning from textual context.

Some strategies resulted in higher target word recall than others. Rote memorization produced the highest rate of target word recall in intentional learning, followed by self-generated target words. In incidental learning, L2 word-context association resulted in higher target word recall, followed by the use of marginal glosses (a monolingual dictionary). Testing vocabulary retention from context resulted in a significant amount of acquired vocabulary compared to testing vocabulary retention in isolation. According to the significance results of the correlational analyses of the number of strategies used and the vocabulary test scores in both types of learning, the more learning strategies used, the more vocabulary was recalled in both immediate- and delayed memory tests.

Some individual differences seemed to affect the learners' choices of deliberate and incidental VLS, such as their native language, culture, and previous knowledge. One significant factor was the learners' L1 backgrounds, which were either English or Chinese. Participants with L1 English backgrounds tended to use cognitive strategies in intentional learning, such as note taking or L2-L1 translation. In contrast, Chinese learners tended to use memory strategies, such as rote memorization, visualizing the target word and picture, and self-generating the target word. With regard to the differences within each group, the results revealed that a combination of good strategies led to outstanding results. In other words, learners who combined more than one good strategy achieved higher grades and remembered more target words on a long-term basis. Conversely, learners who used only one strategy frequently did not achieve high grades, even if the strategy was good.

4.5.2 Limitations of the pilot study

The pilot experiments could not answer the research questions fully, but their results led to several changes to the methodology of the main study. One important aim of conducting the study was to compare the two modes of learning L2 vocabulary intentionally and incidentally; however, due to the differences in the experimental words between intentional and incidental learning, these could not be compared directly. Therefore, for the main study, only one list of thirty-two experimental words were used, instead of fourteen words for each type of learning, which contained sixteen nouns and sixteen verbs. Hence, the study was conducted on the same participants and used the same target words so that the method of vocabulary learning either intentionally or incidentally could be isolated. As in the pilot experiments, the method included vocabulary tests, questionnaires, and interviews. Additionally, the researcher used an eye-tracking method for assessing incidental learning.

As mentioned previously, there is no doubt that a wide range of factors can impact language learning (see Roberts & Meyer, 2012, for an overview); in the main study, the potential impact of differences between individuals on their VLS choices and the relationship with successful uptake in intentional and incidental vocabulary learning was investigated. To do this, a detailed background questionnaire was designed to be completed by study participants. This questionnaire included questions about the participant's age, native language, nationality, length of time spent learning Arabic, and objectives of learning Arabic.

4.6 Methodological issues for the main study

4.6.1 Study design

The general design of the study was the same as those of the pilot studies reported above. It consisted of three experimental studies; the first was an intentional vocabulary learning experiment, the second was an incidental vocabulary learning experiment, and the third experiment was an eye-tracking study. These three experimental studies were designed according to the nature of the research questions and the scope and aim of the study, which was to investigate the effect of the strategies most frequently used by L2 learners – in immediate and delayed post-tests – on L2 word retention in both intentional and incidental vocabulary acquisition. More specific details about the aim, design, and procedures of each experimental study are provided in the following subsections.

4.6.2 Selection of the target words for all experimental studies

As identified in the previous section, one important implication for the main study was to design only one list of experimental words to compare the two modes of learning; that is, intentional and incidental L2 vocabulary acquisition. Therefore, only one list of thirty-two experimental words was designed for the main study, with a mixture of high and low frequency Arabic words. The study was also conducted on the same participants and used the same target words so that the method of vocabulary learning – whether intentional or incidental – was isolated.

Extensive research has indicated that the poor results of some incidental vocabulary acquisition research (in particular) may be a result of flaws in study methodology. These flaws have included the amount of reading text, the number of test items, the kinds of text used (e.g. simplified vs. authentic), and how many words participants already know before the reading

(Nation, 2001, 2013). Moreover, the measurement instruments used in most studies have been multiple-choice tests, and these have limitations in terms of measuring the readers' exact knowledge of words because certain types of multiple-choice tests allow guessing from contextual information (Waring & Takaki, 2003). Therefore, it is crucial to also use other types of tests, such as self-report checklist measures, meaning-translation tests, or word-form recognition tests (Barcroft, 2009; Waring & Takaki, 2003) to measure learners' vocabulary knowledge more precisely. As previously mentioned, this research seeks to examine the effects of different modes of L2 vocabulary acquisition, along with the influence of self-selected strategies, on L2 learners' short- and long-term retention of new lexical items. Consequently, careful criteria for selecting the target words were used in the experiments to avoid the limitations identified in previous similar studies, and to measure the impact of different word aspects (i.e. abstract and concreteness, and the part of speech the word belongs to) on intentional and incidental vocabulary acquisition. Thus, thirty-two target words were chosen according to the following features (see Table 4.10).

- Half of the words were Arabic words with a high frequency, and the other half were low frequency Arabic words, based on the Arabic Corpus (Al-Thubaity, 2015).
- Sixteen nouns and sixteen verbs
- Eight abstract nouns and eight concrete nouns
- Eight action verbs and eight state verbs

High frequency words were chosen according to an occurrence of more than 1.0 per million in the Arabic Corpus. Whereas low frequency words were chosen based on an occurrence of less than 1.0 per million in the Corpus (Al-Thubaity, 2015). All pictures that were used for concrete nouns and action verbs in the intentional learning study were stimuli pictures that were

taken from the International Picture Naming Project for language research (<http://crl.ucsd.edu/experiments/ipnp/>). To ensure that every participant was unfamiliar with the thirty-two experimental words used in the intentional and incidental experiments, the participants were asked by the researcher to complete an experimental word determination test. This included a list of sixty Arabic words with a mixture of abstract and concrete terms. Forty of these words were selected based on the strong probability that the participants would be unfamiliar with them. The remaining twenty words were used as control words based on their presumed relative familiarity. The participants were instructed to write the meaning next to any of the sixty Arabic words that they knew or thought they knew. Based on the results of the experimental word determination test, thirteen words were changed due to their familiarity to some participants.

A problem that must be addressed when constructing this type of study is how to present the test items within the surrounding easy text, when testing for incidental vocabulary acquisition from reading. As shown in the incidental learning material presented in Section 4.6.4.2, several issues were taken into account in this study to facilitate the learning of new words from context.

Table 4.10: Criteria of experimental words selected for the intentional and incidental learning

Criteria			Word	Frequency (per million)	Translation ¹
Noun	Abstract	High Frequency	القطاع	168.7	sector
			المؤتمر	137.3	conference
			السلطات	107.3	authorities
			المفاوضات	60.9	negotiations
		Low Frequency	أتعاب	0.9	remuneration
			استبدادية	0.9	authoritarianism
			البون	0.9	contrast
			القريحة	0.6	talent
	Concrete	High Frequency	قفص	4.2	cage
			رافعة	2.3	jack
			سياج	2.1	fence
			منظار	1.6	binoculars
		Low Frequency	حافر	0.9	hoof
			مقلاة	0.7	pan
مسلة			0.6	needle	
خلّاط			0.6	mixer	
Verb	Action	High Frequency	يلوح	4.3	wave
			يُفْطِر	2.2	drip
			يعتقل	1.6	arrest
			يلمع	1.5	polish
		Low Frequency	ينحت	0.6	carve
			يَحِيك	0.3	knit
			يتسول	0.3	peg
			يبارز	0.2	fence
	State	High Frequency	اكتفى	7.3	be content oneself with
			ثار	2.4	revolt against
			شُغِف	1.8	be passionately in love with
			يستحوذ	1.5	take one's entire attention
		Low Frequency	يسرح	0.9	daydream
			يَطْرَب	0.9	be enraptured
استخفّ			0.9	depreciate	
تَشَفَّ			0.6	become abstinent	

¹ The Almany online dictionary was used to translate the words from Arabic into English.

4.6.3 Experiment 1: Intentional vocabulary learning

The aim of this experimental study was to identify the effect of different types of strategies used by learners in intentional vocabulary learning on immediate and delayed word retention, and to measure the relationship between the strategies used and vocabulary learning performance. Twenty English and Chinese advanced learners of Arabic as a second language completed a pre-test to ensure that they were unfamiliar with the experimental words used in the intentional learning experiment. In the learning session, the participants were introduced to Arabic words while viewing word-picture pairs for concrete nouns and action verbs and meanings of the abstract nouns and state verbs. They then completed two tests: an immediate test that was conducted by the researcher immediately after the learning phase and a delayed test that was conducted by the researcher one week later. During this time, the participants were asked to answer questions regarding the strategies they used. Their responses were coded to identify the strategy most frequently used by each participant. Mixed effects models were run on the data with the dependent variable *number of strategies*, and the fixed factors *learning mode* (intentional/incidental), *test time* (immediate/delayed), and *group* (Chinese/English), with random factor *subjects*. Another linear mixed effects model was run on the data to investigate the effects of the predictor variables (fixed factors) *number of strategies*, *group* (English/Chinese), *mode of learning* (intentional/incidental), and *noun type* (abstract/concrete) or *verb type* (state/action) on the outcome variables *post-test scores* or *delayed test scores*, with *participants* and *items* as random effects.

With regard to memory effect and the pre-test/post-test issues, the study considered the following: when using the same tests twice, Schmitt (2010a) suggested using some techniques to cut out the memory effect. He recommended giving the participants a cognitively challenging

task immediately after test administration to distract them or to get them thinking about something else. This study applied this technique by asking the learners questions about the strategies they used immediately after the vocabulary test.

Research questions

The research questions for the intentional learning experiment were as follows:

- 1- What strategies do L2 learners use in general and most frequently during intentional L2 vocabulary acquisition?
- 2- Is there a difference between the immediate and delayed retention results?
- 3- Is there a difference depending on L1 background?
- 4- What is the relationship between the number of strategies used and the uptake of new vocabulary?
- 5- What is the effect of frequency of strategies and uptake of target-words based on type (noun/verb) and subtypes (concrete/abstract noun and action/state verb)?

4.6.3.1 Participants

The intentional learning experiment recruited twenty participants, comprised of ten English and ten Chinese learners of Arabic as a second language studying at the Institute of Teaching Arabic Language (ITAL), which is affiliated with Al-Imam Muhammad Ibn Saud Islamic University in Riyadh, Saudi Arabia.

The general level of participants' Arabic language in both groups was advanced, based on the grading standards of the ITAL – which can be used as an indicator of students' proficiency levels – and based on the online Arabic proficiency test (<http://goo.gl/7QLCHe>) created by Europe's Star Agency. The test consists of forty multiple-choice questions, and the participants achieved above thirty-four out of forty. According to the Common European Framework of Reference for Languages (<https://goo.gl/LTz3sv>), this result indicates upper-intermediate level

Arabic language proficiency. Participants were aged from 19 to twenty-eight. All participants were rewarded with £7 each.

Table 4.11. Overview of information about the learners participating in the intentional vocabulary learning

Participants' Group	Number	Proficiency level	Age average	Length of learning Arabic (by month)	Gender
English	10	advanced	23.3	33.6	males
Chinese	10	advanced	23.1	32.4	

4.6.3.2 Materials

To ensure that every participant was unfamiliar with the thirty-two experimental words used in the intentional and incidental experiments, they were asked by the researcher to complete an experimental word determination test. This test included a list of sixty Arabic words with a mixture of abstract and concrete terms. Forty of these words were selected based on the strong probability that the participants would be unfamiliar with them. The remaining twenty words were used as control words based on their presumed relative familiarity.

The participants were instructed to write the meaning next to any of the sixty Arabic words that they knew or thought they knew. Based on the results of the experimental word determination test, thirteen words were changed due to their familiarity to some participants.

4.6.3.3 Tasks and Procedures

The participants completed three tasks: a learning task and two assessment tasks. These two assessment tasks were administered to measure the participants' intentional learning, the first concentrating on immediate knowledge uptake and the second on delayed word retention.

4.6.3.3.1 Learning Task

This task followed a similar procedure to that implemented by Barcroft (2009) to explore the effects of different learning strategies used by L2 learners on intentional vocabulary acquisition. In his study, Barcroft used a word-picture vocabulary-learning paradigm “to focus on the strategies and cognitive activity in which learners engage when they are given access to each target word form and its referent” (p. 78). After the learning phase, participants immediately answered questions about the strategies they used to learn the new words. The study also explored abstract word acquisition. Nation (2013, p. 339) described this method of data gathering concerning VLS as having “the advantage that the reporting does not interfere with or influence the learning, and is based on very recent performance”.

4.6.3.3.2 Immediate knowledge uptake test

This task was conducted by the researcher immediately after the learning task to assess the participants’ immediate uptake vocabulary knowledge. This test consisted of two parts: the first was a picture-to-L2 recall test, in which the participants were instructed to write down the target Arabic words that matched the pictures, and provide the meanings of the abstract words. The participants then completed a questionnaire, which asked them about the strategies they used in the learning task. The questionnaire contained two items:

- 1) Please list and describe the strategies that you used when attempting to learn the thirty-two Arabic words.
- 2) Which strategy did you use most frequently? Why?

The reason these items were located after the immediate knowledge uptake task was explained in Section 4.4.1.3.

4.6.3.3.3. Delayed knowledge retention test

This task was the same as the immediate knowledge uptake test but was conducted a week later.

4.6.3.4 Procedures of the learning task

The two groups of participants were gathered together in one classroom and regarding the task was explained by the researcher (e.g. the project outline, procedures, and participation). At this point the participants were able to ask any questions relating to the task. They then signed the consent forms and moved to the tasks.

In the learning task, word-picture pairs for concrete nouns and action verbs and the meanings of the abstract nouns and state verbs were displayed on a screen – the word-picture pairs for six seconds and the abstract/state word meanings for ten seconds. All the target words were presented in this manner twice, in the same order each time to help participants who missed any of the slides (see slides of the intentional learning phase in Appendix B , B1). To meet the standards of intentional learning, the participants were informed that after the learning task they would be tested on thirty-two experimental words in the short-term knowledge uptake test. The hypothesis for this was that the students would pay more attention if they were given access to each target word's form and its picture or meaning (Barcroft, 2009). This approach also allowed the researcher to measure the strategies used by participants.

4.6.3.4.1 Procedures of the testing tasks

After the learning task, the participants started the initial (short-term) uptake of new vocabulary assessment which consisted of two parts: a test and a questionnaire. In the test part (picture-to-L2 recall), the participants were asked to write down the target Arabic words that matched the pictures and provide the meanings of the abstract words. At the end of the test, the

participants were instructed to do the second part, which was to answer the two questions about the strategies they had used during the learning task.

The test and questionnaire were provided to the students together but they were asked to complete the test first, followed immediately by the questionnaire. The two questions (the meaning of ‘strategies’ in particular) were clearly explained to the participants by the researcher, who clarified that ‘strategy’ means the method, technique, or action that a learner uses to acquire new vocabulary. The researcher also gave some example strategies, such as connecting a new word with its picture as in the L2 word-picture association strategy.

A week later, the delayed knowledge retention test was performed in the same way as the short-term knowledge uptake task. It included the same two questions from the end of the previous test regarding strategies.

4.6.3.5 Interviews

Interviews were conducted to verify and enhance the data obtained from the questionnaires. Accordingly, the researcher asked questions similar to those used in the tests. For the purpose of the study, semi-structured interviews using open-ended questions were conducted to clarify participants’ responses concerning the strategies they used and why they chose each strategy. The interviews took place immediately after each test. The researcher just added comments, explanations, and verifications next to the students’ responses to the strategies questions. See a sample of the added comments next to a participant’s response in the appendix B4.

The strategy coding, reliability analysis, and assessments of vocabulary tests have been clarified in the pilot experimental studies (see Section 4.4.1.4).

The results of all three experimental studies are presented in the results chapter.

4.6.4 Experiment 2: Incidental vocabulary learning

The study was designed to identify the effect of strategies used during incidental vocabulary learning on immediate and delayed word retention, and to measure the relationship between the strategies used and vocabulary learning performance. Twenty advanced Chinese and English students of Arabic as a second language read an Arabic short story that contained thirty-two target words. On completion, two tests were conducted in two phases. The first test assessed [a] words in isolation, and [b] words in context; for this, thirty-two target words were presented in short sentences taken from the original text. The second test addressed incidental delayed word retention of [a] words in isolation, and [b] words in context. During both assessments, participants answered questions regarding the strategies they used. Their responses were coded to identify the strategy used most frequently by each participant. Mixed effects models were run on the data with the dependent variable *number of strategies*, and the fixed factors *learning mode* (intentional/incidental), *test time* (immediate/delayed), and *group* (Chinese/English), with random factor *subjects*. Another linear mixed effects model was run on the data to investigate the effects of the predictor variables (fixed factors) *number of strategies*, *group* (English/Chinese), *mode of learning* (intentional/incidental), and *noun type* (abstract/concrete) or *verb type* (state/action) on the outcome variables *post-test scores* or *delayed test scores*, with *participants* and *items* as random effects.

According to Pellicer-Sánchez (2016), the possibility of the immediate test effect must be considered in the incidental learning. She pointed out that the vocabulary knowledge revealed in the delayed test (of her study) might have been an effect not only of the vocabulary learned incidentally from reading but also of further exposure to the target words in the immediate test.

Nevertheless, Pellicer-Sánchez states if participants did not know about the content of the delayed test and they did not meet the target words in the period between the two testing sessions (2 weeks here), the results are still a good indication of incidental learning after the initial encounter. Accordingly, the results of the current incidental learning in the delayed post-test are still a good indication of long-term learning one week after the initial incidental exposure, since L2 learners did not know about the content of the delayed test and they did not encounter the target words during the seven days between the two tests. Additionally, they also had a cognitively challenging task immediately after test administration (i.e. answering questions about the strategies they used) to get them thinking about something else as suggested by Schmitt (2010a).

Research questions

The research questions for the incidental learning experiment were as follows:

- 1- What strategies do L2 learners use in general and most frequently during incidental L2 vocabulary acquisition?
- 2- Is there a difference between the immediate and delayed retention results?
- 3- Is there a difference depending on L1 background?
- 4- Is there a difference between learning words in context and isolation?
- 5- What is the relationship between the number of strategies used and the uptake of new vocabulary?
- 6- What is the effect of frequency of strategies and uptake of target-words based on type (noun/verb) and subtypes (concrete/abstract noun and action/state verb)?

4.6.4.1 Participants

The incidental learning experiment recruited twenty participants, comprised of ten English and ten Chinese learners of Arabic as a second language in Saudi Arabia. The experiment has been done at the university where the study was conducted. The general level of participants'

Arabic language in both groups was advanced, based on the grading standards of the ITANA – which can be used as an indicator of the students’ proficiency levels – and based on the online Arabic proficiency test (<http://goo.gl/7QLCHe>), that consists of forty multiple-choice questions, in which all the learners achieved above thirty-four out of forty. Participants were aged from twenty-two to twenty-nine. Each participant was rewarded with £7. It is worth mentioning that due to the use of only one list of experimental words for both modes of learning, the participants in this incidental mode of learning are different from those learners participating in the intentional learning.

Table 4.12. Overview of information about the learners participating in the incidental vocabulary learning

Participants’ Group	Number	Proficiency level	Age average	Length of learning Arabic (by month)	Gender
English	10	advance	25.8	38	males
Chinese	10	advance	25.2	47.4	

4.6.4.2 Materials

When constructing an incidental vocabulary acquisition study, it is important to consider several issues to facilitate the learning of new words from context. First, a suitable text should be chosen or written if needed. To achieve successful guessing of new vocabulary, there must be an appropriate balance between known and unknown words in a text. Learners need to read at a high level of text comprehension and text coverage (Hsueh-Chao & Nation, 2000). The optimal rate has been stated to be between 96% to 99% coverage of known words (Nation, 2001, 2013). Waring and Takaki (2003) explained that one possible way to achieve the desired

coverage rate would be to use a text the students would usually encounter at their level of study. Then, several words could be selected from this text and tested after reading. Nation (2001) described learning from context as a cumulative process where knowledge of form and meaning is gradually enriched and strengthened. Therefore, tests of learning from context need to be sensitive to small amounts of learning (Nagy et al., 1985).

As text comprehension influences vocabulary learning from reading (e.g., Pulido, 2004), a different text was written for the main study to make it easier for L2 learners to understand and follow the story. As mentioned previously, to allow learning from context to occur, learners should already know a large proportion of the words in the text: “it is likely that at least 95% of the running words need to be already familiar to the learners [to allow guessing and learning] to happen” (Nation, 2013, p. 352). A coverage of 95% equals one unknown word in every twenty running words, or one in every two lines (Nation, 2013). Based on this, the vocabulary in the story written for this study was controlled to ensure that potential acquisition of the unknown items would not be hindered by lack of knowledge of the remaining items in the text. Hence, careful attention was given to ensure that the text contained no unfamiliar items except for the targeted unknown words, by using words that students usually meet at lower levels (Waring & Takaki, 2003) of Arabic language study. Thus, for the incidental learning phase, the participants received a written Arabic short story (966 words) that contains the thirty-two target words, which were carefully placed throughout the story to meet the criteria of 95% coverage (i.e. twenty known words or two lines between each target word and another) and to ensure a balanced distribution of unknown items. The thirty-two target words were divided into nouns and verbs. The nouns were concrete and abstract, the verbs were actions and states (see Section 4.6.2 for

more details of the criteria of the experimental words' selection). See text with target words in appendix B3.

4.6.4.3 Tasks and Procedures

The participants completed three tasks: a learning task and two assessment tasks. These two assessment tasks were administered to measure incidental learning, the first focusing on immediate knowledge uptake and the second on delayed knowledge retention.

4.6.4.3.1 Learning task

The learning task included the written Arabic short story that contained the thirty-two target words, with a combination of concrete and abstract nouns, and action and state verbs. In the task, the participants were given thirty minutes to read the story.

4.6.4.3.2 Initial (short-term) uptake test

This test was conducted by the researcher immediately after the learning task to assess the participants' uptake of vocabulary. This task was comprised of two parts; the first assessed participants' initial uptake of the thirty-two target words, in which they were asked to provide the meanings of the target words [a] in isolation and [b] in context. As guessing from context can play a significant role in incidental vocabulary learning, this strategy was investigated closely by looking at how the learners benefited from guessing when they were examined on the target words in their contexts (Hulstijn et al., 1996). This also helped to determine whether any relationship existed between the learners' methods of guessing and how well they could use guessing to recall new vocabulary items in the long-term.

The second part of the task was a questionnaire about the strategies the participants used in the learning task, containing two items:

- 1) Please list and describe the strategies that you used when attempting to learn the new Arabic words through reading.

2) Which strategy did you use most frequently? Why?

The reason these questions were located after the initial (immediate) uptake task is explained in the previous experiment, see Section 4.6.3.3.

4.6.4.3.3 Delayed knowledge retention task

This task was the same as the initial (immediate) uptake task but was conducted a week later to assess Delayed retention.

4.6.4.3.4 Procedures of the learning task

The two groups of participants were gathered together in one classroom where the researcher explained the requirements of the task and answered any questions the participants had. The participants then signed the consent forms and moved to the tasks.

At the beginning of the learning task, the participants were told that they would be given thirty minutes to read a text and would then be asked to answer questions relating to their text comprehension. They were also informed that they would not have the text at hand when answering the questions. To meet the standards of incidental vocabulary learning, the participants were not told in advance that they would be tested on their knowledge of unknown words. Thus, they focused on understanding the whole meaning of the text (while reading) rather than the meaning of the unknown words (Hulstijn et al., 1996; Hulstijn, 2001, 2003).

4.6.4.3.5 Procedures of the testing tasks

After the learning task, the participants completed the initial (short-term) uptake of the new vocabulary task, which was comprised of two parts: a test and a questionnaire. In the test part, the participants were asked to provide the meanings of the thirty-two target words [a] in isolation, and [b] in context – for which the target words were presented in short sentences taken directly from the original text. At the end of both recall tests, for words [a] in isolation and [b]

in context, the participants were instructed to complete the second part of the task, which was to answer the two questions about the strategies they used during the learning task. See tests and questionnaire in Appendix B2.

The tests and questionnaire were provided to the students together but they were asked to complete the test first followed immediately by the questionnaire. The two questions (the meaning of ‘strategies’ in particular) were clearly explained to the participants by the researcher (see subsection 4.6.3.4)

A week later, the delayed knowledge retention test was performed in the same way as the initial (short-term) uptake task. It included the same two questions from the end of the previous tests regarding strategies.

4.6.4.4 Interviews

Interviews were conducted to verify and enhance the data obtained from the questionnaires. Accordingly, the researcher asked questions similar to those used in the tests. For the purpose of the study, semi-structured interviews using open-ended questions were conducted to clarify participants’ responses concerning the strategies they used and why they chose each strategy. The interviews took place immediately after each test. The researcher just added comments, explanations, and verifications next to the students’ responses to the strategies questions. See a sample of the added comments next to a participant’s response in the appendix B4.

The strategy coding, reliability analysis, and assessments of vocabulary tests have been clarified in the pilot experimental studies (see Section 4.4.1.4).

The results of all three experimental studies are presented in the results chapter (Chapter Five).

4.6.5 Experiment 3: Eye-tracking study

4.6.5.1 Purpose and design of this study

In the previous two experiments (intentional and incidental vocabulary learning), the study identified the types and frequencies of reported strategies through quantitative analysis (see the results chapter). However, there is also a qualitative aspect of strategy use, such as whether strategies are well chosen and implemented in appropriate steps. Some strategy types, such as rehearsing and guessing from the context, are very general and can be used for various purposes in different ways. Some strategies can potentially be established into multiple steps, such as guessing from context (Nation, 2013) and using a dictionary (Yang, 2017). Thus, knowing what type of strategy a learner has used does not necessarily prove s/he has utilised (or not utilised) certain processing strategies. Accordingly, Yang (2017, p. 73) argued that it is certain cognitive processing strategies which “affect the learning outcomes rather than the labels of the strategy types”. Therefore, eye-tracking is a useful technique for identifying those strategies that underpin incidental vocabulary acquisition through reading and to investigate the potential effects of the strategies on the uptake of new lexical items. Moreover, as previously discussed, there are some gaps in the research regarding VLS in incidental vocabulary acquisition. Only a few studies have measured the effects of guessing through reading (e.g., Chun, Choi, & Kim, 2012; Hulstijn et al., 1996). Thus, this experimental study examined in depth the strategies and behaviours utilised for incidental vocabulary acquisition through the use eye-tracking and stimulated verbal recall.

The design tests the three stages of incidental learning: (1) eye-tracking as a method for measuring cognitive processing strategies during reading; (2) vocabulary post-test with questions about the strategies used to measure the memory traces (the uptake of vocabulary

knowledge) and to discover the strategies employed during reading; and (3) stimulated recall protocols to gain insight into participants' subjective experiences of the mental activities that occur when encountering unknown words incidentally. The triangulation of eye movements and verbal reports "seems a productive way forward to study questions of implicit and explicit processing" (Godfroid & Winke, 2015a, p. 338). Using a combination of online measures of eye-tracking, offline vocabulary tests, and verbal reports of the strategies used, the present study examined both the incidental acquisition of knowledge of unknown words from reading and the cognitive processing strategies used during online reading of the novel words in context.

Participants read a story containing thirty-two unknown vocabulary items while their eye movements were recorded. After the learning phase, the participants completed an unannounced vocabulary test with questions regarding strategies to assess their knowledge uptake and to identify the strategies they used while reading the text. This was followed by a stimulated recall interview conducted with each participant while showing him/her a recording of their performance during the learning session.

With regard to the purpose of this experimental study, the following research questions were addressed:

- 1- What strategies (or cognitive processes) do L2 learners use most frequently during incidental L2 vocabulary acquisition?
- 2- Does the duration of L2 learners' eye fixation on novel words during incidental learning predict their recalling of these words in an unannounced vocabulary post-test?

4.6.5.2 Methods:

4.6.5.2.1 Participants

Seven English learners of Arabic as a foreign language (AFL) in the UK initially participated in this study. Based on the online Arabic proficiency test (<http://goo.gl/7QLCHe>)

created by Europe’s Star Agency, the participants’ general level of Arabic Language was deemed above upper-intermediate (B2) level. The test consists of forty multiple-choice questions, and participants all scored above thirty-four out of forty. According to the Common European Framework of Reference for Languages (<https://goo.gl/LTz3sv>), this result indicates an upper-intermediate level of proficiency in Arabic. To ensure that every participant was unfamiliar with the thirty-two experimental words, the participants completed an experimental word determination test at the beginning of the experiment (see more details regarding this test in Section 4.6.3.2). Based on the results of the experimental word determination test, two participants were excluded due to their knowledge of some target words. The age of the remaining five participants ranged from twenty-five to fifty-nine years ($M = 42.2$). All participants had spent between three and five years ($M = 4$ years) learning Arabic for different purposes, mainly for better understanding of the religion of Islam. After completing the experiment, the five participants were rewarded with £15 each.

Table 4.13. Overview of information about the learners participating in the eye-tracking study

Participants’ Group	Number	Proficiency level	Age average	Length of learning Arabic (by month)	Gender
English	5	advanced	42.2	41.6	males

The location of the eye tracking device at the York University, required the researcher to find learners of Arabic (AFL) in the UK, who were mainly English participants. Consequently, the comparison of AFL learners in the UK with those ASL learners in Saudi Arabia may be initially considered as a methodological flaw. Nevertheless, applying the same Arabic proficiency test, as well as conducting the same learning procedures in all incidental vocabulary

learning experiments, might justify the employment of AFL with ASL learners, as both groups of participants are complementary. Additionally, considering that both groups were at the same level, shared the same purpose regarding learning Arabic, having a similar length of time to learn Arabic, yielded the prediction that VLSs' used and their implementation by both groups (AFL/ASL) might not result in noticeable differences.

4.6.5.2.2 Target words and reading material

As indicated above, the major aim of this experimental study was to identify the strategies used by L2 learners and to measure their effects on the incidental acquisition of new words through reading. The researcher collected data online and offline, by means of eye-tracking and a post-test, respectively. To do this, the study used the same thirty-two target words (see Section 4.6.2 for more details) that were used in the previous two experiments (intentional and incidental), as the researcher expected to gain deeper knowledge regarding L2 learners' cognitive activities and strategy use during reading through eye-tracking. Therefore, the participants received the same Arabic short story that was written by the researcher for the purpose of the current thesis and used in experiment 2 (i.e. incidental learning). The story contained the thirty-two target words with a combination of nouns and verbs; the nouns were concrete and abstract nouns, the verbs were divided into action and state verbs. See Section 4.6.4.2 for more details regarding how the target words were placed in the text to meet the 95% coverage of text comprehension. See reading text with target words in appendix B3.

4.6.5.2.3 Apparatus

The researcher used an eye movement recording device to track learners' eye behaviours during the reading task. The eye-tracking laboratory is located in the Department of Education at the University of York and is equipped with an EyeLink 1000 eye tracker device (average

accuracy 0.25° – 0.5° , resolution 0.01° RMS) supported by Experiment Builder, which is a software package used to design different types of experiments for research purposes. The equipment consists of two computers. The first is called the Host PC, on which the eye-tracking is recorded at a rate of 1000 samples per second, and then stored in a data file. The Host PC is connected to a display screen, on which the actual experiment is displayed to participants. A video camera is fitted beneath the display screen and used to capture the viewers' pupils and record their watching patterns. There is also a desktop mount (chin rest) that is used to rest the viewer's head in front of the display screen and minimize any head movements or shaking during the viewing time, which helps to ensure that watching patterns are recorded with high accuracy. Figure 4 shows the eye tracker lab.

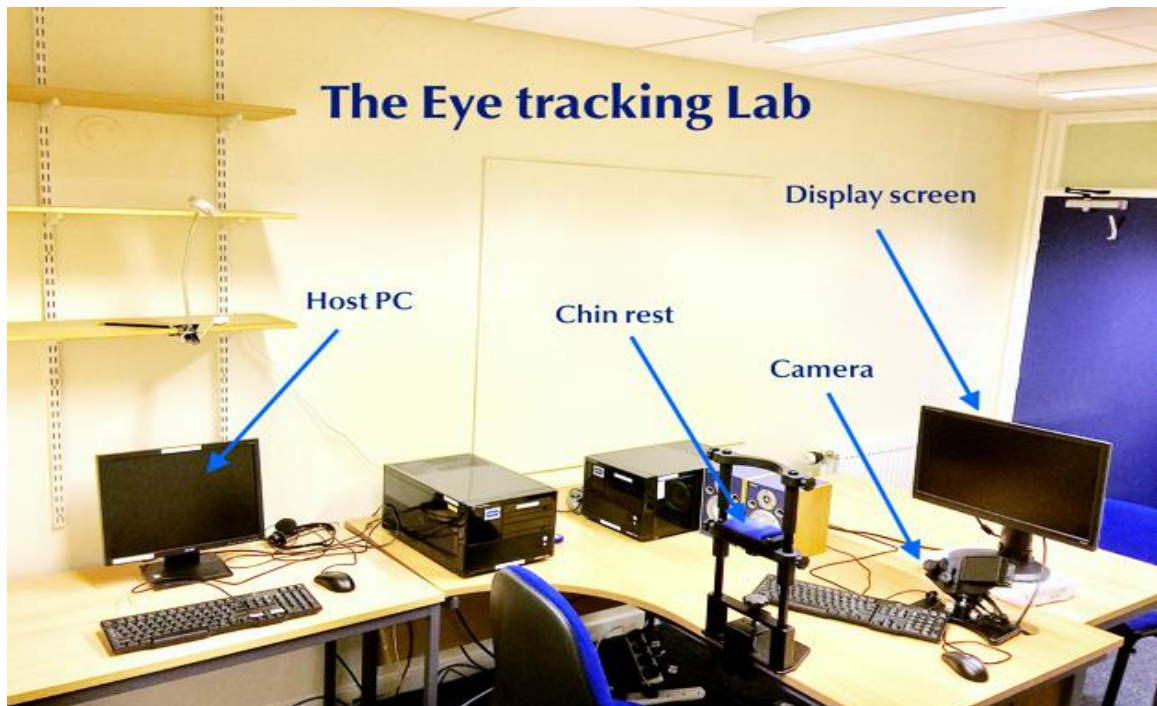


Figure 4. The eye-tracking lab

4.6.5.2.4 Learning task through reading

For this study, the learning task was conducted on a computer screen while participants' eye-movements were tracked as they read the written Arabic short story that contained the thirty-two target words. The story was presented on a computer screen (Arial (Body) font, size 18) and divided over seven screens/trials. The text presented on each screen had a similar length (twelve lines; 130 – 147 words, $M = 137.57$). All screens contained a maximum of five target words. This task was timed, with thirty minutes allowed for learning through reading the story. At the beginning of the learning task, the participants were told that they would receive thirty minutes to read a text on a computer screen and then answer questions regarding their text comprehension. To meet the standards of incidental vocabulary learning, the participants were not told in advance that they would be tested on their knowledge of unknown words. Thus, they could focus on understanding the whole meaning of the text (while reading) rather than the meaning of the unknown words (Hulstijn, 2003; Hulstijn et al., 1996).

4.6.5.2.5 Measurement Instruments

For the online measures, participants' eye movements were tracked using the EyeLink 1000 eye tracker device. The following measures were examined: first fixation duration, number of fixations, and total time in the interest area. First fixation duration is the duration of the first fixation on a word or region of interest when that region is encountered during forward reading (i.e., in Arabic, right to left) for the first time. Given that first fixation duration is the earliest measure of processing time, it is considered to reflect very fast cognitive processes (Rayner, 1998, cited in Godfroid et al., 2013). The determination of the context region of each target word is based on the surrounding sentences. Context regions consist of approximately twenty-three words including the target word. The total reading time is the sum of all fixation durations for a

word or region of interest. This is the primary measure that the researcher used in this study to assess the relationship between eye fixation times (and hence cognitive processes) and vocabulary acquisition (Research Question 2).

For the offline measures, a vocabulary post-test with questions about the strategies used was conducted immediately after the learning session. This measure consisted of two parts. The first assessed participants' uptake of the thirty-two target words using meaning recall, in which participants were asked to provide the meanings of the target words [a] in isolation and [b] in context. As guessing from context can play a significant role in incidental vocabulary learning, this strategy was investigated closely by looking at how the learners benefited from guessing when they were examined on the target words in their contexts (Hulstijn et al., 1996). This also helped determine whether any relationship existed between the learners' methods of guessing and how well they could use guessing to recall new vocabulary items. The second part of the measurement was a questionnaire containing two items related to the strategies that participants used in the learning task, (see appendix B2). These two questions were the same as those used in the previous two experiments:

- 1) Please list and describe the strategies that you used when attempting to learn the new Arabic words.
- 2) Which strategy did you use most frequently? Why?

The questions were located after the knowledge uptake test to avoid influencing the learners and their learning strategy selection. This approach also enabled better objectivity, as the participants could report information about the strategies they used to acquire new lexical items incidentally without interruption or interference (Barcroft, 2009; Nation, 2013). After this, a simulated recall interview was conducted with each participant while they watched a recording of their behaviour during the learning session. The researcher selected some specific segments

of the recording and asked the interviewee some general questions. For example: *What is happening here? What were you thinking at this point?* (Friedman, 2011). This enabled the researcher to obtain some spontaneous comments about the cognitive processes and activities that the participants engaged in. Furthermore, stimulated recall protocols provided learners with some support to facilitate their recall of the strategies that they applied during the reading phase (Gass & Mackey, 2000; Godfroid et al., 2010).

4.6.5.2.6 Procedure

Each participant was scheduled for an individual session of approximately two hours in the eye-tracker laboratory. At the beginning of the session, each participant was asked to read and sign a consent form (see appendix A2), then they completed an experimental word determination test (see more details regarding this test in Section 4.6.3.2). The participant was then seated about 60cm away from the display screen, with their head on the desktop mount, supported by the head and chin rest. They were informed that they would receive thirty minutes to read a story on the computer screen, and were asked to read the story as naturally as possible for comprehension. Participants were aware that there would be post-reading comprehension questions, but they were not aware that they would be tested on their vocabulary knowledge uptake. After the explanation of the procedure, a nine-point grid calibration and nine-point grid validation were completed. The nine points were distributed to cover all parts of the screen, as shown in Figure 5.

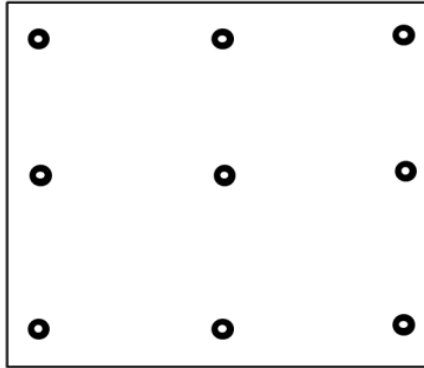


Figure 5. Distribution of nine-point calibration.

After the participants had fixated on the point and a calibration and validation check had been carried out, a written instruction appeared on the screen repeating the given information and asking the participant to press ‘Enter’ when they were ready to start the reading session. By pressing ‘Enter’, the story appeared on the screen. To proceed from one screen to the next, participants had to press the ‘right arrow’ button on the keyboard. During the reading, participants could not go back to previously read screens.

After reading the story, the participants completed the vocabulary tests in paper format. They were asked to provide the meanings of the thirty-two target words [a] in isolation, and [b] in context – for which the words were presented in short sentences taken directly from the original text (see appendix B2). At the end of each word recall test [a] in isolation and [b] in context, the participants were instructed to answer the two questions about the strategies they used during the learning task. These tests and questionnaires were provided to the students together but they were asked to complete the test, first followed immediately by the questionnaire. The two questions (the meaning of ‘strategies’ in particular) were clearly explained to the participants by the researcher (see subsection 4.6.3.4 for more details).

After participants had completed the vocabulary knowledge uptake assessment and answered the strategy questions, the researcher conducted a stimulated recall interview with each

participant while showing them a recording of their eye-movements over the text during the reading session. Seven trails for the seven pages were presented for each participant, reflecting each single eye movement from right to left and regressions. During the vocabulary test, the original trails/pages were replaced with prepared copies of the seven pages, in which the target words were highlighted in a way that did not affect the recording of the eye movements. Thus, each participant was interviewed while they were watching their behaviour regarding the text and the target words. Some general questions were asked, for instance: What is happening here? What were you thinking at this point? Why did you return to this word? Why did you spend a longer time on this target word? Other questions related to what participants reported about the strategies they used, for example: Could you explain how you connected the target word to the context? How did you connect the word to its root? How did the context help you when guessing the meanings of the target words?

4.7 Summary of the chapter

The chapter addressed the methodology used in this study, and was divided into six sections. The first section presented an overview of the purpose of the study, and a description of the main research questions used in three types of experimental study: intentional vocabulary acquisition, incidental vocabulary acquisition, and eye-tracking. In the second section, an attempt was made to justify the combination of quantitative and qualitative research methods adopted, and to present the rationale for employing multiple data collection approaches in this study. Then, a discussion of the retrospective reporting and stimulated verbal recall was provided, followed by a clarification of the general data analysis procedure and the ethical considerations. The third section described the general design of the pilot study and then addressed in depth the first and second pilot experimental studies, on intentional and incidental

vocabulary learning respectively, including participants, tasks and data collection methods, and debates regarding coding strategies and reliability analyses. This was followed by analyses of the results of the two pilot experiments; intentional and incidental respectively. The fourth section addressed the conclusions and limitations of these two pilot studies. The fifth section used the findings of the pilot studies to clarify the methodology for the main study; this included the main study design and the selection criteria for target words for all experimental studies, as well as the subjects, data collection and data analysis procedures for the three experiments: intentional, incidental, and eye-tracking.

5 Results

5.1 Analyses

The data gathered was analysed according to the study aims and objectives, and the results are reported in this chapter. Several data analysis steps were completed delivering the following results:

- General means, maximum and minimum scores by strategy, and standard deviation across the three experiments (intentional, incidental, and eye-tracking);
- Correlations between the scores on different tests;
- Rate of decrease (difference) between the immediate- and delayed post-tests;
- Difference between the gains of the two learning groups (English & Chinese); and
- Correlation between the strategies used and vocabulary retention achieved.

The primary tool used to produce the descriptive and correlation findings detailed above was the R statistical package. Additionally, a mixed effect model, a robust statistical technique, was run on the data as a repeated measures logistic regression (Hardin & Hilbe, 2003). Logistic regression is appropriate, because both strategy use and recall of vocabulary on post-tests comprise multi-dependent variables.

Mixed effect models have become increasingly prevalent for the analysis of experimental data. However, according to Luke (2017), there is one issue that needs some consideration here. In lme4, the output of linear mixed models provides *t*-values but no *p*-values, and this has generated confusion about how to evaluate the significance of the fixed effects in the model output. Luke (2017) further explains, “The primary motivation for this omission [of *p*-values] is that in linear mixed models it is not at all obvious what the appropriate denominator degrees of freedom to use are, except perhaps for some simple designs and nicely balanced data” (p. 1494).

For researchers who are required to report p -values by journal and style standards, this absence of p -values in the R output presents a difficulty (Luke, 2017). Consequently, different techniques have been presented in order to solve this problem. Baayen, Davidson, and Bates (2008) proposed that p -values can be estimated using Markov-chain Monte Carlo (MCMC) sampling. The samples in the MCMC method can be used to evaluate the probability that a given parameter is different from 0, with no degrees of freedom needed. However, this method has a major disadvantage, never having been applied to situations where the model involved random correlation parameters (Bates et al., 2014).

There are two other techniques frequently used for evaluating the significance of fixed effects in mixed-effects models; the first is the likelihood ratio test (LRT), which compares two different models to define if one is a better fit to the data than the other. The LRT can be used even when the model has a complex random effects structure that includes random slopes (Luke, 2017). According to Pinheiro and Bates (2000), the LRT method has a potential drawback; using LRTs to compare two models that vary in their fixed effects structure might not always be fitting. To avoid this disadvantage when using LRTs to evaluate significance, Luke (2017) states that models must be fitted using maximum likelihood (ML).

The second most frequently used technique for the significance evaluation in mixed-effect models is to simply use t -as- z method to obtain p -values. As Luke (2017) notes, “The logic behind this t -as- z approach is that the t distribution begins to approximate the z distribution as degrees of freedom increase, and at infinite degrees of freedom they are identical” (p. 1495). Whereas, this method observed by Luke (2017) is typically used to explicitly generate p -values, and is also employed indirectly by many researchers (e.g. Leal et al., 2016) who abstain from giving p -values, but consider any t -values greater than 1.96 as significant. Accordingly, in the

current study, any *t*-value with an absolute value exceeding 1.96 has been considered statistically significant, at an alpha level of $p < .05$. Luke (2017) criticizes this technique as it has no formalized guidelines to establish if one's data set is big enough to validate *t-as-z* method, hence, it might be potentially anti-conservative. Nevertheless, because this study comprises a simple design and carefully balanced data (intentional versus incidental mode of learning, and each mode contains two groups, English and Chinese with equal number of participants and items), the use of a *t-as-z* approach to evaluating the significance of the fixed effects in the model output could be valid.

The data analyses for the first and second experimental studies: intentional and incidental vocabulary learning, comprised three sets of analyses in reference to the following research questions:

- 1- What strategies do L2 learners use in general and most frequently during intentional and incidental L2 vocabulary acquisition?
- 2- Do the results of L2 learners' immediate and delayed retention differ between intentional and incidental vocabulary acquisition?
- 3- Is there a difference depending on L1 background regarding strategy use and retention?
- 4- Is there a difference between learning words in context and isolation in incidental learning?
- 5- What is the relationship between the number of strategies employed and the uptake of new vocabulary?
- 6- What is the effect of frequency of strategies and uptake of target-words based on type (noun/verb) and subtypes (concrete/abstract noun and action/state verb)?

Analysis one related to research questions 1, 2, 3, and 4 (above) and includes:

- a. Descriptive results for general strategies reported by self-selection, as used by L2 learners themselves in accordance with intentional and incidental vocabulary learning

modes. This data reflects the participants' responses to the first question they were asked regarding the strategies used in general in both modes of learning: (*intentional/incidental*) (*Strategies Q1: Please list and describe the strategies that you have used when attempting to learn the 32 Arabic words*). These results were then supported with statistical analysis. Mixed effect models were then run on the data, applying the dependent variable, *number of strategies*, and fixed factors *learning mode* (*intentional/incidental*), *test time* (*immediate/delayed*), and *group* (*Chinese/English*), with random factors subjects.

- b. Qualitative analysis: description of the most frequently utilised strategies (MFS) across both groups, test time, and learning mode. This related to the question: What strategies do L2 learners use *most frequently* during L2 vocabulary acquisition? Is there a difference between those used during intentional and incidental learning in immediate and delayed post-tests, and between L2 groups? Answers to this research question are drawn from the second self-report question concerning strategies (i.e., *which strategy did you use most frequently? Why?*). This question seeks to highlight the self-selected 'core' set of strategies directly, as these are the most frequent and affected strategies.
- c. Qualitative analysis: a comparative analysis of strategies used to recall words in context and under isolated test-conditions in incidental learning modes only. RQ: Is there a difference between the number and types of strategies used to recall words in incidental contexts and under isolated test-conditions?

Analysis two refers to RQ 5:

That is, it examines the relationship between the number of strategies used and the uptake of vocabulary in (a) post-test and (b) delayed post-test tasks. The aim of this is to establish if there is a difference between learner groups (quantitative analysis). Mixed effect models were run on the data applying the dependent variable *Post-test scores* or *Delayed-test scores* based on test time. Fixed factors were *number of strategies*, *group* (Chinese/English) and *learning mode* (intentional/incidental). Random factors considered are participant and item.

Analysis three refers to RQ 6: acquisition of vocabulary type (nouns/verbs) and strategies, including:

- a. Quantitative analysis of the frequency of strategy use and the uptake of nouns in (a) post-test and (b) delayed post-test tasks.
- b. Quantitative analysis of the frequency of strategies and uptake of verbs in (a) post-test and (b) delayed post-test tasks. By applying a linear mixed-effects model, the researcher was able to investigate the effects of fixed factors (predictor variables); such as *Number of strategies*, *group* (English/Chinese), *learning mode* (intentional/incidental), and *noun type* (abstract/concrete) or *verb type* (action/state), on the outcome variable post-test scores or delayed-test scores, where the participants and items were random factors.
- c. Qualitative analysis was performed on the different types of strategies used for nouns and verbs.

The data analysis for the third experimental study: eye-tracking and incidental vocabulary learning, was drawn from two sets of analyses according to the research questions:

- 1- What strategies (or cognitive processes) do L2 learners use most frequently during incidental L2 vocabulary acquisition?
- 2- Can the duration of L2 learners' eye fixation on novel words during incidental learning predict their retention of these words in an unannounced vocabulary post-test?

Thus, two analyses were conducted here; the first considering RQ1, demanding a full qualitative analysis of the verbal data collected from participants by means of retrospective report questions regarding the strategies employed and the stimulated verbal recall interviews.

The second analysis considered the second research question, relating to the relationship between fixation time on target words and learning gain, several descriptive analyses and correlations were used to assess three aspects of eye-fixation (i.e., first fixation time, number of fixations, and total time) and scores of different words variable (i.e., word type, and subtype).

Before presenting the results for the intentional and incidental experimental studies, it is worth stating that the effect of three individual differences factors, namely; *age*, *length of learning Arabic*, and *previous other languages* on two dependent variables: *strategy use* and *vocabulary learning gain*, were tested, but no effect was found, see appendix C1 and C2. Thus, these factors were not evaluated in the follow up analyses.

5.2 Analysis 1: General strategy use under intentional and incidental learning conditions

The questions addressed in this section of the analysis are: What strategies do L2 learners use during L2 vocabulary acquisition? Is there a difference between those used during intentional and incidental learning in immediate and delayed post-tests, and between L2 groups? To answer these:

- a) The researcher first investigated which strategies the L2 learners themselves reported as self-selected and used in intentional and incidental vocabulary learning modes. Table 5.1 displays the frequencies and means for all the strategies reportedly utilised by each *group* (*English/Chinese*) when answering the first research question concerning the strategies

they used in both learning modes (*intentional/incidental*) (*Strategies RQ1: Please list and describe the strategies that you used when attempting to learn the 32 Arabic words*).

Twenty different strategies were reportedly used by the English group in the intentional vocabulary learning mode (see Table 5.1). Some of these strategies were used by three participants or more; for example, *associate word to its root (derivation)*, *L2 word–picture association*, *connect word to its synonyms*, *rehearsal*, *note taking*, and *L2–L1 translation*. In contrast, the Chinese group only reported using thirteen strategies in the context of intentional learning. Some of these strategies were used by three or more participants; such as, *associate word to its root (derivation)*, *L2 word–picture association*, *rehearsal*, *note taking*, and *L2–L1 translation*. The rehearsal strategy (root memorisation) was the most popular strategy among the Chinese group in the intentional mode, and was reportedly used by all the participants (10 times) during the immediate and delayed post-tests.

Some effective strategies were only used just once or twice in the intentional learning mode; however, these strategies contribute to produce higher scores than the other strategies did. The majority of these single strategies were reported by the English group; for instance, *associate words spoken form with meaning* was only reported by two English participants, which resulted in a high score mean 27.00 (5.65) in the immediate post-test and 20.00 (7.07) in the delayed post-test. The strategies *use physical action when learning a word*, *use word’s morphological scale*, and *self-generate target words* also resulted in high scores, even when reported by just one or two participants (see Table 5.1 for responses regarding the frequencies and means for each of the strategies).

In the incidentally oriented vocabulary learning mode, fourteen different strategies were reportedly used by the English group in the immediate post-test, compared with eleven strategies

in delayed post-tests. The strategies: *guess from textual context*, *associate word to its root (derivation)*, *remembering the story line*, *connect word to a personal experience* and *reading for general understanding* were reported frequently by more than three of the English participants in incidental immediate post-test. Whereas, in the delayed post-test, the strategies most frequently used by more than three participants were: *associate word to its root*, *guess from textual context*, *remembering the story line*, *connect word to a personal experience* and *use new words in sentences*. In the Chinese group, fourteen different strategies were also reportedly used in immediate post-test, but sixteen strategies were used in incidental delayed post-test. Some of the strategies utilised in the immediate post-test were reported by more than three Chinese participants; for example, *connect word to its synonyms* (8 times), *guess from textual context* (9 times), *remembering the story line* (4 times), *connect word to a personal experience* (5 times), *reading for general understanding* (6 times), *reading for thorough understanding* (4 times), and *use word's morphological scale* (4 times). For the delayed post-test, the strategies most frequently used by more than three participants were: *associate word to its root* (5 times), *guess from textual context* (9 times), and *remembering the story line* (4 times), for frequency of strategies and recall means (see Table 5.1).

Some of the vocabulary learning strategies employed in incidental learning phase resulted in higher target word recall than others (see Table 5.1); for example, *visualise target word and picture*, which was only used by two English learners, but resulted in the highest target words recall in the immediate test [23.00 (4.24)] and delayed post-tests [18.50 (4.95)]. *Using word's morphological scale* was another good strategy used by only three English learners, which resulted in high mean scores [20.33 (1.52)]. By examining the strategies used by the Chinese group, we can identify that the strategy, *associate word to its root* resulted in the highest

target words recall in immediate post-test [25.00 (2.00)]. Whereas, in the delayed post-test, the strategy, *using word's morphological scale* helped to produce the highest mean scores [20.00 (1.00)], reflecting the significance of this strategy in assisting learners' ability to recall target words after significant time has elapsed.

Table 5.1. Frequencies and recall means for all strategies reported to be used in intentional and incidental conditions (SEs in parentheses).

Strategies used by E group in intentional mode	Freq.	Mean Inten- imm-post-T	Freq.	Mean Inten- delayed-post-T	Strategies used by Ch. group in intentional mode	Freq.	Mean Inten- imm-post-T	Freq.	Mean Inten- delayed-post-T
Associate word to its root (derivation)	5	24.60 (6.14)	4	19.75 (6.07)	Associate word to its root (derivation)	4	15.00 (5.09)	1	10.00
L2 word–picture association	7	19.57 (6.85)	8	16.50 (6.25)	L2 word–picture association	7	18.43 (4.75)	7	10.00 (3.95)
Connect word to its synonyms	4	26.25 (3.86)	3	21.33 (3.51)	Connect word to its synonyms	2	20.00 (7.07)	1	7.00
Written repetition	1	14.00	0	--	Written repetition	1	8.00 (0.00)	1	3.00
Rehearsal	9	19.78 (7.93)	7	14.57 (7.93)	Rehearsal	10	15.30 (6.37)	10	8.40 (4.24)
Guess from textual context	1	24.00	0	--	Visualise target word and picture	1	23.00	1	13.00
Visualise target word and picture	1	23.00	3	15.33 (9.50)	L2 – L1 translation	6	15.67 (6.31)	3	9.33 (4.72)
L2 – L1 translation	5	20.80 (5.97)	2	13.00 (2.82)	Self-generate target words	2	24.00 (1.41)	2	14.00 (1.41)
Self-generate target words	2	19.50 (13.43)	1	25.00	L2 – L1 association	2	19.00 (1.41)	0	--
L2 – L1 association	1	30.00	0	--	Note taking	6	14.33 (5.92)	7	7.86 (3.67)
Focus on presentation order	1	24.00	0	--	Use new words in sentences	1	17.00	0	--
Note taking	7	20.29 (8.78)	4	14.25 (8.05)	Keyword method	1	8.00	0	--
Connect word to a personal experience	2	23.00 (9.89)	2	21.50 (0.70)	Use spaced word practice (expanding rehearsal)	0	--	1	13.00
Use physical action when learning a word	1	29.00	1	25.00					
Use new words in sentences	1	31.00	1	21.00					
Keyword method	0	--	1	18.00					
Connect word to its antonyms	1	29.00	0	--					
Associate words spoken form with meaning	2	27.00 (5.65)	2	20.00 (7.07)					
Use word's morphological scale	1	30.00	1	22.00					
Use spaced word practice (expanding rehearsal)	0	--	1	14.00					

Strategies used by E group in incidental mode	Freq.	Mean Inci-imm-post-T	Freq.	Mean Inci-delayed-post-T	Strategies used by Ch. group in incidental mode	Freq.	Mean Inci-imm-post-T	Freq.	Mean Inci-delayed-post-T
Associate word to its root (derivation)	5	14.60 (3.54)	4	11.25 (7.54)	Associate word to its root (derivation)	2	25.00 (2.00)	5	18.40 (3.13)
Connect word to its synonyms	2	5.50 (0.70)	2	9.50 (7.77)	Connect word to its synonyms	8	16.88 (6.99)	3	16.00 (8.54)
Guess from textual context	10	13.10 (2.51)	5	12.40 (3.65)	Guess from textual context	9	17.56 (2.37)	9	15.33 (1.97)
Visualise target word and picture	2	23.00 (4.24)	2	18.50 (4.95)	Visualise target word and picture	1	14.00	1	17.00
Remembering the story line	4	15.25 (9.17)	7	11.14 (5.52)	Remembering the story line	4	16.75 (8.46)	4	17.25 (5.73)
L2-L1 translation	2	16.00 (14.14)	2	4.50 (0.70)	L2-L1 translation	2	11.50 (3.53)	1	13.00
Paraphrase the word's meaning	1	20.00	0	--	Paraphrase the word's meaning	1	27.00	3	19.00 (2.00)
Connect word to a personal experience	4	13.75 (7.08)	4	11.50 (5.50)	Connect word to a personal experience	5	16.00 (7.10)	2	9.50 (3.53)
Use new words in sentences	1	11.00	4	13.25 (3.30)	Use new words in sentences	1	9.00	3	17.67 (4.16)
Reading for general understanding	5	15.60 (6.80)	0	--	Learn words as collocations	2	16.00 (9.89)	0	--
Reading for thorough understanding	2	16.50 (7.77)	0	--	Reading for general understanding	6	18.33 (6.53)	1	7.00
Reading repetition	2	13.00 (9.89)	1	11.00	Reading for thorough understanding	4	22.00 (3.36)	0	--
Use word's morphological scale	3	20.33 (1.52)	1	20.00	Reading repetition	3	15.00 (7.55)	3	12.33 (5.03)
Connect word to its antonyms	0	--	1	15.00	Use word's morphological scale	4	17.50 (8.85)	3	20.00 (1.00)
					Rehearsal	0	--	1	24.00
					Associate words spoken form with meaning	0	--	1	24.00
					Connect word to its antonyms	0	--	1	24.00

Different types of strategies were identified when evaluating intentional and incidental modes of learning. This suggested a new taxonomy for VLS based on mode of learning. (See the discussion chapter for a full representation and discussion of the current VLS taxonomy.)

As observed in the literature review (e.g., Al-Shuwairekh, 2001; Barcroft, 2009; Gu & Johnson, 1996; Yang, 2017), a number of different strategies were key to the significant effects from predictor variables (*learning mode, test time, and group*). These observations were supported by the statistical analysis below. Mixed effect models were run on the data with the dependent variable *number of strategies*, and the fixed factors *learning mode* (intentional/incidental), *test time* (immediate/delayed), and *group* (Chinese/English), for random factors subjects. Any t-value exceeding 1.96 was considered statistically significant at an alpha level of $p < .05$ (Leal et al., 2016).

Table 5.2. Means of number of strategies reported by groups under different conditions (SD in parentheses).

Group	Test time				Total mean of strategies number
	Immediate post-test		Delayed post-test		
	Intentional mode	Incidental mode	Intentional mode	Incidental mode	
Mean for English	4.70 (1.41)	4.40 (1.69)	4.00 (1.61)	6.10 (1.82)	4.80 (1.63)
Mean for Chinese	4.20 (1.40)	5.30 (1.62)	3.30 (1.55)	7.20 (.89)	5.00 (1.37)

The following two tables, Table 5.3 and Table 5.4, show the effect sizes for the interaction between the two factors (group and learning mode) on the dependent variable: number of strategies in both test-times (immediate and delayed).

Table 5.3. Tests of Between-Subjects effects for the two factors (group and learning mode) on the dependent variable: number of strategies in immediate test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	220.800 ^a	3	73.600	31.155	.000	.068
Intercept	27676.800	1	27676.800	11715.631	.000	.902
Group	12.800	1	12.800	5.418	.020	.004
Learning mode	51.200	1	51.200	21.673	.000	.017
Group* Learning mode	156.800	1	156.800	66.374	.000	.049
Error	3014.400	1276	2.362			
Total	30912.000	1280				
Corrected Total	3235.200	1279				

a. R Squared = .068 (Adjusted R Squared = .066)

Table 5.3 shows that the group variable contributes in explaining 0.4% of the variance of number of strategies in immediate time and the learning mode variable contributes in explaining 1.7% of the variance of number of strategies in immediate test-time. Also, it shows that the interaction between the two variables (group and learning mode) contributes to 4.9% of the variance of number of strategies in immediate test time.

Table 5.4. Tests of Between-Subjects effects for the two factors (group and learning mode) on the dependent variable: number of strategies in delayed test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	181.600 ^a	3	60.533	30.515	.000	.067
Intercept	17287.200	1	17287.200	8714.628	.000	.872
Group	.800	1	.800	.403	.526	.000
Learning Mode	.800	1	.800	.403	.526	.000
Group * Learning Mode	180.000	1	180.000	90.740	.000	.066
Error	2531.200	1276	1.984			
Total	20000.000	1280				
Corrected Total	2712.800	1279				

a. R Squared = .067 (Adjusted R Squared = .065)

From Table 5.4 we see that both factors (the group variable and learning mode variables) have no contribution in explaining the variance in the dependent variable -the number of strategies in delayed test-time. However, the interaction between the two variables (group and learning mode) contributes to 6.6% of the variance of number of strategies in delayed time variable.

Table 5.5. Effects of *learning mode*, *group*, and *test time* on number of strategies

Random effects	Variance	SD	
Participant	0.87537	0.93561	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	7.20000	0.30389	23.69
Group: English	1.10000	0.42976	-2.56*
Mode: intentional	-3.90000	0.09849	-39.60*
Time: immediate	-1.90000	0.09849	-19.29*
Group: English; Mode: intentional	1.80000	0.13928	12.92*
Group: English; Time: immediate	0.20000	0.13928	1.44
Mode: intentional; Time: immediate	2.80000	0.13928	20.10*
Group: E; Mode: intentional; Time: immediate	-0.40000	0.19698	-2.03*

Note: anything above 1.96 is significant.

As illustrated in Table 5.2 and shown by the main effect of *group*, Chinese speakers use more strategies overall than English speakers. There was also a main effect from *learning mode*, because overall there were more strategies used in the incidental versus the intentional mode. Specifically, the overall mean for number of strategies used in the incidental learning mode is [5.75 (1.50)] compared to [4.05 (1.49)] for strategies used in the intentional learning mode. A further notable effect was linked to *test time*, because there were more strategies used under delayed rather than in immediate time conditions (particularly in the incidental learning mode) as demonstrated in Table 5.2.

A two-way interaction between *learning mode* and *test time* arose because under the immediate time condition there was no difference between number of strategies used in the incidental versus the intentional learning modes [(4.85 (1.66) vs. 4.45 (1.41)), whereas there was

a significant difference between the number of strategies used in the incidental versus the intentional modes under the delayed time condition, with the former eliciting higher numbers of strategies [6.65 (1.36) vs. 3.65 (1.58)].

The three-way interaction between *group*, *learning mode* and *test time* occurred because, for both test-time conditions (immediate and delayed) the Chinese used more strategies than the English in the incidental learning mode. However, the English group used more strategies than the Chinese in the intentional learning mode, for both test-time conditions (immediate and delayed), as exposed in the means in Table 5.2.

To summarise, different types of VLS were identified in intentional and incidental modes of learning, and therefore, additional details regarding the classification of strategies will be provided in the next chapter to facilitate and organise discussions regarding the identified strategies. The number of strategies were key to the significant effects from predictor variables; i.e., group, mode of learning, and test time. The results also revealed the Chinese group employed more strategies than the English (particularly in the incidental mode of learning as noted above). There was a significant two-way interaction between the learning mode for the predictor variables and test time, and a three-way interaction between the previous two variables and the group. Following there is a qualitative analysis of the self-selected ‘core’ set of strategies reportedly used as the most frequent and affective strategy based on participants’ beliefs.

- b) Qualitative: description of *the most frequent strategies* (MFS) across groups, test time and learning mode. To answer the research question: What strategies do L2 learners use most frequently during L2 vocabulary acquisition? The aim was also to identify any differences between VLSs used during intentional and incidental learning in immediate and delayed post-tests, and between L2 groups.

The current research question was answered by respondents' answer to the second question regarding strategy use (*which strategy did you use most frequently? Why?*). This question sought to highlight a self-selected 'core' set of strategies as most frequent according to learners' preferences.

Column 1 in Table 5.6 below displays the most frequently used strategy per L2 group (English and Chinese) in the intentional learning mode. Columns 2 and 3 display the number of participants who reported using each strategy, and the recall means indicate the most frequent strategies according to the immediate uptake word retention test, while columns 4 and 5 display the number of participants (in each group) who reported using strategies during the delayed retention test, and recall relates to the most frequently used strategies.

Table 5.6. Frequencies and recall means for most frequently used strategies at intentional immediate and delayed post-tests (SEs in parentheses)

Most frequently used strategy by English Group	Immediate-post_T		Delayed-post_T	
	Freq.	Mean	Freq.	Mean
Associate word to its root (derivation)	4	24.75 (3.54)	4	19.00 (3.02)
L2 word–picture association	4	21.25 (4.28)	4	16.75 (4.13)
Rehearsal	2	12.00 (2.00)	2	10.00 (4.00)
Most frequently used strategy By Chinese Group	Immediate-post_T		Delayed-post_T	
	Freq.	Mean	Freq.	Mean
L2 word–picture association	4	17.75 (3.03)	5	10.80 (1.28)
Rehearsal	6	13.67 (2.67)	5	6.00 (1.89)

Evidently, some strategies were reported as the most frequently used strategies—per group—during immediate and delayed post-tests. The strategies most frequently reported by English learners in the immediate and delayed word retention tests were: *associate word to its root (derivation)*, *L2 word–picture association*, and *rehearsal (rote memorisation)*. While the

strategies reported most frequently by Chinese learners in the initial uptake and delayed post-tests were: *L2 word–picture association*, and *rehearsal (rote memorisation)* (see Table 5.4 for the means for each of the strategies).

Some of the most frequently used strategies resulted in higher target word recall, as seen in Table 5.6 For instance, the strategy of *associate word to its root (derivation)* produced the highest target word recall among the English group, in both the immediate [24.75 (3.54)] and delayed post-tests [19.00 (3.02)], when compared to *L2 word–picture association*, and *rehearsal*. This finding reflects the strategy of associating words with their roots to contribute successfully to recalling new lexical items in immediate and delayed word retention.

By contrast, *L2 word–picture association* produced the highest target word recall, with the Chinese groups' in vocabulary uptake both immediately after the learning phase [17.75 (3.03)] and during the delayed post-test [10.80 (1.28)], being compared to the *rehearsal* strategy. The results pertaining to the *L2 word–picture association* emphasise the robust effect of this memory association strategy upon word retrieval in the context of immediate and delayed retention.

Considering the incidental learning mode, column 1 in Table 5.7 below displays the most frequently used strategies in the incidental mode, divided by group. Columns 2 and 3 display the number of participants who reportedly used each strategy, and the recall means indicate all the strategies most frequently used for the incidental uptake (immediate post) isolated word recall test. Columns 4 and 5 display the number of participants who reported strategy use during the incidental uptake (immediate post) word recall test in context, and the recall means for the most frequently used strategies. Columns 6 and 7 display the number of participants—per L2 group—who reported using each strategy, and the recall means shows the most frequently used strategies

for the incidental delayed recall test using isolated words. Columns 8 and 9 present the number of participants who reported using strategies during the incidental delayed word recall test in context, and the recall means for the most frequently used strategies.

A variety of the most frequently preferred strategies were examined by L2 group, to recall the newly acquired vocabulary for the incidental (immediate/delayed) retention tests, under both isolation and context conditions. The strategies most frequently used by English learners in isolation (immediate) for acquiring new vocabulary were *guessing the meaning from context* (8 times), and *visualise target word and picture* (2 times). As regards the uptake of vocabulary knowledge from context in the immediate post-test, all the members of the English group preferred to use *guessing the meaning from context*. Whereas, the Chinese learners on the other hand, recalled words on the immediate isolation test, *guess from textual context* (8 times), and *learn words as collocations* (2 times). Moreover, *the guessing from textual context* strategy was reported 8 times by Chinese learners as their most frequent employed strategy, and two of the participants used the strategy, *learning words as collocations* most frequently to improve their word recall from the context. (To discover different strategies' frequency and means see Table 5.7.).

The data from the delayed post-tests provides details concerning the strategies most frequently reported by English learners during the delayed isolated words recall test. These were *guessing from textual context* (4 times), *visualise target word and picture* (2 times), and two new strategies, that were not mentioned during the immediate test, i.e., *remembering the story line* (2 times), and *L2-L1 translation* (2 times). Under the delayed word retention from context condition, all the English learners typically relied on the *guessing from textual context* strategy. By contrast, the strategies most frequently reported by Chinese learners in delayed word recall

in isolation were *guess from textual context* (5 times), and two additional strategies that were not used in the immediate tests, i.e., *associate word to its root (derivation)* (3 times), and *paraphrase the word's meaning* (2 times). Meanwhile, under the conditions requiring delayed word recall from context, nine participants used *guessing from textual context* most frequently, and one participant reported using *learning words as collocations* as their most frequently utilised strategy when answering the second question (see Table 5.7 for strategies' frequency and means).

Table 5.7 Frequencies a and the recall means for the most frequently used strategies and recall means for most frequently used strategies under different incidental conditions (isolation vs. context, immediate vs. delayed post-tests) (SEs in parentheses)

Most frequently used strategies by the English group	Freq.	Mean Inci-imm-iso-T	Freq.	Mean Inci-imm-cont-T	Freq.	Mean Inci-Delay-iso-T	Freq.	Mean Inci-Delay-cont-T
Guess from textual context	8	10.63 (2.33)	10	23.20 (1.80)	4	13.25 (3.19)	10	21.90 (1.71)
Visualise target word and picture	2	23.00 (3.00)	--	--	2	18.50 (3.50)	--	--
Remembering the story line	--	--	--	--	2	10.00 (1.00)	--	--
L2-L1 translation	--	--	--	--	2	4.50 (0.50)	--	--
Most frequently used strategies by the Chinese group	Freq.	Mean Inci-imm-iso-T	Freq.	Mean Inci-imm-cont-T	Freq.	Mean Inci-Delay-iso-T	Freq.	Mean Inci-Delay-cont-T
Guess from textual context	8	16.88 (2.58)	8	22.50 (2.36)	5	12.60 (3.10)	9	21.22 (2.36)
Learn words as collocations	2	16.00 (7.00)	2	21.50 (4.50)	--	--	1	24.00
Associate word to its root	--	--	--	--	3	20.00 (0.57)	--	--
Paraphrase the word's meaning	--	--	--	--	2	18.00 (1.00)	--	--

When comparing the types of strategies most frequently used by the L2 groups, it emerges that some strategies were used by both groups (English/Chinese), such as *guess from textual context*. However, some strategies were only reported by English learners (e.g., *visualise target word and picture*, *remembering the story line*, and *L2–L1 translation*) and others only by Chinese participants (e.g., *learn words as collocations*, *associate word to its root (derivation)*, and *paraphrase the word's meaning*).

Assessing the most frequently used strategies used during incidental vocabulary acquisition, it emerges that some of the strategies resulted in higher target word recall than others. The strategy, *visualising target word and picture* produced the highest target word recall rate among the English group, even though it was only used by two learners (compared to other most frequent strategies) for recalling words in isolation conditions; in the post-test 23.00 (3.00) and after the one-week delayed post-test 18.50 (3.50). This result for *visualising target word and picture* strategy clarifies that visualisation can be used successfully as a tool for incidental vocabulary learning, as well as leading to superior word acquisition and retention over a long-time frame. The specific strategy still needs to be investigated in depth, in order to learn *how* it is employed, and *what* the motivations are behind the use of a consolidation-memory strategy of this type. Therefore, conducting stimulated verbal recall interviews by means of the eye-tracking technique (third experiment) appears to be beneficial as a mechanism to gather additional information relating to the cognitive processing that underlies incidental vocabulary learning. When reviewing the conditions associated with context, English learners tended to use *guessing from context*, which produced high scores for both the immediate post-test 23.11 (2.03) and the delayed post-test 21.90 (1.71). For the Chinese group, *guessing from textual context* resulted in

the highest target word recall; i.e., 16.88 (2.58) compared to the other most frequently reported strategies identified relative to the immediate retention of isolated words. Whereas, in the delayed isolated words test, the strategy *associate word to its root (derivation)* produced the highest recall of target words 20.00 (0.57), when compared to other strategies reported, among the Chinese under this condition.

Above we also identified and discussed the self-selected ‘core’ set of strategies reportedly used by each participant to answer the second question regarding the most frequent and effective strategy they used. What follows is a comparative qualitative analysis of the differences between strategies used to recall words in context, and under isolation conditions in the incidental mode of learning.

- c) **Incidental learning mode only** - a comparison between strategies used to recall words in context and isolation conditions in incidental mode of learning. This answers the research question: Is there a difference between number and type of strategies used to learn words in incidental context and isolation conditions?

As it is well known that guessing from context can play a significant role in incidental vocabulary learning, we decided to investigate this learning strategy closely by examining how learners benefit from guessing when examined on target words presented in context (Hulstijn et al., 1996), as well as to determine whether any differences exist between learners’ methods of guessing, and their assessment of how well they might use guessing as a strategy to recall new vocabulary items long term. As explained in the methodology chapter, the participants were asked (in the incidental mode) to provide the meanings of 32 target words [a] in isolation, (i.e., testing words separately without context), and [b] in context. For this task, the target words were presented in short sentences taken directly from the original text. At the end of each word recall

test: [a] in isolation and [b] in context, the participants were instructed to complete the second part, which involved answering two questions about the strategies they used during the learning task.

Table 5.8 below illustrates the frequencies and recall means for strategies reported by the groups for use under different incidental conditions; i.e., when words are presented in isolation and in context for both immediate and delayed words retention tests. Column 1 in Table 5.8 displays all the VLSs reported divided by group. Columns 2 and 3 display the frequency of participants who reported utilising each strategy, and the recall means indicate each of the strategies used for the incidental uptake isolated word recall test (immediate post-test). Columns 4 and 5 display the number of participants who reported using each of the strategies during the incidental uptake word recall test in context, and the recall means is for every strategy. Columns 6 and 7 show how many participants—per L2 group—reported using each strategy, and the recall means show every strategy used for the incidental delayed recall test using isolated words. Columns 8 and 9 also present the number of participants who reported using the strategies during the incidental delayed word recall test in context, and the recall means for every strategy used. A variety of strategies were used by each L2 group to recall newly acquired lexis in the incidental learning mode when completing the immediate and delayed post-tests.

Table 5.8. Frequencies and recall mean for strategies used on different incidental conditions (isolation vs. context, immediate vs. delayed recall tests) (SEs in parentheses)

Strategies used by English group in incidental mode	Freq.	Mean Inci-imm-iso-T	Freq.	Mean Inci-imm-cont-T	Freq.	Mean Inci-Delayed-iso-T	Freq.	Mean Inci-Delayed-cont-T
Associate word to its root (derivation)	5	14.60 (3.54)	3	17.00 (3.78)	4	11.25 (7.54)	4	20.00 (6.97)
Connect word to its synonyms	2	5.50 (0.70)	2	25.00 (2.82)	2	9.50 (7.77)	1	24.00
Guess from textual context	10	13.10 (2.51)	10	23.20 (1.81)	5	12.40 (3.65)	10	21.90 (5.42)
Visualise target word and picture	2	23.00 (4.24)	0	--	2	18.50 (4.95)	0	--
Remembering the story line	5	15.25 (9.17)	2	25.00 (4.24)	7	11.14 (5.52)	4	19.50 (6.02)
L2-L1 translation	2	16.00 (14.14)	1	22.00	2	4.50 (0.70)	1	15.00
Paraphrase the word's meaning	1	20.00	1	27.00	0	--	1	26.00
Connect word to a personal experience	4	13.75 (7.08)	1	27.00	4	11.50 (5.50)	1	24.00
Use new words in sentences	1	11.00	0	--	4	13.25 (3.30)	1	23.00
Reading for general understanding	5	15.60 (6.80)	2	26.00 (2.82)	0	--	0	--
Reading for thorough understanding	2	16.50 (7.77)	1	24.00	0	--	0	--
Reading repetition	2	13.00 (9.89)	2	19.50 (4.95)	1	11.00	1	16.00
Use word's morphological scale	3	20.33 (1.52)	0	--	1	20.00	2	25.00 (1.41)
L2-L1 association	0	--	1	27.00	0	--	0	--
Connect word to its antonyms	0	--	0	--	1	15.00	0	--
Strategies used by Chinese group in incidental mode	Freq.	Mean Inci-imm-iso-T	Freq.	Mean Inci-imm-cont-T	Freq.	Mean Inci-Delayed-iso-T	Freq.	Mean Inci-Delayed-cont-T
Associate word to its root (derivation)	2	25.00 (2.00)	1	26.00	5	18.40 (3.13)	3	25.00 (4.58)
Connect word to its synonyms	8	16.88 (6.99)	3	23.00 (5.29)	3	16.00 (8.54)	3	24.33 (6.02)
Guess from textual context	9	17.56 (2.37)	10	22.30 (1.98)	9	15.33 (1.97)	10	21.50 (2.13)
Visualise target word and picture	1	14.00	0	--	1	17.00	0	--
Remembering the story line	4	16.75 (8.46)	3	24.00 (2.64)	4	17.25 (5.73)	3	24.00 (5.56)
L2-L1 translation	2	11.50 (3.53)	0	--	1	13.00	0	--
Paraphrase the word's meaning	1	27.00	1	29.00	3	19.00 (2.00)	1	18.00
Connect word to a personal experience	5	16.00 (7.10)	1	29.00	2	9.50 (3.53)	2	27.00 (2.82)
Use new words in sentences	1	9.00	0	--	3	17.67 (4.16)	2	21.50 (4.95)

Learn words as collocations	2	16.00 (9.89)	2	21.50 (6.36)	0	--	1	24.00
Reading for general understanding	6	18.33 (6.53)	3	23.67 (4.16)	1	7.00	1	14.00
Reading for thorough understanding	4	22.00 (3.36)	1	25.00	0	--	0	--
Reading repetition	3	15.00 (7.55)	3	18.00 (9.53)	3	12.33 (5.03)	2	11.00 (4.24)
Use word's morphological scale	4	17.50 (8.85)	2	27.50 (2.12)	3	20.00 (1.00)	1	30.00
Analyse part of speech	0	--	1	29.00	0	--	0	--
Expanding Rehearsal	0	--	0	--	1	24.00	0	--
Associate words spoken form with meaning	0	--	0	--	1	24.00	0	--
Connect word to its antonyms	0	--	0	--	1	24.00	0	--

When reviewing the frequency of the strategies used per English group, it emerges that the total number of strategies reported was higher under isolated words' tests conditions than in context-based conditions; e.g., for immediate uptake [44 in isolation vs. 26 strategies in context condition] and for the delayed post-test [33 in isolation vs. 26 strategies in context condition]. Consequently, we can assert that more diverse VLS use occurs in isolated conditions relative to context conditions [14 vs. 11 types in immediate uptake tests, and 11 vs. 10 in delayed post-tests].

The types of strategies only used in immediate isolation tests were *visualise target word and picture*, *use new words in sentences*, *remembering the story line*, and *use word's morphological scale*. In the previous section (5.2), the researcher discussed the strategies used in incidental isolated words tests, comparing them to those strategies used under the intentional learning mode; thus in this section, I clarify the types of strategies employed to recall words in context. Examining the types of strategies used under context conditions, it is apparent that all the English participants used the context information, reporting use of the *guessing from textual context* strategy for both the immediate and delayed post-tests.

Similarly, in the Chinese group, the total number of strategies used under the isolated words test conditions were much higher than under conditions where the context was present [52 vs. 31 in immediate post-tests, and 41 vs. 29 in delayed post-tests]. Consequently, additional strategies were used under isolation conditions in both the immediate post-tests [16 vs. 13 types] and the delayed post-tests [17 vs. 13 types]. Overall, the number of strategies used by the Chinese group in incidental mode was higher than those used by the English participants. More discussions and details about the relationship between the number of strategies used, and the uptake of vocabulary are provided in section 5.3. By reviewing the strategies used under context conditions, we can confirm that all the Chinese learners used the *guessing from textual context* strategy for the immediate- and delayed post-test.

Interestingly, the results revealed that other effective strategies, aside from guessing strategies, worked for the participants in each L2 group, even when context was provided. For example, in the immediate post-test, some strategies were only reported by two English participants. Yet they are notable as they resulted in high target word recall; i.e., *reading for general understanding* 26.00 (2.82), *remembering the story line* 25.00 (4.24), *connect word to its synonyms* 25.00 (2.82), *reading repeatedly* 19.50 (4.95), and *associate word to its root (derivation)* 17.00 (3.78). Additional effective strategies that contributed positively towards final scores were, *paraphrase the word's meaning*, *connect word to a personal experience*, and *L2–L1 association* (see Table 5.8 above for more details).

Moreover, as shown in Table 5.8, there were other valuable types of strategies that resulted in high recall of target words. Specifically considering the strategies reportedly used by the Chinese group in the immediate post-test, we can identify additional effective strategies used by two or more Chinese learners. One of these strategies was “*use word's morphological scale*”, which although it was even only reported by two participants, nevertheless produced the highest target word recall [27.50 2.12] relative to other strategies (such as the *guessing strategy* as reported by ten participants [22.30 (6.27)]). Further examples of beneficial strategies, presented respectively according to their highest rating by mean scores are, *remembering the story line* 24.00 (2.64), *reading for general understanding* 23.67 (4.16), *connect word to its synonyms* 23.00 (5.29), *learn words as collocations* 21.50 (6.36), and *reading repeatedly* 18.00 (9.53). Some strategies were only reported by one Chinese participant, but are worthy of mention as they contributed to good vocabulary learning scores; i.e., *paraphrase the word's meaning*, *connect word to a personal experience*, and *analyse part of speech*, for frequency and means see Table 5.8.

In the incidental delayed post-tests, under context conditions, other strategies aside from *guessing from textual context* were reportedly used by both groups. For the English group,

strategies noted, include *associate word to its root (derivation)* and *remembering the story line*, which were apparently used frequently by four participants. The strategy *using word's morphological scale* was only reported by two English learners, however it produced the highest recall of target words long term [25.00 (1.41)]. This tactic assists in incidental vocabulary acquisition, and is one of several efficient strategies that will be discussed in depth in the discussion chapter. Additionally, other strategies that contributed to good scores were, *paraphrase the word's meaning*, and *connect word to its synonyms* (see Table 5.8 for additional means for strategies and scores). In the case of the Chinese group, other good strategies employed in conjunction with guessing strategies were, *associate word to its root (derivation)* 25.00 (4.58), *connect word to its synonyms* 24.33 (6.02), and *remembering the story line* 24.00 (5.56). The means for these three strategies demonstrate their capacity to deliver relatively higher scores than the *guessing strategy* 21.50 (2.13), which was utilised by ten participants. However, this fact does not affect the advantages of context, or its significant contribution to increasing the number of acquired vocabulary items under context test-conditions. Other strategies were merely reported by two Chinese learners, but nevertheless resulted in high scores means. The strategy *connect word to a personal experience* resulted in the greatest capacity for the recall of target words 27.00 (2.82), when compared to other strategies, followed by *use new words in sentences* 21.50 (4.95), and *reading repeatedly* 11.00 (4.24). Additional strategies that assist learners in remembering novel words over a long period of time in the incidental mode of learning include *paraphrase the word's meaning*, *learn words as collocation*, and *use word's morphological scale*.

The above descriptive analysis was provided regarding the differences between strategies reportedly used under isolation and context related test-conditions in the incidentally oriented mode of vocabulary learning. The section below discusses the relationship between the number of strategies used and the uptake of vocabulary.

5.3 Analysis 2: Relationship between the number of strategies used and the uptake of vocabulary in post and delayed post-test tasks, and any difference between learner groups

a) Post-test: dependent variable: post test scores- Fixed factors are number of strategies* group*mode. Random factors are participant and item.

Mixed effect models were run on the data applying the dependent variable, *Post-test scores*. The fixed factors were *number of strategies*, *group* (Chinese/English) and *learning mode* (*intentional/incidental*).

Table 5.9. groups' means of scores across *learning mode* in the immediate post-tests

group	Mode	
	Intentional imm_score	Incidental imm_score
Mean for Chinese	.47 (.50)	.52 (.50)
Mean for English	.65 (.48)	.40 (.49)

(Std.Dev. in parentheses)

Table 5.10 shows the effect sizes for the interaction between the two factors (group and learning mode) on the dependent variable: immediate-test scores.

Table 5.10. Tests of Between-Subjects effects for the two factors (group and learning mode) on the dependent variable: immediate-test scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10.827 ^a	3	3.609	14.904	.000	.034
Intercept	335.176	1	335.176	1384.106	.000	.520
Group	.176	1	.176	.726	.394	.001
Learning Mode	3.301	1	3.301	13.631	.000	.011
Group * Learning Mode	7.351	1	7.351	30.355	.000	.023
Error	308.997	1276	.242			
Total	655.000	1280				
Corrected Total	319.824	1279				

a. R Squared = .034 (Adjusted R Squared = .032)

From Table 5.10 we see that the group variable contributes in explaining 0.1% of the variance of immediate scores and the learning mode variable contributes in explaining 1.1% of the variance of immediate score. Also, the interaction between the two variables (group and learning mode) contributes to 2.3% of the variance of immediate score variable.

Table 5.11. Means of number of strategies across *learning modes* in the immediate post-tests

group	Mode	
	Intentional No_stra_imm	Incidental No_stra_imm
Mean for Chinese	4 (1)	5 (2)
Mean for English	5 (1)	4 (2)

(Std.Dev. in parentheses)

Table 5.12. Means of fixed factors effects in the immediate post-tests

Random effects	Variance	SD		
Participant	0.38858	0.62336		
Item	0.92237	0.96040		
Fixed effects	Estimate	Std. Error	Z value	p value
(Intercept)	-2.06102	0.61392	-3.357	$p < 0.001$ ***
Mode: intentional	0.81498	0.81036	1.006	0.314560
No-Stra-immediate	0.41292	0.10236	4.034*	$p < 0.001$ ***
Group: E	-0.17045	0.80744	-0.211	0.832809
Mode: intentional; No-Stra-immediate	-0.14720	0.16769	-0.878	0.380027
Mode: intentional; Group: E	-1.23009	1.09229	-1.126	0.260099
No-Stra-immediate; Group: E	-0.03825	0.14981	-0.255	0.798460
Mode: intentional; No-Stra-immediate; Group: E	0.51190	0.23006	2.225*	$p < 0.05$ *

Note: Anything above 1.96 is significant.

There is a main significant effect from *number of strategies* used ($p < 0.001$ ***), as displayed in Table 5.12. These results support the patterns observed in the means presented in Table 5.9; i.e., the greater the number of strategies used by the English group in intentional mode the better their results in the post-test compared to the Chinese group [.65 (.48), vs. .47 (.50)]. Additionally, the more strategies used by the Chinese in the incidental learning mode the higher their scores in the post-test than the English group [.52 (.50) compare to .40 (.49)].

A three-way interaction emerged between *learning mode*, *group*, and *number of strategies*, meaning the scores for each group were affected by the number of different strategies reportedly used in the immediate post-tests.

b) Delayed post-test: dependent variable: delayed test scores - Fixed factors are number of strategies* group*mode. Random factors are participant and item.

Mixed effect models were run on the data, with the dependent variable *Delayed-test scores*, and fixed factors being *number of strategies*, *group* (Chinese/English) and *learning mode* (intentional/incidental). Random factors here are participant and item.

Table 5.13. Groups' means of scores across *learning modes* in delayed post-tests

Group	Mode	
	Intentional delayed _score	Incidental delayed_score
Mean for Chinese	.26 (.441)	.50 (.501)
Mean for English	.51 (.501)	.37 (.483)

(Std.Dev. in parentheses)

Table 5.14 shows the effect sizes for the interaction between the two factors (group and learning mode) on the dependent variable: delayed-test scores.

Table 5.14. Tests of Between-Subjects effects for the two factors: group and learning mode on the dependent variable: delayed-test scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	13.441 ^a	3	4.480	19.287	.000	.043
Intercept	216.153	1	216.153	930.518	.000	.422
Group	1.013	1	1.013	4.359	.037	.003
Learning Mode	.800	1	.800	3.444	.064	.003
Group * Learning Mode	11.628	1	11.628	50.058	.000	.038
Error	296.406	1276	.232			
Total	526.000	1280				
Corrected Total	309.847	1279				

a. R Squared = .043 (Adjusted R Squared = .041)

Table 5.14 displays that the group variable contributes in explaining 0.3% of the variance of delayed post-test scores and the learning mode variable contributes in explaining

0.3% of the variance of delayed post-test scores. However, interaction between the two variables (group and learning mode) contributes to 3.8% of the variance of delayed post-test variable.

Table 5.15. Means of *number of strategies* across modes in delayed post-tests

Group	Mode	
	Intentional No_stra_delayed	Incidental No_stra_delayed
Mean for Chinese	3.30 (1.55)	4.10 (1.30)
Mean for English	4.00 (1.61)	3.30 (1.10)

(Std.Dev. in parentheses)

Table 5.16. Means of fixed factors effects in delayed post-tests

Random effects	Variance	SD		
Participant	0.38668	0.62183		
Item	1.42281	1.19282		
Fixed effects	Estimate	Std. Error	Z value	p value
(Intercept)	-1.5507	0.6763	-2.293	$p < 0.05$ *
Mode: intentional	-0.4268	0.8722	-0.489	0.62466
No-Stra-delayed	0.3799	0.1458	2.606*	$p < 0.01$ **
Group: E	1.2687	0.8627	1.471	0.14139
Mode: intentional; No-Stra-delayed	-0.1904	0.2251	-0.846	0.39762
Mode: intentional; Group: E	-0.5362	1.0752	-0.499	0.61798
No-Stra-delayed; Group: E	-0.5154	0.2163	-2.383*	$p < 0.05$ *
Mode: intentional; No-Stra-delayed; Group: E	0.6470	0.2839	2.279*	$p < 0.05$ *

Note: Anything above 1.96 is significant.

There is a main effect from *number of strategies* used in the delayed post-tests, and a two-way interaction between *number of strategies* and *group* (Chinese/English), which is caused by the fact that the English learners used more strategies in the intentional learning mode than the Chinese did [4.00 (1.61) vs. 3.30 (1.55)]. Whereas, the reverse was true in the incidental learning mode, as in this case the Chinese used more strategies than the English [4.10 (1.30) vs. 3.30 (1.10)]. These results support patterns observed in the means in Table 5.13; i.e., the more strategies used by the English group in the intentional mode the better their results in the delayed post-test relative to the Chinese [.51 (.501), vs. .26 (.441)]. Meanwhile, the more

strategies used by the Chinese in the incidental learning mode the better they performed in the delayed post retention test compared to the English [.50 (.501) versus .37 (.483)].

The three-way interaction between learning mode (*intentional/incidental*), group (*Chinese/English*) and number of strategies, means the scores for each group were affected by the number of different strategies used. In other words, the greater the number of strategies the participants used to learn vocabulary intentionally or incidentally in both post-tests, the greater the word retention that occurs.

5.4 Analysis 3. Refers to acquisition of vocabulary type and strategies

5.4.1 Frequency of strategies and uptake of nouns

- A. Post-test: dependent variable: post test scores- Fixed factors are number of strategies* group*mode*noun type. Random factors are participant and item.

Firstly, by using a linear mixed-effects model, the researcher investigated the effects of the predictor variables (fixed factors) *Number of strategies*, *group (English/Chinese)*, *learning mode (intentional/incidental)*, and *noun type (abstract/concrete)* on the outcome variable Post-Test Scores of nouns, with participants and items as random effects.

There were no effects or interactions with the variables *number of strategies* and *group (English/Chinese)* and so these were removed from the model. The mean accuracy of post-test scores is presented in Table 5.17 (purely for illustration) and the results of the linear mixed-effects model are presented in Table 5.18. (For the means of all fixed factors see appendix C3).

Table 5.17. Means of immediate post-test scores across *noun type* and *learning mode*

Word type	Type	Mode	Mean
Noun	Abstract	incidental	.51 (.501)
		intentional	.56 (.498)
	Concrete	incidental	.49 (.502)
		intentional	.74 (.438)

(Std.Dev. in parentheses)

Table 5.18. Means of fixed factors effects (*learning mode* and *noun type*) on immediate post-tests

Random effects	Variance	SD	
Participant	0.01993	0.1412	
Item	0.03086	0.1757	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.51250	0.07771	6.595
Mode: intentional	0.04375	0.04868	0.899
Type: concrete	-0.01875	0.10042	-0.187
Mode: intentional; Type: concrete	0.20625	0.06884	2.996*

Note: Anything above 1.96 is significant.

The two-way interaction between learning mode (*intentional/incidental*) and noun type (*concrete/abstract*) arose because of the considerable difference between the scores in the intentional and incidental learning modes for the *concrete* words type, with the former eliciting higher scores in the immediate post-tests retention [.74 (.438) as compared to .49 (.502)]. However, there no difference emerged between the results for the two learning modes (*intentional/incidental*) for the *abstract* words type.

Thus, in the next step, I examine the effect of learning mode (*intentional/incidental*) on the type of noun (*concrete* or *abstract*) discretely.

Table 5.19. Effects of learning mode on abstract nouns in immediate post-tests

Random effects	Variance	SD	
Participant	0.02092	0.1446	
Item	0.04743	0.2178	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.51250	0.09028	5.677
Mode: intentional	0.04375	0.04850	0.902

Note: Anything above 1.96 is significant.

Table 5.20. Effects of learning mode on concrete nouns in immediate post-tests

Random effects	Variance	SD	
Participant	0.01798	0.1341	
Item	0.01426	0.1194	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.49375	0.06230	7.925
Mode: intentional	0.25000	0.04898	5.104*

Note: Anything above 1.96 is significant.

The results showed there is only a significant effect from learning mode on concrete nouns ($p < 0.05$), although there is no effect for abstract nouns ($p > 0.05$). These results support patterns observed in the means in Table 5.17, where responses were more accurate for concrete items overall than for abstract items [.615 (.47) compared to .54 (.50)]; in particular in the intentional learning mode, the accuracy for concrete nouns was significantly above that which would be expected by chance (74%), whereas in the incidental learning mode, it was significantly at chance (49%).

In summary, there is no significant difference between the groups, nor any marked effect from number of strategies used on post-test scores of nouns type. However, there is a significant interaction between learning mode (*intentional/incidental*) and noun type (*concrete/abstract*). When the subtypes for the nouns are evaluated separately, no effect emerges from learning mode on abstract nouns, although there was a significant effect from learning mode on concrete nouns, with a considerable influence from intentional learning on concrete nouns when the target words were learned intentionally as paired pictures.

- B. Delayed post-test: dependent variable: post test scores- Fixed factors are number of strategies* group*mode*noun type. Random factors are participant and item.

Secondly, once more, when using a linear mixed-effects model, the researcher investigated the effects of the predictor variables: *number of strategies*, *group* (*English/Chinese*), *Mode of learning* (*intentional/incidental*), and *noun type*

(*abstract/concrete*) on the outcome variable Delayed Post-Test Scores, with participants and items as random effects.

There were only noteworthy effects and interactions in regard to three variables: *number of strategies*, *group (English/Chinese)*, and *noun type*, so the *learning mode* variable was removed from the model. The mean accuracy for delayed post-test scores among the groups and noun types is presented in Table 5.21, and the mean effects for noun type on scores are presented in Table 5.22, whilst Table 5.23 presents the results for the logistic regression model. For the means of all fixed factors see appendix C4.

Table 5.21. Mean accuracy scores between groups across *noun type* on delayed post-test

Group	Noun type	Mean
English	Abstract	.44 (.498)
	Concrete	.48 (.501)
	Total mean	.46 (.500)
Chinese	Abstract	.38 (.487)
	Concrete	.51 (.501)
	Total mean	.45 (.498)

(Std.Dev. in parentheses)

Table 5.22. Means effects of *noun type* in delayed post-tests

Noun type	Mean
Abstract	.41 (.492)
Concrete	.50 (.501)

(Std.Dev. in parentheses)

Table 5.23. Effects of fixed factors (*group, number of strategies, noun type*) on delayed post-tests

Random effects	Variance	SD	
Participant	0.01154	0.1074	
Item	0.05702	0.2388	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	-0.10923	0.12947	-0.844
Group: E	0.42351	0.14766	2.868*
No_stra_delayed	0.13256	0.02320	5.713*
Type: concrete	0.59898	0.17387	3.445*
Group: E* No_stra_delayed	-0.09880	0.03580	-2.760*
Group: E* Type: concrete	-0.45903	0.18108	-2.535*
No_stra_delayed * Type: concrete	-0.12641	0.03170	-3.988*
Group: E* No_stra_delayed * Type: concrete	0.10006	0.04583	2.183*

Note: anything above 1.96 is significant.

The effect on the data from the group variable arises from the fact that the results for English learners show greater accuracy, than for the Chinese group, on the delayed post-test in terms of retention. Considering *noun type* separately, focusing on only abstract nouns, the English group scored higher than the Chinese [.44 compare to .38]. However, for concrete nouns, the mean accuracy for both groups was relatively similar [.51 (.501)] vs. [.48 (.501)], showing a slight advantage among the Chinese (see Table 5.21 above).

The significant effect of the predictor variable, *number of strategies* on the retention of nouns obviously occurred because, as revealed in Figure 6 below, there was a gradual improvement in retention relative to the number of strategies learners used.

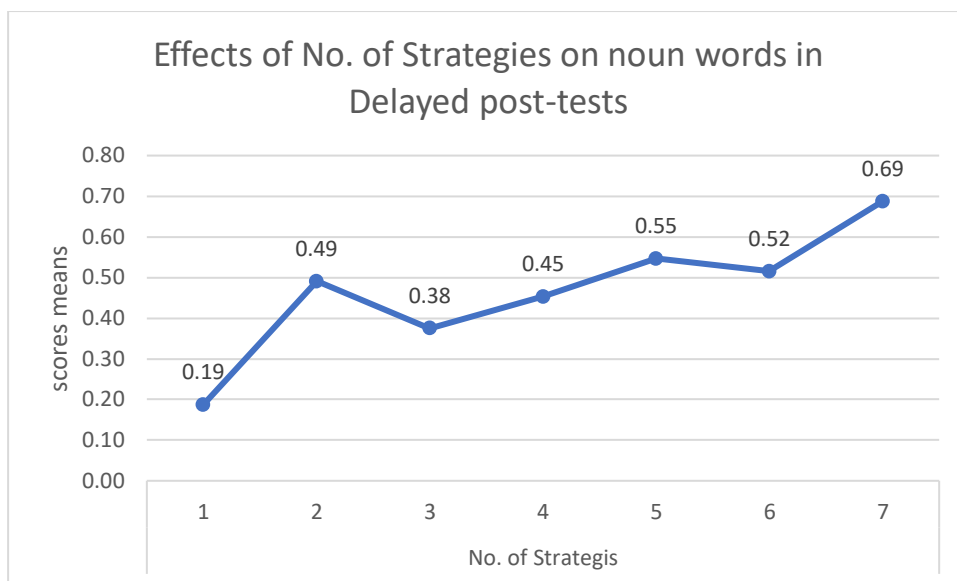


Figure 6. Display the effects of No. of strategies on noun words retention in delayed post-test.

The main effect from *noun type*, as we can see from the means presented in Table 5.22 above, is caused by the fact that the accuracy for concrete nouns was greater (50%) than the accuracy for abstract nouns (41%). Reflecting the fact that concrete nouns can be retained better and be retrieved for longer than abstract words.

The two-way interaction between group and number of strategies is caused by the fact that there were no major discrepancies in the scores between the groups when the participants used two, three, and four number of strategies. However, there were considerable differences in the scores between groups when the participants used five, six, and seven strategies. As seen in Figure 7 below, the Chinese got better scores than the English, when using five or six strategies. However, the situation changed when some participants used seven strategies, and then the English learners got the highest scores; i.e., .75 compare to .63 for Chinese. The results went in the opposite direction when the scores of the Chinese improved after employing more strategies 5, 6, and 7; whereas, the results of English group appeared not to be affected by the additional number of strategies employed, except when some learners employed 7 strategies.

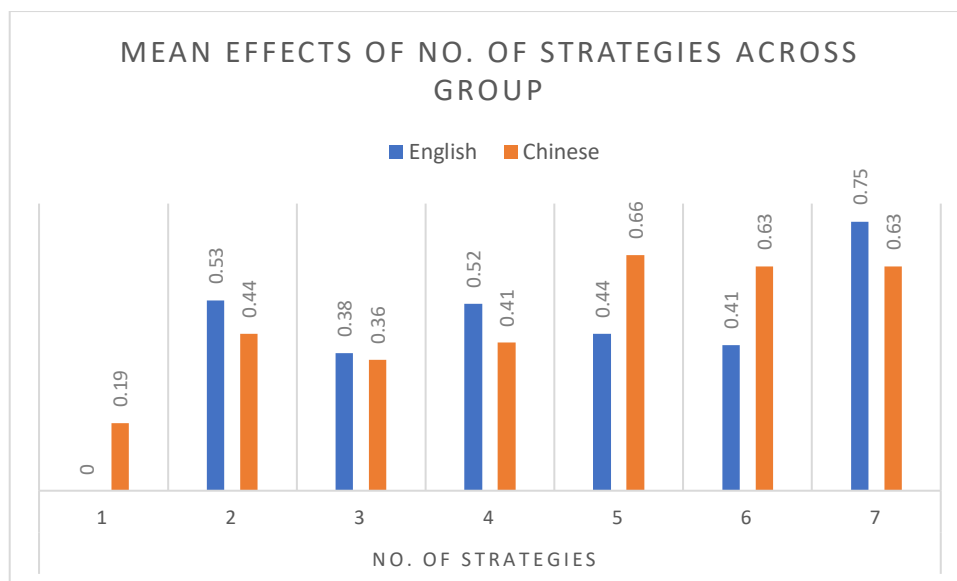


Figure 7. Displays Effects and interaction between Groups and Number of Strategies

The two-way interaction between group (*English/Chinese*) and *noun type* (*abstract/concrete*) is caused by the fact that both groups performed better with concrete nouns than with abstract nouns as demonstrated in the means given in Table 5.22 above, [.50 (0.501) for concrete nouns compared to .41 (0.493) for abstract nouns]. Further, the mean accuracy for concrete nouns was quite higher for the Chinese group (51%) than for the English group (48%). With the abstract nouns, the English group received higher scores than the Chinese [.44 compare to .38] (see means in Table 5.21 above). This explains why patterns occurred opposing directions in the results for the two-way interactions between group and *noun type*.

There was a significant two-way interaction between *number of strategies* and *noun type* (*abstract/concrete*), and this interaction occurred in the opposite direction, apparently caused by the fact that for *abstract* nouns a higher number of strategies delivers better retention scores, as demonstrated in Figure 8 below. In contrast, for *concrete* nouns, there were no noticeable effects in terms of retention scores when employing a greater number of strategies; thus, it seems that participants can successfully rely on employing one or two good strategies (e.g., L2-word picture association) to recall concrete nouns.

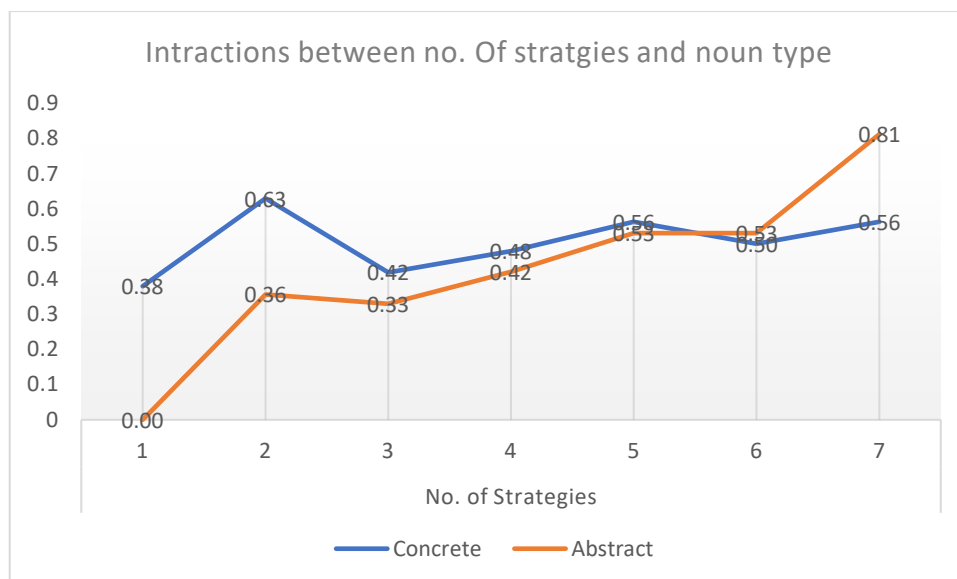


Figure 8. Displays scores means and interactions between No. of strategies and Noun Type

As presented in the results for the linear mixed-effects model in Table 5.23, there was a significant three-way interaction between *group* (*English/Chinese*), *Noun type* (*abstract/concrete*), and *number of strategies*. When considering the dissimilar charts in Figure 9 below, we can identify that a number of strategies affected the retention of nouns in both types (*concrete/abstract*) across the *English* and *Chinese* groups, showing these three variables significantly affect participants' ability to recall the meaning of words on delayed post-tests. More details regarding this interaction will be delivered in the following analysis by breaking data down by *noun type*.

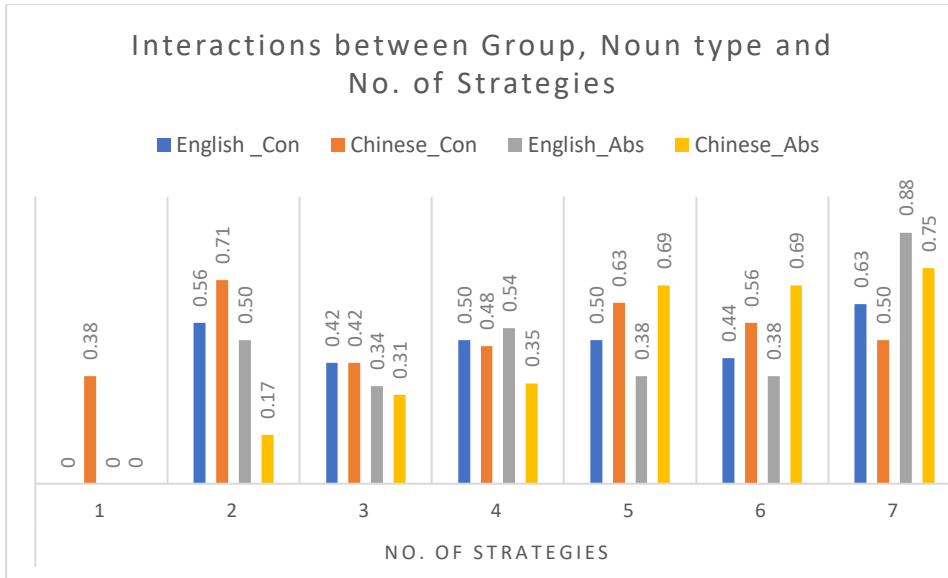


Figure 9. Displays scores means and interaction effects between Group, No. of Strategies and Noun Type

In view of the findings given above, in the next step of the analysis, the researcher examined the data by *noun type* (*abstract & concrete*), to carefully evaluate the effect of *group* and *number of strategies* separately by *noun type*.

Table 5.24. Mean effects from *group* on abstract nouns only in the delayed post-test

Group	Noun type	Mean
English	Abstract	.44 (.498)
Chinese	Abstract	.38 (.487)

(Std.Dev. in parentheses)

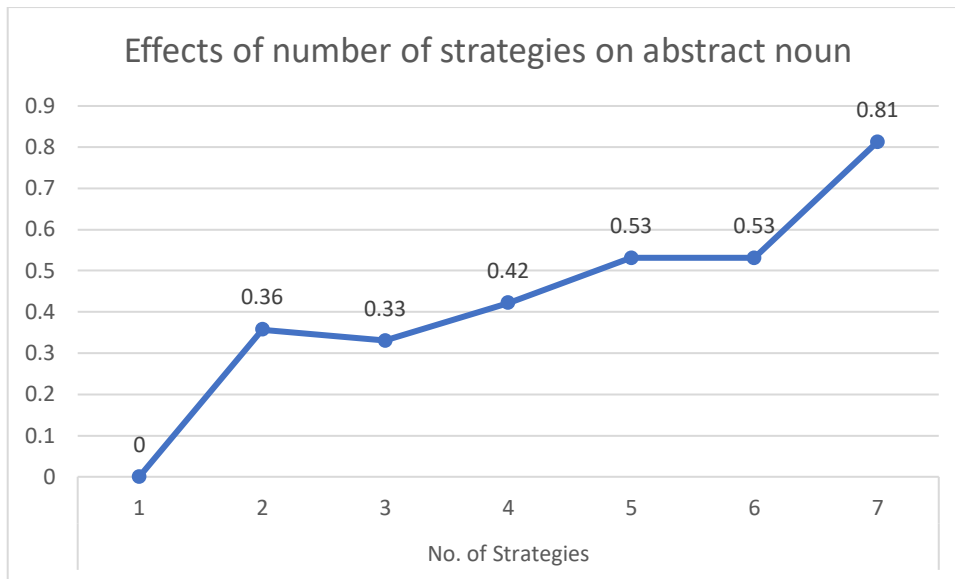


Figure 10. Effects of number of strategies on abstract nouns in delayed post-test

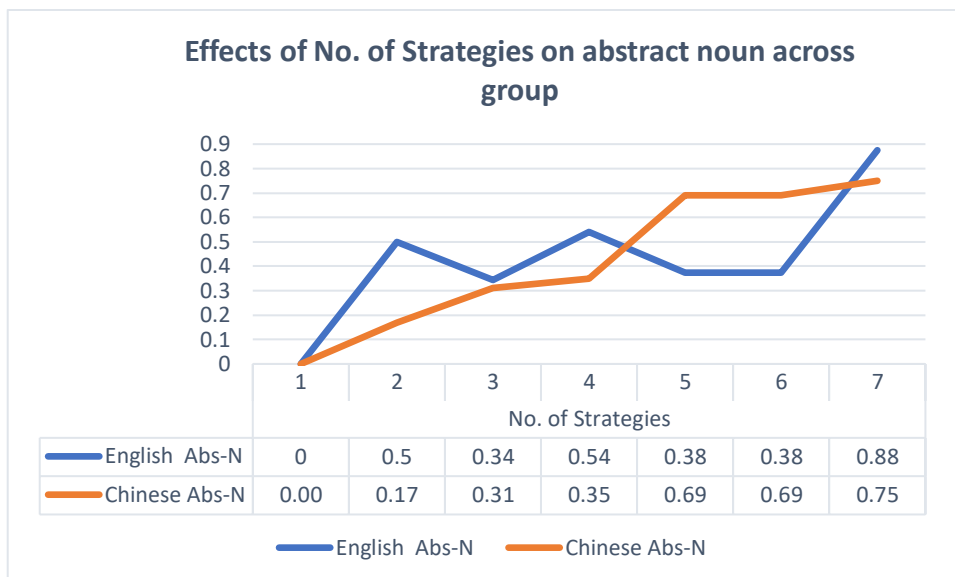


Figure 11. Displays effects of No. of Strategies on abstract noun across Group

Table 5.25. Effects of Group and No. of Strategies on Abstract noun

Random effects		Variance	SD	
Participant		0.003626	0.06021	
Item		0.092408	0.30399	
Fixed effects		Estimate	Std. Error	t value
(Intercept)		-0.11395	0.13591	-0.838
Group: E		0.44307	0.12299	3.603*
No_stra_delayed		0.13384	0.02039	6.565*
Group: E* No_stra_delayed		-0.10414	0.03065	-3.398*

Notice: anything above 1.96 is significant.

As is shown by the means in Table 5.24 above, the principal effect from *group* on *abstract* nouns arises because English learners performed better on the retention of abstract nouns in this case [.44 (.498) vs. .38 (.487)].

The significant effect of *number of strategies* on abstract nouns is caused by the progressive relationship between how many strategies have been employed and the scores obtained. Figure 10 above clearly displays this relationship, the more strategies were utilised, the better the scores for the number of abstract words acquired.

The two-way interaction between *group* and *number of strategies* is caused by the fact that there were considerable differences in the scores for both groups in response to this variable. For example, the Chinese participants' scores were meaningfully enhanced by the number of strategies used, as illustrated in Figure 11 above, the higher the number of strategies the Chinese used the better the scores they gained for abstract nouns. However, this was not the case with the English group, since the relationship between the number of strategies used and scores fluctuated; ranging from 50% for two strategies, to 38% for five or six strategies, to 88% for seven strategies (see Figure 11). That could be due to individual differences between the English learners themselves.

Having investigated the impact of the two predictor variables, *group* and *number of strategies* on abstract nouns, I then examined the potential effects of these two variables on *concrete* nouns.

Table 5.26. Effects of *group* on concrete nouns in delayed post-test

Group	Noun type	Mean
English	Concrete	.48 (.501)
Chinese	Concrete	.51 (.501)

(Std.Dev. in parentheses)

Table 5.27. Effects of *group* and *number of strategies* on concrete nouns

Random effects	Variance	SD	
Participant	0.02514	0.1586	
Item	0.02176	0.1475	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.5098416	0.1259698	4.047
Group: E	-0.0657750	0.1776742	-0.370
No_stra_delayed	0.0007185	0.0260827	0.028
Group: E* No_stra_delayed	0.0094687	0.0421314	0.225

Note: Anything above 1.96 is significant.

As demonstrated by the means in Table 5.26 above, there was no difference between the groups in terms of concrete nouns for the delayed post-test scores, as well as no effect or interaction between *group* and *number of strategies* and *concrete nouns*. The mean accuracy scores were relatively similar (English 48% and Chinese 51%). The results for the linear mixed-effects model given in Table 5.27 above supported this finding, by illustrating that there are no significant effects from the two predictor variables, *group* and *number of strategies*, on *concrete nouns* in the delayed post-test.

In summary, there were effects and interactions for three predictor variables; Number of strategies, *group* (*English/Chinese*), and *noun type*. However, when examining the data broken down according to noun type (*abstract & concrete*), no effect was found for *number of strategies* or *group* on concrete nouns, despite the significant effects and interactions between these two variables in the case of abstract nouns.

5.4.2 Frequency of strategies and uptake of verbs

- A. Post-test: dependent variable: post test scores- Fixed factors are number of strategies* group*mode*verb type. Random factors are participant and item.

Using a linear mixed-effects model, the researcher investigated the effects for the predictor variables (fixed factors), *number of strategies*, *group* (*English/Chinese*), *Mode of learning* (*intentional/incidental*), and *verb type* (*action/state*) on the outcome variables Post-Test Scores of verbs, with the participants and items listed as random effects.

There were effects and interactions between the variables, Number of strategies, group (*English/Chinese*), Mode of learning (*intentional/incidental*), and Verb type (*action/state*). Table 5.28 displays the effects from learning mode (*intentional/incidental*) on verb acquisition. The results of the logistic regression model, and the effects from the fixed factors are presented in Table 5.29. For the means of all fixed factors see appendix C5.

Table 5.28. Effects of *learning mode* on the acquisition of verbs

Word type	Mode	Mean
Verb	intentional	.48 (.500)
	incidental	.42 (.494)

(Std.Dev. in parentheses)

As illustrated by the means in Table 5.28 above, the main effect of the learning mode (*intentional/incidental*) on verb acquisition was caused by the fact that the mean accuracy scores for the intentional learning mode were higher (48%) than the mean accuracy scores for incidental learning (42%). The results for the linear mixed factors support this finding demonstrate that there is a significant effect from learning mode on verb acquisition (see Table 5.29).

Table 5.29. Effects of fixed factors (*group, learning mode, number of strategies, and verb type*) in immediate post-tests

Random effects	Variance	SD	
Participant	0.03330	0.1825	
Item	0.01102	0.1050	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	-0.31910	0.21341	-1.495
Group: E	0.12881	0.27317	0.472
Mode: intentional	0.66056	0.28980	2.279*
No_stra_imm	0.15926	0.03708	4.295*
Group: E; Mode: intentional	-0.60397	0.37687	-1.603
Group: E; No_stra_imm	-0.01943	0.05160	-0.376
Mode: intentional; No_stra_imm	-0.13044	0.05995	-2.176*
Group: E; Mode: intentional; No_stra_imm	0.16799	0.07840	2.143*

Note: anything above 1.96 is significant.

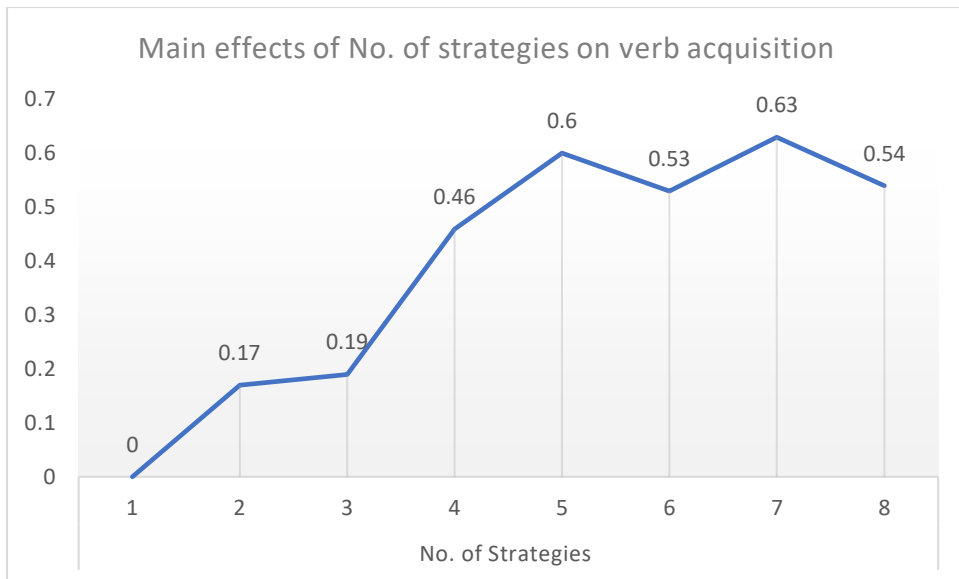


Figure 12. Main effects of No. of strategies on verb acquisition in immediate post-test

Figure 12 above displays the main effect from *number of strategies* on verb acquisition, reflecting that there is a steady relationship between the *number of strategies* used and the scores obtained, such that the greater the *number of strategies* used in the immediate post-test the better the scores gained in terms of verb acquisition.

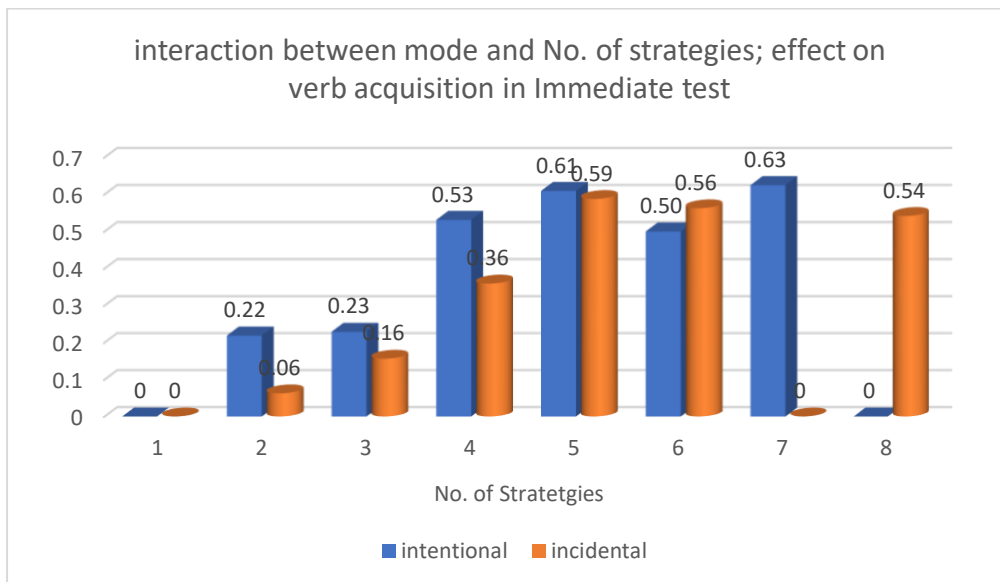


Figure 13. interaction between mode of learning and No. of strategies' effect on verb acquisition

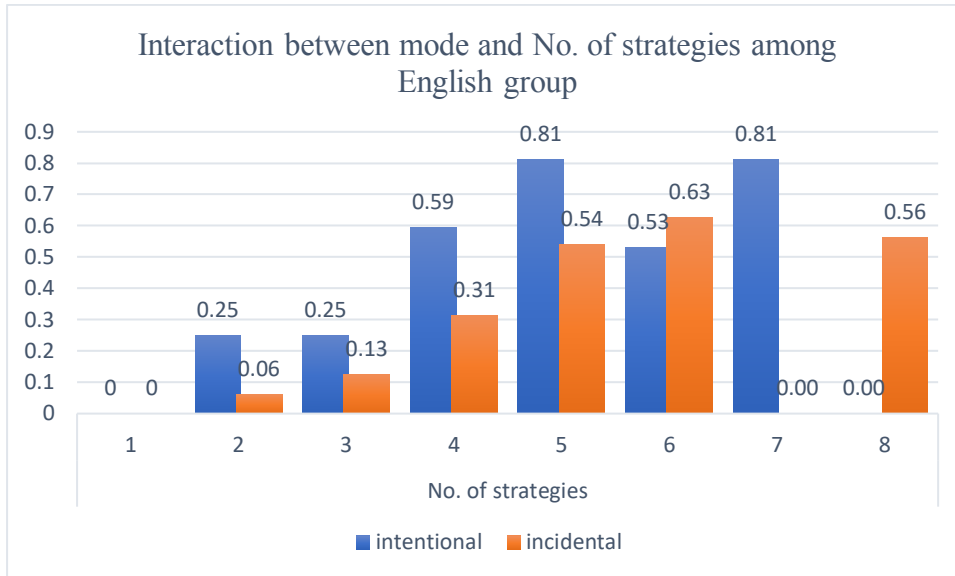


Figure 14. Interaction between mode of learning and No. of Strategies among English group

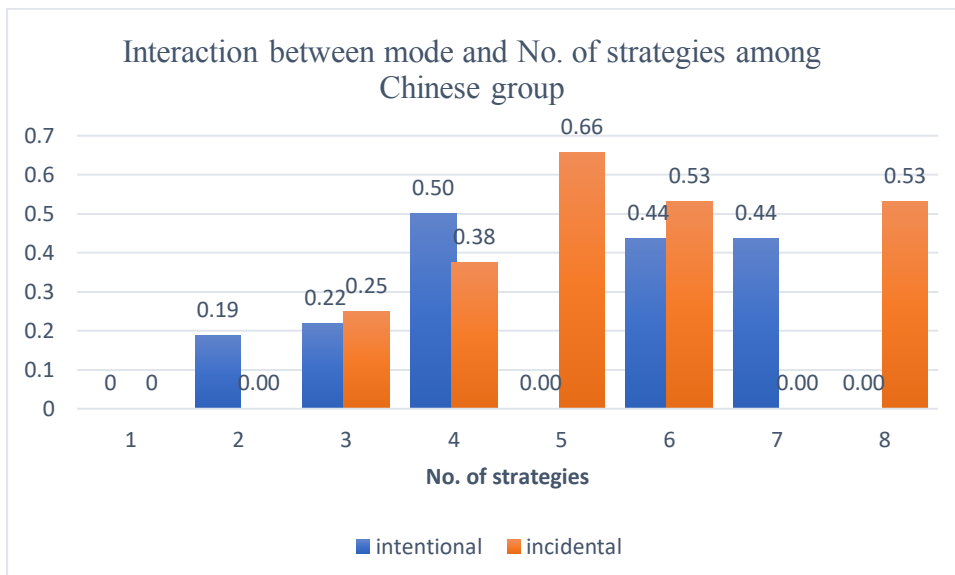


Figure 15. Interaction between mode of learning and No. of Strategies among Chinese group

The two-way interaction between *learning mode* and the effect of *number of strategies* occurs because the latter variable results in significantly better verb acquisition in the intentional mode of learning, as shown in Figure 13.

The three-way interaction between *group*, *learning mode*, and *number of strategies* is caused by the fact that for the English group the *number of strategies* resulted in higher scores on the intentional learning mode (see the mean scores in Figure 14 above). Whereas, for the

Chinese group, the *number of strategies* resulted in better scores in the incidental mode of learning, as demonstrated in Figure 15. This finding supports the patterns observed previously when considering the general effect from *number of strategies* upon retention, and that the greater *number of strategies* used by the English group in the intentional mode leads to greater results in the post-test compared to the Chinese [.65 (.48), vs. .47 (.50)]. In addition, the more strategies the Chinese used in the incidental learning mode the better they did in post-test, significantly outperforming the English group [.52 (.50) compared to .40 (.49)].

In the next step of the analysis, I split the data into groups and verb types to examine the potential effects of mode and number of strategies on the acquisition of *action* and *state* verbs independently.

Table 5.30. Mean effects of *group* on action verbs in immediate post-test

Group	Verb type	Mean
Chinese	Action	0.49 (0.502)
English	Action	0.56 (0.498)

(Std.Dev. in parentheses)

Table 5.31 Effects of fixed factors (*learning mode* and *number of strategies*) on action verbs among the Chinese group

Random effects	Variance	SD	
Participant	0.00000	0.0000	
Item	0.02428	0.1558	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.450192	0.178701	2.519
Mode: intentional	-0.325192	0.231232	-1.406
No_stra_imm	-0.002395	0.030681	-0.078
Mode:intentional; No_stra_imm	0.029180	0.046849	0.623

Note: Anything above 1.96 is significant.

Table 5.32. Effects of fixed factors (*learning mode* and *number of strategies*) on action verbs among the English group

Random effects	Variance	SD	
Participant	0.00999	0.09995	
Item	0.03116	0.17652	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	-0.0385375	0.1664220	-0.232
Mode: intentional	0.1922744	0.2310694	0.832
No_stra_imm	0.0740994	0.0325516	2.276*
Mode:intentional; No_stra_imm	-0.0004264	0.0482296	-0.009

Note: Anything above 1.96 is significant.

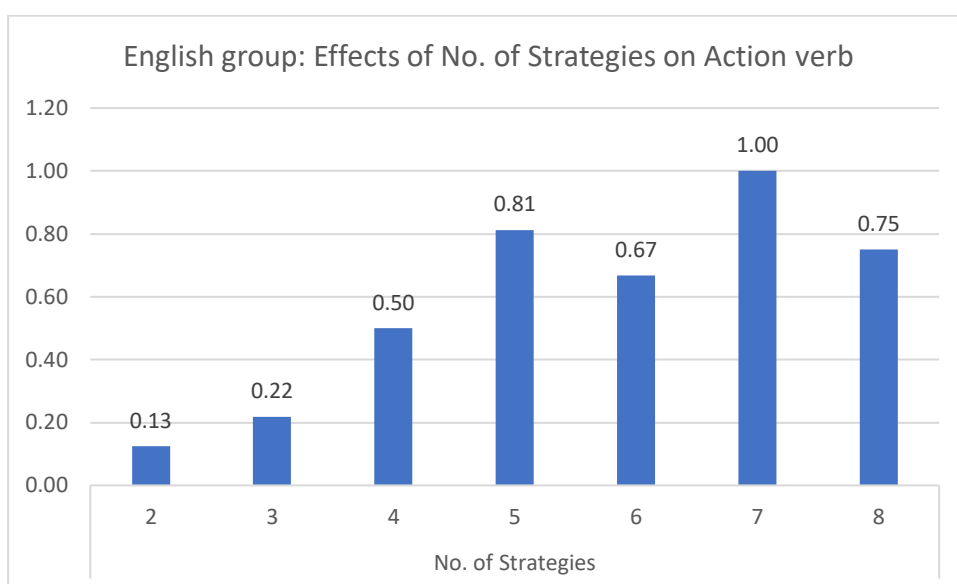


Figure 16. Main Effects of No. of Strategies on action verb among English group

By evaluating the effects of the predictor variables *learning mode* and *number of strategies* on action verbs only, no effect or interaction was found among the Chinese group. The results of the linear mixed model support this finding, as set out in Table 5.31. However, for the English group, there was only one significant effect caused by the predictor variable *number of strategies*. Figure 16 above displays the main effect of *number of strategies* on acquisition of action verbs, and recalls that results were influenced by a different *number of strategies*, with better results when 5 to 7 strategies were used. The results of the linear mixed model support this finding, as demonstrated in Table 5.32 above. Having investigated the impact of key predictor variables group, mode of learning, and number of strategies on action verbs, I subsequently examined the potential effects of these variables on state verbs.

Examining the effects of predictor variables, *group (English/Chinese)*, *learning mode (intentional/incidental)*, and *number of strategies* on state verbs only, the results revealed the main effect of group and learning mode; thus, for illustration purposes, the additional predictor variable (No. of strategies) was removed from the model, as displayed in Table 5.34. The mean accuracy scores are listed in Table 5.33 below.

Table 5.33. Mean accuracy scores for state verbs across groups, broken down by mode

Group	Mode	Mean
English_state verb	intentional	0.50 (0.503)
	incidental	0.29 (0.455)
Chinese_state verb	intentional	0.24 (0.428)
	incidental	0.44 (0.499)

(Std.Dev. in parentheses)

Table 5.34. Effects of fixed factors (*group* and *learning mode*) on state verbs

Random effects	Variance	SD	
Participant	0.006046	0.07776	
Item	0.031674	0.17797	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.43750	0.08328	5.253
Group: English	0.15000	0.07715	-1.944
Mode: intentional	-0.20000	0.06887	-2.904*
Group: English; Mode: intentional	0.41250	0.09740	4.235*

Note: Anything above 1.96 is significant.

The significant two-way interaction between *group* and *learning mode* is caused by the fact that the intentional learning mode had a strong effect on the accuracy of responses for the English group (50%) but not for the Chinese group (24%), as is shown in the means in Table 5.33 above. Whereas, in incidental learning mode the situation changed for the Chinese group who attained better results than the English group (44% compared to 29%). These results explain why the significant effect of learning mode occurs in an opposite direction, as demonstrated in Table 5.34. In the next step of the analysis I divided the data by *group*, with learning mode as a fixed factor, and the results of state verbs presented as a dependent variable to examine the potential effect of *Mode of Learning*.

Table 5.35. Effect of *learning mode* as a fixed factor on *Chinese* state verbs' scores

Random effects	Variance	SD	
Participant	0.00000	0.0000	
Item	0.02437	0.1561	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.43750	0.07403	5.910
Mode: intentional	-0.20000	0.06977	-2.867*

Note: Anything above 1.96 is significant.

Table 5.36. Effect of *learning mode* as a fixed factor on *English* state verbs' scores

Random effects	Variance	SD	
Participant	0.01790	0.1338	
Item	0.03099	0.1760	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.28750	0.08941	3.215
Mode: intentional	0.21250	0.06829	3.112*

Note: Anything above 1.96 is significant.

By referring to the mean accuracy scores for state verbs in both groups (*English/Chinese*) in Table 5.33 above, we can clearly identify how and which mode, whether intentional or incidental had a strong influence on the scores of both groups. In the case of the English group, the main effect from mode occurred as a consequence of intentional learning, and the mean accuracy scores for intentional learning were significant at chance 50%, whereas the mean accuracy scores in incidental learning was significantly below chance 29%. In contrast, for the Chinese group, the main effect occurred through the incidental mode of learning; i.e. 44% compare to only 24% in intentional learning mode. The results of the linear mixed-effects model shown in Table 5.35 and Table 5.36 support these findings, demonstrating a main effect from learning mode (*intentional/incidental*) on both groups (*Chinese/English*). However, as apparent from both tables, patterns occurred in the opposite direction, since we expected that intentional mode of learning would have a main effect on both groups, but this was not the case with the Chinese group who received better scores in the incidentally oriented mode of learning when recalling state verbs.

To sum up, there were effects of *learning mode*, *number of strategies*, and a three-way interaction between *group*, *mode*, and *number of strategies*. When examining data broken down by groups and verb types (*action/state*) no effect from action verbs was found with Chinese group, but for the English group, there was a main effect of *number of strategies* on action verbs. Considering state verbs, there was a significant main effect from learning mode on both groups. The English learners performed better under the intentional mode, whereas the Chinese got their high scores with the incidental vocabulary learning mode.

B. Delayed post-test: dependent variable: post test scores- Fixed factors are number of strategies* group*mode*verb type. Random factors are participant and item.

Using a linear mixed-effects model, the researcher investigated the effects of the predictor variables *number of strategies*, *group* (*English/Chinese*), *learning mode* (*intentional/incidental*), and *verb type* (*action/state*) on the outcome variable Delayed Post-Test Scores of verbs, with the participants and items as random effects.

The results revealed there was only a three-way interaction between the predictor variables *group*, *learning mode*, and *number of strategies* as supported by the linear mixed-effects model in Table 5.37. Thus, for illustration purposes, the predictor variable *verb type* was removed from the model, and for means of all fixed factors see appendix C6.

Table 5.37. Effects of fixed factors (*group, learning mode, and number of strategies*) on Delayed post-tests

Random effects	Variance	SD	
Participant	0.03330	0.1825	
Item	0.01102	0.1050	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.278065	0.192048	1.448
Group: English	0.116514	0.254033	0.459
Mode: intentional	-0.008424	0.242724	-0.035
No_stra_delayed	0.063277	0.042805	1.478
Group: English; Mode: intentional	-0.197796	0.319182	-0.620
Group: English; No_stra_delayed	-0.076786	0.065069	-1.180
Mode: intentional; No_stra_delayed	-0.042713	0.061954	-0.689
Group: English; Mode: intentional; No_stra_delayed	0.168508	0.083340	2.022*

Notice: anything above 1.96 is significant.

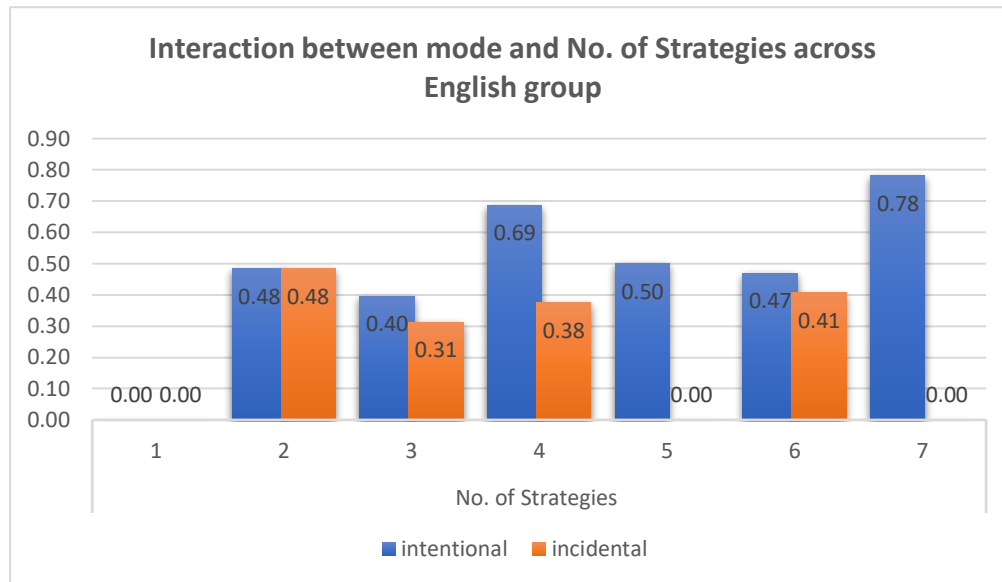


Figure 17. Interaction between mode of learning and No. of Strategies across English group

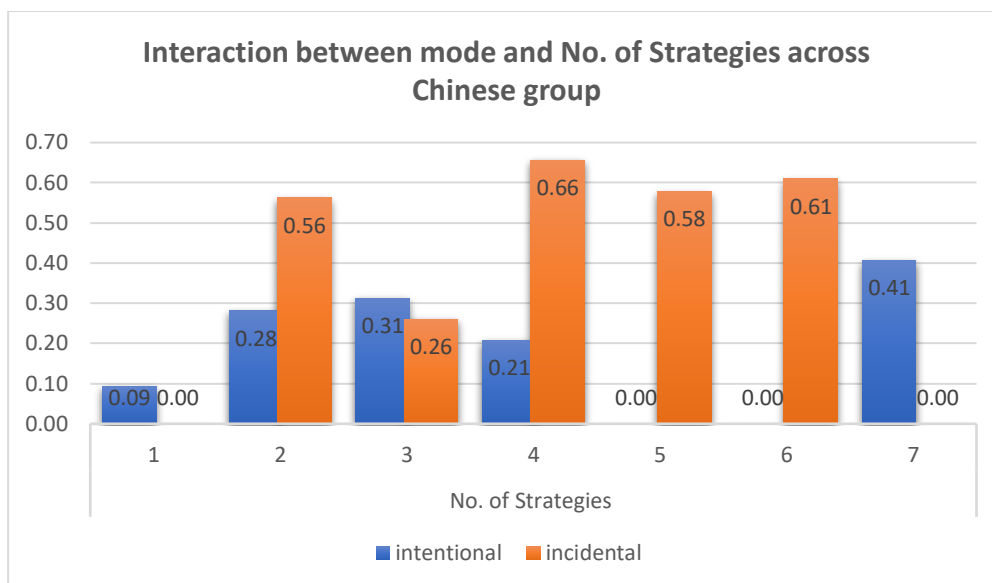


Figure 18. Interaction between mode of learning and No. of Strategies across Chinese group

The three-way interaction between *group*, *learning mode*, and *number of strategies* arises because the *number of strategies* has a strong effect on the scores of the English group in the intentional learning mode, as presented in Figure 17. Whereas, with the Chinese group, the variable *number of strategies* has a strong effect on scores only in the incidental mode of vocabulary learning, as demonstrated in Figure 18.

By undertaking a close investigating of the predictor variable *number of strategies* in reference to recalling verb types (action/state) across groups in delayed post-tests, the results revealed both groups produce the same effects regarding *number of strategies*, irrespective of mode or type of verb, as depicted in Table 5.38 below.

Table 5.38. Effects of fixed factor (*number of strategies*) on verb type in delayed post-tests

Random effects	Variance	SD	
Participant	0.01795	0.1340	
Item	0.02660	0.1631	
Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.09232	0.07388	1.25
No_stra_delayed	0.07522	0.01390	5.41*

Note: Anything above 1.96 is significant.

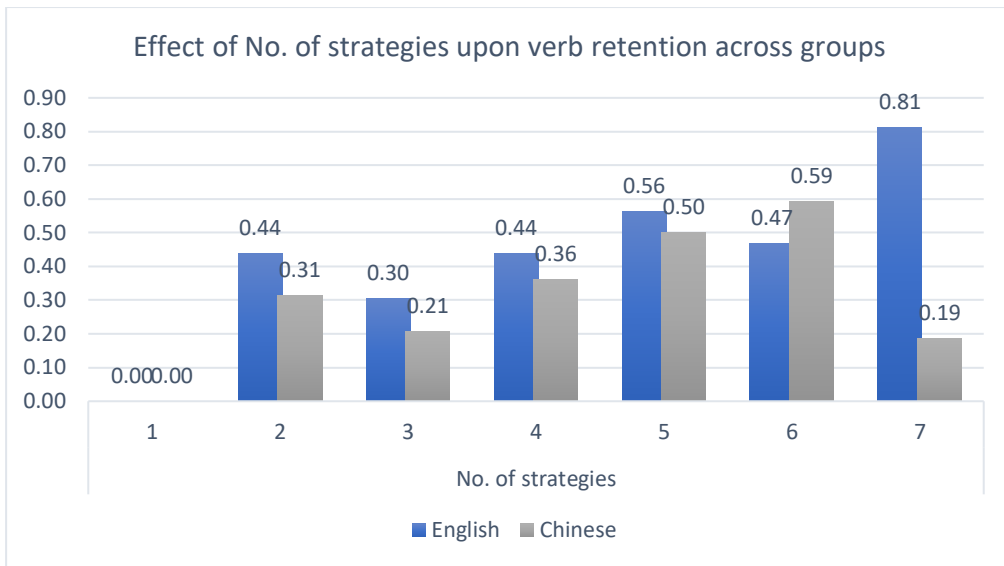


Figure 19. Displays mean accuracy of the effect of No. of strategies on verb retention across groups in delayed test.

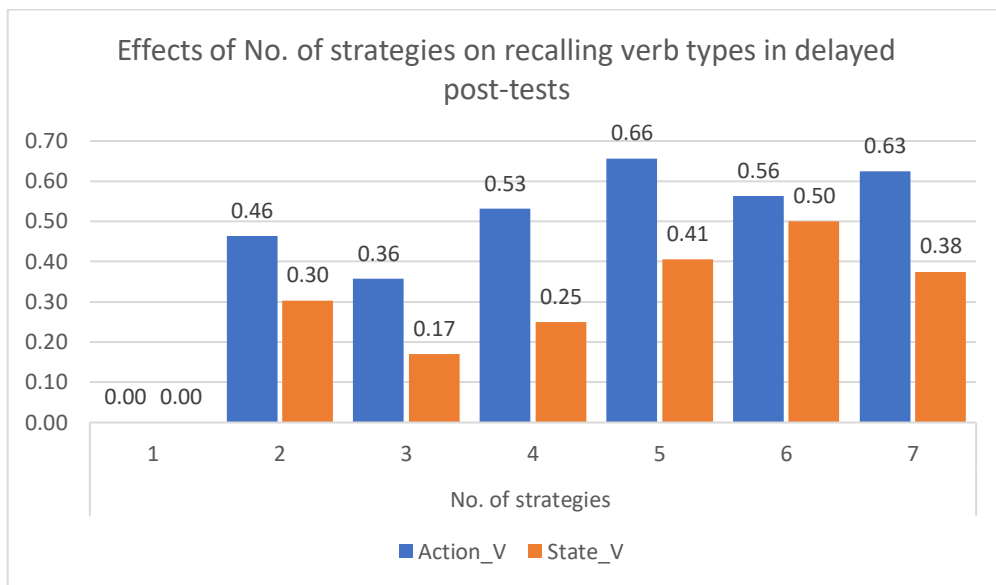


Figure 20. Displays mean accuracy of the effect of No. of strategies on verb type in delayed test

Figure 19, shows the mean accuracy for the effect of *number of strategies* on verb retention across groups, demonstrating that a variable *number of strategies* resulted in better scores for both groups. However, the English group achieved significantly better scores when using seven strategies (81% in comparison to only 19% for Chinese group). The findings also reveal that a variable *number of strategies* resulted in better scores for action verbs than for

state verbs in the delayed vocabulary retention test, as displayed in Figure 20, which shows the mean accuracy of the effect of *number of strategies* on recalling verb type (*action/state*).

Hence, we can conclude based on the results of the linear mixed effect model, that there was only a three-way interaction between predictor variables *group*, *learning mode*, and *number of strategies*. When investigating the predictor variable *number of strategies* in reference to verb types (*action/state*) across the groups in the delayed post-tests, the results revealed both groups have the same effects relative to how many strategies they used, irrespective of mode or type of verb. Table 5.39 below summarises those factors affecting word type (nouns and verbs) and subtype (concrete and abstract nouns, action and state verbs) in immediate and delayed vocabulary retention tests. A full discussion of the differences between verbs and nouns will be presented in the discussion chapter.

Table 5.39. Factors affecting word type (nouns and verbs) and subtype (concrete and abstract, action and state) in immediate and delayed tests.

Test time	Words type	Investigated Factors	Effect	Sig. interaction	Data broken down by subtype	Affecting factors
Immediate	Noun	Group	-	A two-way interaction between mode and noun type	Concrete	Mode of learning (<i>intentional</i>)
		Mode	+			
		Number of strategies	-			
		Noun type	+		Abstract	
	Verb	Group	+	A two-way interaction: mode and No. of Ss A three-way interaction: Group, mode and No. of Ss	Action	number of strategies with English group only
		Mode	+		State	Sig. interaction bet. mode and group (<i>intentional</i> with English, <i>incidental</i> with Chinese)
		Number of strategies	+			
		Verb type	+			
Delayed	Noun	Group	+	A two-way interaction: group and No. of Ss. A two-way interaction: group and noun type. A two-way interaction: No. of Ss and noun type. A three-way interaction: group, No. of Ss and noun type.	Concrete	No effect
		Mode	-		Abstract	Group (English) and No. of Ss
		Number of strategies	+			
		Noun type	+			
	Verb	Group	+	A three-way interaction: group, mode, and number of Ss.	Action	Main effect of number of strategies
		Mode	+		State	No effect
		Number of strategies	+			
		Verb type	-			

Note: + = effect, - = no effect.

5.4.3 Qualitative analysis of different types of strategies used for nouns and verbs

In order to ascertain whether participants found a specific type of strategy useful for learning a specific type of word; i.e., noun or verb, in the contexts of intentional and incidental vocabulary learning, a qualitative analysis of the verbal data was conducted. This involved examining and arranging the retrospective responses regarding the strategies used and the interview data thematically. It should be noted here, that the interviews were originally only intended to support and verify the questionnaire data, and included only two retrospective questions. Accordingly, in the interviews the researcher asked questions similar to those asked during the tests (see section 4.6.4.4 for more information about the interviews).

The analysis of the verbal data revealed that almost all L2 learners responded to the different word types (noun/verb) equally in terms of strategy use. However, several participants indicated using some strategies specifically for certain word types. For instance, some participants reported using the *word's morphological scale* with nouns more often. Others reported employing *associating word with its root* to learn verbs, precisely because the past tense of Arabic verbs usually comprises radical three or four letters (words root). Another strategy only reported twice in reference to intentional vocabulary learning, seemed to be a verb learning strategy, *associating words spoken form with meaning*. This strategy was reported as useful when learning the verb *أَتَقَشَفُ/atagashafū/* 'to become an abstinent'; one participant commented that he had found an association between the difficulty of the word's spoken form (how it is pronounced) (*أَتَقَشَفُ/atagashafū/*) and its meaning 'to be abstinent and patient to save money'. Nonetheless, such strategies can be used for both type of Arabic words noun and verb; hence, we need more evidence to prove if there is a pattern. Accordingly, the author sought more information about the eye-tracking technique. This requires the ability to track a reader's eye-movements on every single word of text, and might give an indication of which strategies are to be employed for each type of word (noun/verb).

5.5 Results of experiment 3: Eye-Tracking Study

In the previous two experiments (intentional and incidental vocabulary learning) we identified the type and frequency of the strategies used based on participants' reports, and the effect of those strategies in reference to recall in a quantitative analysis. As explained above, to gather additional details about the qualitative aspects of strategy use, the researcher carried out a qualitative analysis of the verbal data from five participants, by asking retrospective questions about the strategies employed, and through stimulated verbal recall interviews.

5.5.1 The first research question relating to the third experiment

RQ1: What strategies (or cognitive processes) do L2 learners use in general, and which most frequently, during incidental L2 vocabulary acquisition?

To answer the first research question, a qualitative analysis was conducted on the data collected from all five participants. This data comprised of the participants' retrospective reports, immediately after they had completed the vocabulary tests, and were based on two questions about the strategies used (1-please list and describe the strategies that you used when attempting to learn the new Arabic words, 2- which strategy did you use most frequently? Why?), and from their reports during the stimulated verbal recall interviews. The overall aim of research question one was not only to explore the cognitive processing strategies or behaviours that participants engage with during incidental vocabulary learning through reading, but also to identify the potential reasons behind their choice of strategies, based on the evidence from participants stimulated verbal recall interviews when observing their reading performance.

To acquire a general impression about the reportedly used strategies to create guidelines for the stimulated verbal recall interviews for each participant, the researcher initially analysed and coded the learners' responses to the two questions regarding: 1- the used strategies in

general, and 2- the Most Frequent Strategy (MFS) (see section 4.4.1.4.1 for more information about how strategies were elicited and coded).

5.5.1.1 Participants' reportedly used strategies

Table 5.40 below displays the general strategies, scored out of 32, and the most frequent strategy for each participant under the two incidental vocabulary tests condition, (a) in isolation and (b) in context.

It was apparent from the data that the participants used different type of strategies to learn new Arabic words incidentally through reading. Examples of reported strategies (based on the responses to the first question concerning strategies) include: *reading for thorough understanding, reading repeatedly, connect words to its synonyms, connect word to a personal experience, associate word to its root (derivation), use word's morphological scale, guess from textual context, remembering the story line, and say knew words aloud when reading.*

Some learners used a higher number and more diverse strategies, whereas others only relied on a few strategies to learn and recall target words; for instance, participant 1 reported using six types of strategy, in comparison with participant 4 who only reported used three types of strategy in the isolated-word-test condition. However, reported use of more strategies does not always results in better scores or better vocabulary retention, as is the case for participant 4, who reported using just three strategies in the isolated-word-test condition and two strategies in the context-word condition, but still achieved higher target words recall than the other participants who reported using more strategies. This result suggests that the type of strategies or cognitive processes that learners utilise and engage with during incidental reading might inform successful/unsuccessful vocabulary learning and retention. This could also relate to the learners' background and reading abilities, which might benefit from contextual cues to infer the meaning of target words correctly.

Remarkably, the results for the context–word–test condition were better than the results for the isolated–word–test condition, the average of both results (scores) was 21.8 in context condition vs. 16 in isolation condition. This finding reflects the advantage of providing test-takers with short sentences drawn from the original text to help them remember the story line; providing context cues helps them guess the meaning of the target words. This result supports the previous findings from the second experiment conducted for this study (incidental vocabulary learning), and both results confirm Hulstijn et al.’s (1996) suggestion that it is beneficial to assess the acquisition of words in context. Moreover, the learners, in the context–word–test condition tended not to use as many strategies as they did when the words were presented in isolation, preferring to guess the target words’ meaning. Four participants in the context–word–test condition reported using guessing from context as their most frequently used strategy (MFS) (see Table 5.40).

Table 5.40. Displays the general strategies, score and most frequent strategy for each participant across two incidental words tests condition (isolation vs. context tests).

Participants	Isolated–word–test condition			Context–word–test condition		
	General reported Strategies	score	MFS	General reported Strategies	score	MFS
Participant 1	<ol style="list-style-type: none"> 1) Guess from textual context 2) Reading for thorough understanding 3) Connect the word to its synonyms 4) Connect word to a personal experience 5) Associate the word to its root (derivation) 6) Use word’s morphological scale 	22	Guess from textual context	Guess from textual context associate a word to its root (derivation) Use word’s morphological scale	25	Guess from textual context
Participant 2	<ol style="list-style-type: none"> 1) Connect word to a personal experience 2) Guess from textual context 3) Remembering the storyline 4) Reading for general understanding 5) L2–L1 association 	3	Connect word to a personal experience	Guess from textual context Remembering the storyline	12	Guess from textual context
Participant 3	<ol style="list-style-type: none"> 1) Guess from textual context 2) Associate the word with its root (derivation) 3) Connect word to a personal experience 	13	Guess from textual context	Guess from textual context Remembering the storyline Associate the word with its root (derivation)	17	Guess from textual context

	<ul style="list-style-type: none"> 4) Remembering the storyline 5) Say new word aloud when studying 					
Participant 4	<ul style="list-style-type: none"> 1) Reading for thorough understanding 2) Guess from textual context 3) Reading repetition 	24	Guess from textual context	<ul style="list-style-type: none"> Reading for thorough understanding Guess from textual context 	29	Guess from textual context
Participant 5	<ul style="list-style-type: none"> 1) Reading repetition 2) Guess from textual context 3) Connect new words to a personal experience 4) Remembering the story line 	18	Reading repetition	<ul style="list-style-type: none"> Reading repetition Guess from textual context Remembering the story line 	26	Reading repetition

When establishing which strategy was reported most frequently by each participant (responses to the second question about strategies), *guessing from the textual context* emerged as the preferred strategy for the majority of participants under both the incidental vocabulary test conditions (isolation and context). This tactic was the MFS for participants 1, 3, and 4 in the isolated words condition, and the MFS for participants 1, 2, 3, and 4 in the contextualised words test condition. However, as became apparent from the analysis of stimulated verbal recall data, the inferencing strategy involved many cognitive processes and steps in the process of discovering, determining, and manipulating the meaning of the new target words. The use of the eye tracking technique, not only helped with identifying the micro cognitive processes underlying incidental vocabulary acquisition, but also revealed the motivations behind the use of some specific strategies.

The strategy *connect word to previous knowledge and personal experience* was reportedly used by participant 2 as the MFS in the isolated word test condition. However, based on the low score attained by participant 2 (only 3 out of 32 target words), we can conclude that relying so heavily on this memory strategy for incidental vocabulary learning does not assist in the learning or retention of new words. It seems that participant 2 gained some advantage by *connecting word to previous knowledge* to understand the context, as he reported this during the stimulated verbal recall. But when learner was tested on his vocabulary uptake and knowledge under the isolated word condition, he failed to recall and provide the meaning of the target words. However, when the same learner (participant 2) had the benefit of context, he was able to remember and provide the meaning of ten target words correctly (i.e., in the context word test).

Participant 5 reported the strategy of *reading repeatedly* as his MFS in both vocabulary test conditions (isolation and context). The *reading repeatedly* strategy seems to result, with

the help of other strategies, in good uptake vocabulary knowledge, he achieved a score of 18 in the isolated words condition and 26 out of 32 in the context condition.

5.5.1.2 Analysis of stimulated verbal recall data

The data collected via stimulated verbal recall interviews highlighted the qualitative aspects of the participants' strategy use. It revealed what they were able to note themselves about their reading of the text and the target words, and the reasons why they might choose and employ particular strategies. The researcher recorded the interview data and transcribed it, and then analysed the findings using Nvivo 11, a computer software package designed specifically to analyse qualitative data.

Each participant was asked to comment on their strategy use while watching a video of their performance during the incidental learning session, which involved reading an Arabic short story. Showing the eye-tracking video to the participants refreshed their memories about the way they behave when reading and encountering new words. As a result, the participants mentioned additional strategies and further details about key aspects of strategy use and the reasons for their behaviour. This technique was noticeably beneficial to the researcher and to the participants, as it made it possible to focus on the area of interest, by determining each target word and its surrounding context in advance, then monitoring and calculating concentration on areas of interest. Some general questions were used during this stage, for instance: what is happening here? What were you thinking at this point? Why did you return to this word? Why did you spend longer on this target word? Other questions related to what the participants had already reported regarding the strategies they used, for example: could you explain how you connect the target word to the context? How did you connect the word to its root? How did context help you guess the meaning of the target words?

The qualitative analysis of the data further revealed that the strategies reportedly used fit into four main categories, based on Schmitt's (1997) taxonomy of VLS. The first category

includes discovering and meaning determination strategies. The other three categories related to strategies for consolidating a word once it has been encountered, including memory strategies, cognitive strategies, and metacognitive strategies. Table 5.41 summarises the strategies reportedly used in the four main categories. The column of number of comments specifies the total quantity of comments made relating to each strategy, while the number of participants' column indicates the number of participants able to comment on the strategy.

Table 5.41. The strategies reported within each of the four categories

Category	Reported Strategies	No of comments	No of participants
Discovery and meaning determination strategies	1) Spending time on the unknown and interesting words	20	5
	2) Analyse part of speech	1	1
	3) Finding out is it plural or single	1	1
	4) Focusing on short vowels (الْحَرَكَات, hāraakat)	4	3
	5) Associate word with its root (derivation)	10	4
	6) Use the morphological scale	7	3
	7) Connect word to another that is similar in sound	2	2
	8) Guess from textual context	38	5
Consolidation-Memory strategies	1) Connect the word to its synonyms	7	3
	2) Connect word to personal experience and previous knowledge	22	5
	3) Focusing on the abstract meaning	9	4
	4) Focusing on the characters in the story	8	3
	5) Group words together with a story line	2	2
	6) Visualise target word and picture	4	3
Consolidation-Cognitive strategies	1) Reading repeatedly	29	5
	2) L2 – L1 translation	8	2
Consolidation-Metacognitive strategies	1) Leave unknown words	12	4

As indicated in Table 5.41, the results for the qualitative analysis in Nvivo revealed different types of strategies underlying the four categories of VLS, and the number of participants' comments relating to the strategies. The category of discovery and meaning

determination includes eight strategies, four of which received the most frequent comments; *guess from textual context* (38 comments), *spending time on the unknown and interesting words* (20 comments), *associate word with its root* (10 comments), and *use the morphological scale* (7 comments). The category of consolidation-memory strategies includes six strategies, four strategies of which were reportedly used most often by the participants; *connect word to personal experience and previous knowledge* (22 comments), *focusing on the abstract meaning* (9 comments), *focusing on the characters in the story* (8 comments), and *connect the word to its synonyms* (7 comments). The category of consolidation-cognitive strategies includes two strategies, the strategy of *reading repeatedly*, which received 29 comments, followed by *L2 – L1 translation* (8 comments). The final category (consolidation-metacognitive strategies) only includes one strategy, *leave the unknown words*; however, this strategy received 12 comments from 4 of the participants during the stimulated verbal recall.

Seventeen types of strategies were identified in the stimulated verbal recall interviews (as in Table 5.41), in comparison to only 12 types of strategies in the retrospective reporting method (as in Table 5.40). This finding reflects the significance of online data collection through the means of eye-tracking and live stimulated verbal recall interviews. The eye-tracking data refreshes the participants' memories, enabling them to comment on and provide immediate details about strategy use when learning new words.

Following the researcher's description, explanation and evaluation of the learners' use of specific strategies involved in the four categories of VLSs identified. The description addresses in detail how the participants use key strategies, and how well they implement them. In addition, the researcher explores the potential factors that might have affected the decision to use such strategies.

a. *Discovery and meaning determination strategies*

1) *Noticing and Spending time on unknown and interesting words*

The first strategy or step was common to all learners when they encountered the target words for the first time. They read and identified the target words in the text by spending more time on them, remembering, analysing and examining their knowledge of them. This step was initially identified by the eye-tracker and the amount of fixation time on the target words as shown in the recording video, see the screenshot in Figure 21 reflecting the fixation and sample visibility on the target words. The strategy of spending time on the unknown words stimulated the researcher to ask the learners: why did you spend so much time on this target word? This prompted them to explain their behaviour, by providing more specific justifications and even where necessary referencing other strategies.

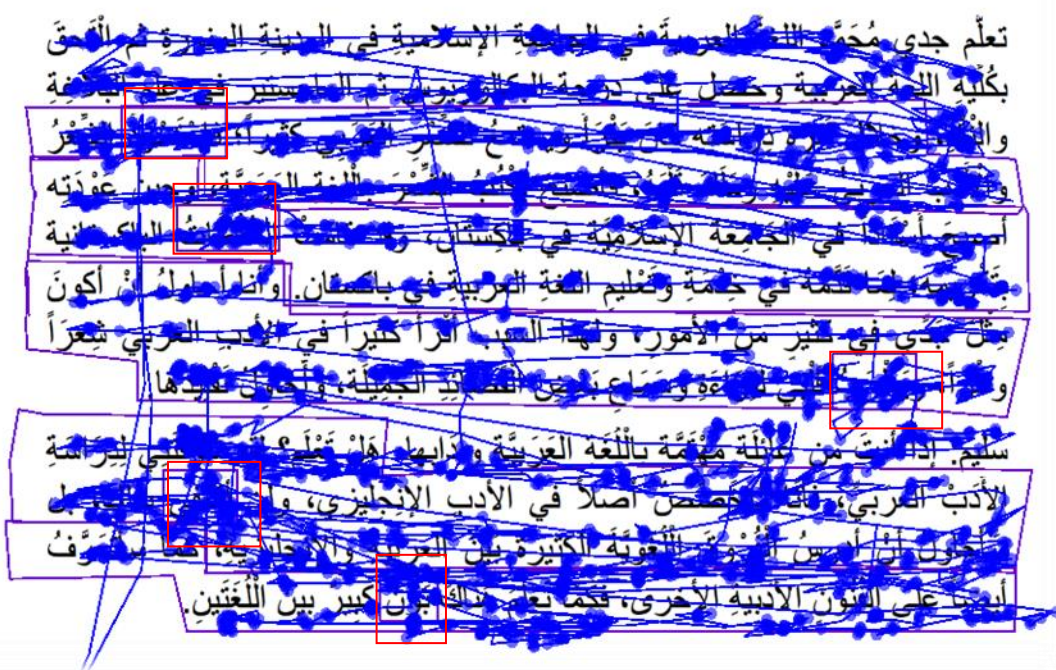


Figure 21. Fixation and sample visibility (target words in red squares)

The total number of comments regarding this strategy is 20. The following examples of comments demonstrate how the learners/readers viewed this strategy and their explanations for it (some of the comments are linked to the target word):

- الشمع/olammio, to shine: *I spent time on this word, because it is a new word for me, so I was thinking of its meaning* (participant 2).
- المسلة/almisallah, needle: *I spent time on it, because it is a new word for me, and I didn't get the meaning, but I recognised later that I knew another word with the same meaning (البيرة).* (participant 5)
- يباريز/ubarizo/, to fence: *I focused on it, trying to figure out the meaning.* (participant 3)
- يتسول/uatasawwal/, to beg: *I spent time to figure out the meaning* (participant 2).
- *I spent time here because I wanted to get the meaning of this new word, I was thinking of its meaning.* (participant 5)
- *I stopped on this word because I thought that I had met it before, but I had forgotten its meaning.* (participant 4)
- *This sentence was a bit complicated so I tried to figure out the meaning in different ways, so I spent time to get the meaning* (participant 2).

The comments reported above reveal that some learners initially stopped on the unknown target words to assure themselves that these words are new to them, and that they cannot attain their meaning via normal reading and shallow processing, which led them to engage in deeper processing, as is apparent from the following comments. Others mentioned that they thought they had encountered the target word before, but had forgotten its meaning, so they began to employ additional strategies that might enable them to identify the correct meaning. The following comments reflect other reasons behind the time spent on the unknown word:

- *I spent time on the words that I like. (participant 3)*
- *I spent time on this word (يطرب/yatrabo/ be enraptured) because I was interested in this word so I liked it and its sound. (participant 4)*
- *I spend time on words that I don't know, like (سرج/sarj, 'saddle'), because it is similar in sound to (سياج/ seyaj, fence) I get confused between them. (participant 1)*
- *مسلة/misallah, needle: I stopped here for sometimes because it's a new word for me, so I tried to connect it to words that are similar in Sound Form, but I couldn't get the meaning. (participant 4)*
- *Sometimes I stop on some words to understand their meaning and to find connections between the sentences. (participant 5)*
- *المفاوضات/almofawadh.at, negotiations: I spent time here, because I wanted to put it on a similar morphological scale in Arabic (participant 2).*

From the comments narrated above concerning the first step (*noticing and spending time on the unknown words*) and determining and discovering meaning of the target words, the participants provided some specific factors that motivated them to spend time on unknown words. For example, they reported becoming interested in some of the target words, or they like the sound form of the words; accordingly they spent more time on these words. As a result, this step towards processing vocabulary knowledge was called (in the current study) *noticing and spending time on the unknown and interesting words*. Another reported factor that causes learners to spend time on unknown words is confusion arising due to close similarities in the sound of the target word and other words in the text, as reported by participants 1 and 4. This factor in particular requires participants to draw on another deeper processing strategy from the consolidation-memory group, one *connecting a word to another that is similar in sound*. Spending time on unknown words could also relate to creating and finding connections between sentences and paragraphs, as reported by participant 5. This suggests learners focus

on a specific target word, while thinking about something else, i.e., the overall meaning of the sentences, or the connections between them. This behaviour has been classified as a “matter of covert attention” (McIntyre, 2016, p. 292), which means a change of mental focus occurs without shifting the eye from a specific point. This might arise when a learner is thinking and preparing to use an appropriate strategy to negotiate the target words they focussed on. Participant 2 for example, justified his behaviour in focussing on the target word *المفاوضات/almofawadhat*, ‘negotiations’, by explaining that he was trying to place the word on a similar morphological scale in Arabic but could not find the morpheme he was looking for. From this source strategy, we can identify that the reader in the context of incidental learning initially determines new words for him by noticing and focussing on them, and then starts the process of discovering a words’ meaning by employing other strategies:

- 2) *Analyse word’s part of speech*
- 3) *Finding out is it plural or single*
- 4) *Focusing on the words’ short vowels (أَلْحَرَكَاتُ, hāarakat)*

Other strategies utilised to determine and discover the meaning of new words involve: *analyse its part of speech*, and *finding out is it plural or single*. These two strategies were reported by participant 1, as expressed below:

- *I tried also to analyse its part of speech, is it noun or adjective. (participant 1)*
- *السلطات/assulūtat, authorities: I return back to try to figure the meaning, and I use my experience of the plural and the single of the word (سُلْطَة). (participant 1)*

These two strategies related to word features analysis, in which the learner utilises identifying and finding the meaning of new words from inside the word itself. Among the features analysis strategies of those words, one specified Arabic language strategy involved *focusing on the words’ short vowels (أَلْحَرَكَاتُ, hāarakat)*. Short vowels, or *hāarakat* in Arabic are

signs or dots written above or below the consonant they follow (see subsection 2.3.1 for more details). This tactic was mentioned in four comments from three participants:

- *I tried to focus on the short vowels (أَلْحَرَكَاتُ, hāarakat).* (participant 3)
- *I focussed on the short vowels in the Arabic language* (participant 4)
- *I noticed that there were some mistakes in the short vowels (الحركات), therefore I spent time on them, because changes in short vowels can affect the word's meaning and grammar in Arabic.* (participant 5)
- *I spent time on some words because I found some mistakes in the short vowels, and I thought I might be asked about these.* (participant 4)

The strategy of focussing on short vowels is a specific Arabic language strategy, since short vowels play a significant role in determining the meaning of some Arabic words. Thus, three of the advanced learners in the current study were aware of this feature, and had identified that some short vowels were not in their correct positions. These mistakes were due to typographical errors, and the researcher did not deliberately create them in order to examine learners' knowledge of this tactic. However, it is interesting that the unintentional mistakes in the short vowels attracted learners' attention, prompting them to employ this strategy to analyse the features of words.

5) *Associate word with its root (derivation)*

The fifth strategy, identified under the category of discovering and meaning determination strategies is *associate word with its root (derivation)*. This strategy was reported 10 times by four participants, the following examples explain how the learners employ this strategy:

- *السلطات/assulūtat, authorities: when I don't know the word, I go back to its three letter root /سلط/slt.* (participant 1)

- أتعاب/atcāb/remuneration: I return immediately to its root, the three letters تَعَب/tab/. (participant 1)
- اكتفي/ectafa/ to be content oneself with: *I tried here to find the root, so I went back to it a couple of times.* (participant 3)
- خلّاط /khllāt/ mixer: *I looked at its root, but the sentences provided more explanation so I got the exact meaning from the context.* (participant 5)
- قطاع/qitac/ section: *I know the meaning of the root of this word قطع/qtc, it means a piece of something, then I knew its abstract meaning from the context, it has something to do with the work, so I thought it might mean a section, division, or part of the work* (participant 1)
- يطرّب/yatrabo/ be enraptured: *I spent time here because I connected the word to its root طرب/trb/, then I got the meaning.* (participant 5)
- يتسول/yataswl/ to beg: *I spent time on this word, I connected it to its root (the three letters /sal/), and this is the beauty of Arabic language, because lots of Arabic words are related to only three letters (root).* (participant 5)

Word roots are the basic building blocks of words. In many languages, particularly Arabic, every word can be broken down into its constituent parts. The majority of words in Arabic are built up from roots, and each word contains three or four consonants letters (roots). These roots convey a specific meaning, and when multiple parts are combined to build a word, we then derive a new word with a new meaning. As we can see from the comments above, examining the words' roots as a strategy possess helps the learners discover the meaning of new Arabic words, and to recall them in vocabulary tests. Almost all the participants in the current experiment referred directly to the strategy of associating words with their root, to deduce their meaning, as was the case with participant 1: "I return immediately to its root, the three letters تَعَب/tab". Some learners give more processing details to explain (how) they employ

this strategy. For example, participants 5 and 1 mentioned that they first refer to the roots of unknown words to ascertain their meaning, and then work out the exact meaning from the context. For instance, participant 5 annotates the word خلّاط /khllāt/ ‘mixer’, he first identifies its root /kh.lṭ/, then relies on the meaning of the rest of the sentence to infer the exact meaning from the context.

It seems that the strategy of associating a word with its root, requires some previous knowledge of the root itself, and its meaning; evidently, learners vary in their ability to determine the exact root of each word. Participant 2 for example, indicates that he could not find the right root for the target word استبدادية /estibdadyah/ ‘authoritarianism’, because it consists of five syllables as expressed below:

- استبدادية /es'tib'da'dy'yah/ ‘authoritarianism’: *I focused on this word, then I tried to return it to the three letters بدأ/badaā/, however, it was difficult to me to get the right root for this long word, so I couldn't get the meaning (participant 2)*

Some reports that the participants associated the word with its root, reflected the fact that advanced learners are aware of this tactic when learning ASL. They justified the significance and benefits of referring to a word's root when learning the Arabic language, reflecting the true significance of words' roots.

6) *Using the morphological scale of the word*

Among the strategies reportedly used for discovering and determining words' meanings is reference to the *morphological scale of the word*. This strategy was reported seven times by three of the participants in the current experiment. At first glance, this strategy might seem to relate to the previous one regarding referring to the word's roots. However, the comments expressed by L2 learners regarding the *use of words' morphological scale*, show this strategy is associated with specific words or parts of speech (verb or noun), as well as requiring prior knowledge of different scales or patterns and their semantic affiliation in the target language.

- مقلاة/miqlah/ pan: *I know from its morphological scale that it's the name of a piece of equipment or a machine, then I connected this to the word cooking, so I thought its meaning is a spoon, because it's the nearest meaning and related to cooking.* (participant 1)
- المفاوضات/almofāwadhat/ 'negotiations': *I remember that I spent time here, because I wanted to put it on a similar morphological scale in Arabic (mūfā'wdhat: equals mūfāclat).* (participant 2)
- تسوّل/tasawwala, to beg: *I connected it to a synonym and a similar word (سؤال/question), then I connected it to the morphological scale (تفعل/Tafa'ccala) which derives from a similar word.* (participant 1)
- منظار/minzār/ binoculars: *this word is on the morphological sale for the name or scale of machine in Arabic (وزن ومُفعال/scale of mif'cal).* (participant 4)
- رافعة/rafiah/ jack/lifter: *I tried to connect it to the morphological scale but I couldn't get the meaning, so I connected it to the context, I tried also to analyse its part of speech; i.e., is it a noun or an adjective.* (participant 1)

Based on the comments narrated above, the strategy, the *use of morphological scale*, refers to the knowledge of words' scales/patterns and their semantic meanings in the target language. Advanced learners in the present study exhibited knowledge of Arabic words' morphological scale and the capacity of different semantic meanings to determine a word's general meaning. Then to find the exact meaning of the word, they employ other useful strategies relating to the components of the word (*word part analysis*) and the words around it (*use the context clues*). The comments also reflect that this strategy is an advanced strategy demanding previous knowledge of the morphological *scale* itself; thus, it involves deeper processing than that which is possible from merely connecting the word to its root. Words in Arabic, whether verbs or nouns, have different morphological scales, and each scale/pattern

determines the exclusive category of words meaning. Accordingly, the participants demonstrated their familiarity with the clues present in different morphological scales. For example, scales of equipment or machine include *مُفْعَال* /*scale of mif'cāl*/ for the target word *منظار/minzār/ mif'cāl* 'binocular', and scale of *مِفْلَاة* /*miflāh*/ for the target word *مِقْلَاة* /*miqlāh/miflāh*/ 'pan'. Another example includes the morphological scale *تَفَعَّل* /*Tafaccala*/, which indicates the general meaning of exaggeration for the target word *تَسَوَّل* /*Tasawwala*/, meaning to beg for money in an exaggerated way. Having knowledge of the general meaning of each morphological scale in Arabic assists learners in determining a word's meaning, and allows for in-depth processing, by transferring that knowledge from the general to the specific meaning of the target word.

7) ***Connect the word to another that is similar in sound-form***

This strategy received two comments from two participants. According to Schmitt's (1997) VLS taxonomy, studying a word's sound has been classified under the consolidation-memory strategy group, and is useful once a word has been encountered. However, participants in incidental learning seem to employ this tactic to discover the meaning of novel words by analysing their sound-form and connecting it to similar word's sound-forms, already stored in their memories. The following comments explain how learners analysed new words' sound-forms to establish their meaning:

- *مسلة/misallah/ needle: I stopped here for some time because it's a new word for me, so I tried to connect it to some words that are similar in sound-form, but I couldn't get the meaning. (participant 4)*
- *I spend time on words that I don't know, like *سرج/sarj*, saddle, because it is similar in sound to *سياج/seyaj*, fence, I got confused between them. (participant 1)*

Both comments show that after noticing and spending time on the unknown words learners try to employ and analyse target word's phonological-form by connecting them to

similar words already known to them, to assist them to guess at their meaning. However, they are not necessarily successful at obtaining the meanings of words in this way, since the L2 words they referred to have completely different meanings that do not relate to the context.

Noticeably, all the strategies previously used for discovering and determining words' meaning (ranging from noticing and focussing on the new form of the target words, to analysing different word features including part of speech, short vowels, finding out if it is singular or plural, phonological form, and analysing roots and morphological scales) share something in common, in that they all related to internal features of the target word. Such strategies seem to be most effective as mechanisms to deduce a word's meaning when combined with other tactics, such as utilising context clues or relying on previous knowledge.

8) *Guess from the textual context*

The last strategy under this category, *guess from textual context*, is a favourite strategy for all participants in the present incidental study. It received the highest number of comments (38) relative to the other strategies reported. The guessing strategy seems to overlap with other strategies; as apparent from the previously reported comments, learners refer to guessing from textual context when they are unable to identify the meaning of the target words from inside the word itself (e.g., through analysing words part of speech, short vowels, finding out if it is singular or plural, and analysing roots and morphological scales). The following comments helped to express how learners process and employ the guessing strategy when they cannot ascertain meaning by using strategies from inside the target word itself:

- *I focused on the word that I don't know, then I look at the words before and after to guess the meaning from the context and from the synonyms. (participant 1)*
- استحوذ/*estahwatha*/ 'to take one's entire attention': *I stopped here because I couldn't follow the meaning of it, but I understand the sentence means that he used to listen to*

Arabic poems a lot, so he loves the poems. This helped me to figure out the word, so I returned to try to guess the meaning of the target word. (participant 2)

- *رافعة/rāfi'ah/ jack/lifter: I tried to connect this to the morphological scale but I couldn't get the meaning, so I connected it to the context. (participant 1)*
- *أنتشِف/ātagashafū/ become abstinent: I tried to figure out the meaning, so I spent time on this word. (participant 2)*
- *I tried to understand what is going on here, so I used and returned to the context many times to figure out the correct meaning. I kept using the context so I could get it right. It's all related to this word. So, I kept returning back to get the connection. (participant 1)*
- *يلوح/ūlawihū/ to wave: I got the meaning from the context. (participant 4)*

From the comments reported, it seems that learners refer to the context when they cannot understand the meaning of the new word from the features of the word itself. Thus, they seek out clues from the context surrounding the target word. Moreover, learners reported employing guessing-strategy alongside other strategies to check they have the correct meaning of target words as explained in the following comments.

- *تسؤل/tasawwala, to beg: I feel that I know the word, but I got the correct meaning from the context. (participant 3)*
- *خلّاط/khllāt/ mixer: I looked at its root, but the sentences provided more explanation so I got the exact meaning from the context. (participant 5)*
- *يسرح/yasrah/ to daydream: I connected this word to a similar abstract word in the Qur'an, and the context helped me work out the meaning. (participant 1)*
- *I returned to this word to get its proper meaning from the context. (participant 5)*
- *قريحة/Qariyah/ talent: I connected this word with another from the context (the word جَدِّي/my grandfather (قريحة جدي/the talent of my grandfather). (participant 4)*

- أُنْعَاب/at'cāb/remuneration: *I returned immediately to its root, the three letters اُنْعَب't'cb/ then I guessed the correct meaning from the context.* (participant 1)
- حافر /hafer/hoof: *I thought it may be related to hoof of the horse, so I connected this word with others from the context to work it out.* (participant 4)

Some comments reported regarding the words' roots, and morphological scales' analysis, demonstrated that L2 learners can also obtain clues about meaning from a word's root and morphological scales, although not necessarily consistently (Schmitt, 1997). The comments also revealed that the word-guessing process also involves activating prior roots knowledge and morphological scales, and hence could help to reinforce prior knowledge of word forms and features.

Moreover, some participants commented on the diversity and interest in context in terms of inferring the correct meaning.

- قفص /qafas/, cage: *I didn't spend much time here, because I got the meaning from the context. The context is very good, he can't travel, can't do anything, so he must be in a cage.* (participant 1)
- *I was very interested to know the rest of the story, and that helped me a lot - to learn the story and the meaning of the words.* (participant 3)
- يا'تاقل/ya'taqel/ to arrest: *I spent time on this word because it's the first time I had encountered this word, then I connected it to the nearest words such as (القاضي /the Judge, رجل الشرطة the police officer, and مدير الشركة the director of the company).* (participant 1)

It seems that when context matching the levels of the students/readers, helps them to correctly guess the meaning of the new words. The guessing strategy for participant 1, for instance, seems to be supported by his previous knowledge of the surrounding words, this previous knowledge narrowed down the possible meaning of the words.

Evidently the learners initially employed different strategies (both internal and external to the words) to discover and determine the meaning of the target words. Thus, the researcher presented and discussed possible strategies for consolidating knowledge of a word once it has been encountered.

b. Consolidation-memory strategies

1) Connect word to its synonyms

Novel words can be connected to other L2 words already known to learners. Utilising existing knowledge of words typically requires some sense of the relationship between words (Schmitt, 1997), as with synonyms and antonyms. The strategy of *connecting word to its synonyms* was reportedly used seven times by three participants; the following comments explain how learners used this strategy:

- *قريحة Qariyah/ talent: I spent time on this word, trying to connect it with its synonym, which came after it (موهبة/mauhibah/talent), and I tried to examine and use the synonym in the context to see if it works well and delivers the same meaning. (participant 4)*
- *The word came after the target word (استغنييت/estagh.nayto) and explained the meaning of (أتقشف/atagashafū). (participant 5)*
- *تسؤل/tasawwal, to beg: I connected it to a synonym and a similar word (سؤال/sū'al to question). (participant 1)*
- *أتقشف/atagashafū/ become an abstinent: I focused on this word and I got the meaning from the context and I connected it to its synonym (استغنييت/estagh.nayto). (participant 4)*

The strategy of connecting the target word to its synonym seemed to assist advanced L2 learners, by enabling them to recall target words when taking the unannounced vocabulary test. These sense relationships affect the meaning relationship between new words and previous known words, and usually help consolidate and retrieve lexical items, as apparent from previous experiments.

Some participants' comments reveal some awareness of the benefits of associating target words with their synonyms, because drawing on a synonym can help to explain the meaning of the target word. As explained in the following comment:

- *This is also a beauty of the writing, that the writer provides some synonyms to explain the unknown words.* (participant 5)

2) Connect word to a personal experience and previous knowledge

New words can be also connected to unrelated words, such when they have been integrated vividly with the learner's personal experiences. Certainly, some of the target words in the present experiment were effectively integrated into learners' memories due to personal experiences and previous partial knowledge of the words. Twenty-two comments were reported from all five participants explaining the use of this strategy to acquire L2 Arabic words incidentally. Following example comments revealed how learners use this tactic to learn and remember the meaning of target words:

- *When I read this sentence, I remembered that I had tried to write a poem in Arabic, I remembered that I had visited the university and its library twice.* (participant 4)
- استبدادية/es'teb'dā'diyyah/ authoritarianism: *I spent time here, then I remembered that the same word is used for the same meaning in Urdu and Farsi as well.* (participant 5)
- شَغِيف/sho'ghi'fa/ 'to be passionately in love with': *I connected this word to my previous knowledge, particularly to a similar word in the Qur'an.* (participant 4)
- *I stopped here, because when reading the story I remembered some events and experiences similar to what I was reading.* (participant 4)
- أتعاب/at'cāb/ 'remuneration': *I connected this word to my previous knowledge, I have met this word before, so I got its meaning from the context.* (participant 3)
- اكتفي/ectafa/ to be content oneself with: *I connected this word to my previous knowledge.* (participant 2)

- *يَطْرَب/yatrabo/ to be enraptured: I stopped here and I returned to this word because I remembered an Arabic singer, and I wrote a translation of an American song into Arabic and I used a similar word to (يَطْرَب/yatrabo/). (participant 4)*
- *يُبَارِز/ūbarizo/ to fence: I asked myself how we can use a sword in sport nowadays, and I connected the word to Arabic traditional culture. (participant 4)*
- *يَنْحَت/yanhato/ to crave: I spent time on this word because again I connected it to a verse from the Qur'an. (participant 5)*

From the comments reported above, we can identify clearly how students utilise and refer to their personal experience to help them learn and remember the meaning of target words. Some participants only mentioned connecting target words to prior knowledge, without explaining how or to what knowledge they were referring. Others provided additional details regarding the types of experiences they drew upon. For example, participant 4 explained how he referred to some specific personal and vivid experiences to learn and later recollect the meaning of target words. These reported experiences reflected the participant's knowledge of the cultural background to the Arabic language, which provided information from which to deduce the correct meaning of new words, or related words with different meanings (polysemy). Participant 4 remarked that in order to understand the exact meaning of the target word (*يُبَارِز/ūbarizo/ to fence*), he connected it to his knowledge of Arabic culture. The comments also revealed knowledge of other languages can prove useful, as was the case for participant 5 who was able to understand the target Arabic word due to his knowledge of Urdu and Farsi. Another participant understood a target word because of having access to a specific source of knowledge, in the example, the holy *Qur'an*.

Additional comments showed that L2 learners might usefully link target words to their own previous partial knowledge of the target words themselves. Some learners reported that they had integrated a new word into their existing incomplete knowledge of the word itself.

For instance, learners might connect the target word with knowledge of a word's morphological scale to narrow down the meaning of the word, drawing on existing experience or known words, as stated below.

- مقلاة/miqlāh/ pan: *I know from its morphological scale that it is the name of a piece of equipment or machine, then I connected it to the word cooking, so I thought its meaning is spoon, because it's the nearest meaning and relates to cooking. (participant 1)*
- المفاوضات/almofāwadhāt/ negotiations: *I thought in my head - what could this mean? Then I tried to connect it to some previous words that I know, then I used the morphological scale for the word (مفاضلة، مفاعلة) but I didn't get the meaning, and as I didn't need the word, I tried to merely understand the context, so I could guess at the approximate meaning of the word. (participant 1)*

The comments also emphasised that learning words involves an incremental process, consequently learners need to employ different strategies and find ways to integrate new words into many kinds of existing knowledge (e.g., personal experiences, or even previous partial knowledge of the target word itself). However, previous familiarity with the word's root or morphological scale is not always sufficiently reliable to deliver its meaning, as indicated by participant 1 above; thus, he ultimately employed a tactic from another category (*meta-cognitive strategies*).

3) Focusing on the abstract meaning

Some of the participants reported negotiating abstract and metaphorical meanings, and the researcher considers this strategy as a consolidation-memory strategy because it involves integrating and associating abstract meaning between L1 and L2, or between the concrete meaning of the target word and its abstract use in a specific context. The following comments explain how L2 learners navigate abstract and metaphorical uses of target words:

- استحوذ/*estahwatha*/ ‘to take one’s entire attention’ (state verb) *I try to translate literary but it doesn’t make sense, and it’s hard, so I need to know its abstract meaning. I try to think of something similar in English to this abstract meaning... I look for the metaphorical meaning, because abstract words and meaning is very difficult in English, so I try to find something similar or common... If the contextual structure is complex it takes time to understand it, then I was wondering if we have similar structure in English, this is also then connected to my previous knowledge.* (participant 1)
- يُقَطِّر/*uqatir*/ ‘to drop’ (action verb): *This means drop, but can be used for an abstract meaning in the text, so I thought it meant slowly give money; then I thought he pays them in instalments, although when I read the last sentence I realised that he did not give them enough.* (participant 1)
- منظار/*minzār*/ ‘binoculars’: *I spent time here because I was making sure that the word I have in my head would be the same as what was said in the context, I was asking myself, does it make sense here, but the concrete meaning does not make sense.* (participant 3)
- يَسْرَح/*yasrah*/ ‘to daydream’ (state verb): *I connected this word to a similar abstract word in the Quran, and the context helped me to figure out the meaning.* (participant 1)
- أُنْعَاب/*at’cāb*/ ‘remuneration’: *I use the direct meaning of this word (tiredness) but not the abstract or metaphorical meaning that came across in the context.* (participant 4)
- منظار/*minzār*/ ‘binoculars’: *it’s a concrete word but it comes in abstract context, so I got the abstract meaning here directly from the context, and I did not think of its concrete meaning, even though it is from the morphological scale of equipment (mifcāl) in Arabic.* (participant 1)

The above comments demonstrate that L2 learners of Arabic employed different tactics to deal with abstract words and the metaphorical use of the concrete words. Strategies include

trying to find a shared meaning linking the target language and the learner's L1 (L2 – L1 association), determining the exact meaning from the context (guess from the context), and connecting the partial knowledge of abstract words with previous knowledge. Thus, focussing on the abstract meaning of the words might be considered a memory strategy because it demands association and integrated knowledge of L2 and L1.

4) Grouping words together with a story line

From consolidation-memory strategies, the participants reported grouping words together according to context and story line. Two learners mentioned that in an attempt to comprehend the meaning of the whole sentences and paragraphs they connected words and sentences together according to the story line. The following two comments illustrate how learners use this strategy:

- *... so, I was thinking what is the link, what is going on here, I connected the word and sentences together to understand the text. (participant 3)*
- *I try to connect words and sentences together in a sequence. (participant 2)*

The strategy of using a narrative chaining (linking words together into a sentence or a story) (Oxford, 2016), seemed to help learners understand the meaning of words during incidental reading, so as to recall them more effectively in vocabulary tests.

5) Focussing on the story's characters

The learners were advised that they would be tested on their knowledge of text comprehension, and thus, three reported employing the tactic of focussing on the characters in the story to prepare for the comprehension test, so as to understand the context. The comments below explain the usefulness of this approach:

- *I focused on the story's characters to find the relationship between them, to understand the text and to answer the comprehension questions... Because I thought that I would*

get comprehension questions, so I focused on the names of the people, for example:

'who is Saleem?' and similar questions. (participant 1)

- *I returned back to this word because I wanted to remember the name of the university that he had studied in, and to remember what he does in sequence - he did this then he did that... I was trying to understand what Saleem studied with. (participant 2)*
- *I returned to this to remember the name, and make a connection between the words... Several times, I returned to this, just to remember the names of the characters in the story, and to understand the relationships between them. (participant 5)*

The strategy of remembering the story's characters to assist incidental vocabulary learning helps learners create sequences and connections between words, sentences, and paragraphs. This then improves their understanding of the overall meaning present. Understanding the context thoroughly is key to accurately guessing the meaning of target words.

6) Visualise target word and picture

Some learners, even during incidental learning, link novel words to visualisations and pictures. This strategy was reported four times by three participants. The following quotations from the interviews provide details regarding this consolidation-memory strategy:

- *When I read I pictured, I visualised the people... the events, I pictured an old Pakistani uncle, I visual a lot, I do not know why I returned to the word, but I do visualise a lot, especially with stories. (participant 3)*
- *مقالة/miqlāh/ pan: I tried to work out what was been done, and to access a request, again when visualising the story it is important to know what is key, this is like an instruction. Visualising is important to me. (participant 3)*
- *Here I understand the meaning, but I was wondering and visualising whether this was true or not, and if they love Arabic too much in Pakistan or not. (participant 4)*

- *I did spend time on (الحدوة/alhadwah/ 'horse shoe') because I visualised the target word in a historical place, and engaged in a similar story in my own language that contained the target word. (participant 5)*

Based on the comments reported above, some of the participants employed visualisation in different ways, 1- to visualise specific target words alone by associating them mentally with their reference pictures and previous knowledge, such as (مقلاة/miqlāh/ 'pan', and الحدوة/alhadwah/ 'horse shoe'), or 2- to visualise all the content involving the target words, as was the case for participants 3 and 4. Activating the imagery in this way can serve to activate a complete representation, which in turn supports learners to better understand, store and retrieve the target word at a later stage.

c. Consolidation-cognitive strategies

1) Reading repeatedly

Repetition is generally considered a cognitive strategy, since it is not focused explicitly on “manipulative mental processing” as is the case with memory based strategies (Schmitt, 1997). The strategy of *repeatedly reading a text many times or verbal repetition* is one of the most commonly reported strategies in vocabulary learning, this was the case in the current study regarding incidental vocabulary learning. It was reported 29 times by all participants. As previously mentioned, the display on the eye-tracking video revealed this, prompting the participants to give additional information about their experience of reading repeatedly, answering the question: *why do you return to read the whole passage?* Hence, the researcher has divided the participants' comments regarding reading repeatedly as a tactic into three groups based on the reasons reported for using the strategy. The first group of comments concerned reading repeatedly to better understand a word's meaning through finding and creating links between targets words or between paragraphs, as revealed in the following comments:

- *I repeatedly read a word to understand the meaning better, reading is easy, but I repeat the process to gain more understanding... I return to check understanding one more time, and to focus on the words that I don't know or realise I don't know, to work out what has been said... that's why I returned again, to understand the whole passage, because the bit at the end clarified the earlier part. (participant 1)*
- *Sometimes I repeat my reading from the beginning to refocus or understand... Again, I return when I have more information and it is easier to work it out. (participant 3)*
- *From the beginning, I tried to understand... I return back many times to understand the sentence... I was trying to understand what Saleem studied ... The text is very easy and I can understand it, but maybe I want to find a link between the paragraphs (participant 2).*
- *I returned to this word because I was thinking of its meaning, I think that I read it before. (participant 4)*
- *I repeated my reading because I just wanted to keep the story in my mind... I returned to learn the name, and sometimes I just want to know that I have read it, then I say to myself what I have read, and read it again, just to focus on the story. (participant 5)*
- *I return many times to find out, what is going on here, because everything depends on this word (Masareef, 'expenses'), he (the writer) skipped from learning to a different topic, to the job, so I expended a lot of effort with this text, because I did not understand this word... Then I returned to understand the whole text because of only the one word. I felt that I had missed something. (participant 1)*
- *قريبة Qariyah/ talent: I returned just out of curiosity, to see what is going on, I recognised the word, then for some reason I linked the word grandfather to Urdu. (participant 3)*

The comments reported above show that learners use reading repeatedly to refocus their attention to assist them in better text comprehension and more effective recognition of a target words' meaning. Participant 1 for example, justified using a reading repeatedly strategy, thus: "because the bit at the end clarified the bit before". The comments also emphasised that when engaged in repeated reading learners also employ several cognitive processing strategies to assess the connections between words, sentences and even paragraphs. Example of such strategic processing include linking words they do not know or have partial knowledge of with others that they recognise, or controlling the similarities/differences between words that are similar in sound-form. As clarified by the following two comments made by participant 3, in response to the researcher's question: *why do you return back to this specific point?:*

- *Sometimes when you find a word that you recognise, this is a bit deeper I guess, if you're reading something more complicated, then you generally go back to the part you recognise to get a bit of confidence, or a connection that makes sense, so you can carry on and make sure that you haven't lost track. You can go back to the beginning where you started; for example, here is a full stop so you returned to something connected to you to make you refocus... This is easier for me to understand as I was trying to link it to other stuff that I had missed or skipped, I just wanted to look at the overall picture, I'm following I'm following, I don't want to lose focus. (participant 3)*
- *ياحيك/yahiku/ 'to knit': I remembered doing that actually, because I remembered the word يلوح/ūlawihu/ 'to wave'. I did understand it, then I said let me start again I'm losing focus, then I returned to the beginning, again this was mainly to refocus, I was trying to work out so many words, thus I forgot what was going on, so I started again, then I remembered, I got it I got it... I think I returned to يلوح/ūlawihu/ because I thought that I knew this word and another word I have already read, so I stopped here*

then I returned to look, because they sound similar (يحيك/yahiku/ and يلوح/ūlawihu/).

(participant 3)

As stated in the above comments, repeated reading when learning incidental vocabulary could relate to the objective of L2 learners to manage their knowledge of new words in a way that increases their confidence and understanding.

The second group of comments related to reading repeatedly revealed another specific reason for reading something again; that is to allow participants to remember the characters in a story so that they can understand the relationships between them in preparation for future comprehension questions. This is expressed in the following comments:

- *Several times, I returned, just to get the name of the characters and to understand the relationships between them... I returned to the names, and made a connection between them.* (participant 5)
- *I focused on the story's characters to find the relationship between them to understand the text, and to answer the comprehension questions... I read the paragraph again to answer the comprehension questions.* (participant 1)

The third group of comments related to reading repeatedly specify another reason for applying this strategy, which is to compare structures between L1 and L2. As verified in the following explanations:

- *I returned because I was comparing this structure in Arabic and English, and the use of punctuations marks.* (participant 4)
- *هل تعلم? /hal/ ta'lam/ 'do you know?', I returned to this construction because I like the style, and I liked the word (شوقتي/shawwqtani/ 'you fill me with desire/interest... to know what is going on'. (participant 3)*

These reported comments show that advanced L2 learners might strengthen their knowledge of the target language by not only focusing on novel words but also by comparing the structures between their L1 and L2.

2) *L2 – L1 translation*

Translation from L2 into L1 is a common cognitive strategy when learning L2 vocabulary in many languages, because it supports ‘mechanical practice’ (Schmitt, 1997). The following comments show how participants employ *L2 – L1 translation* and the reasons behind utilising the strategy:

- *I learnt Arabic with English; I always translate from Arabic into English... Everyone has his own method of learning, I always think with the head of a translator... I always rely on translation, I read Arabic then I translate it to English, I learnt Arabic by translating, if I just want to read this I can read it faster, but I need to understand it first, because of the comprehension questions. English is my first language, so I’m translating from Arabic into English, I use my translator head to learn Arabic.*

(participant 1)

- *شغف /sho’ghi’fa/ ‘to be passionately in love with’: I try to focus on the proper meaning in English, so I try to translate it to the proper meaning or terminology in English.*

(participant 2)

- *قطاع/qitāc/ ‘section’: I tried to figure out the proper terminology in English, and to link it to that sentence (participant 2).*

- *سياج /siyāj/ ‘fence’: I translated it with an erroneous meaning, with saddle for the hours, because it has a similar sound (participant 2).*

The comments above reveal that a translation strategy can be used during incidental vocabulary learning when reading. Learners’ comments also provided reasons for using L2–L1 translation, such as: using translation as the principal mode of learning, as stated by

participant 1 “*I use my translator head to learn Arabic*”. Another reported reason is that using translation assists learners in understanding the target words and text.

d. Consolidation-metacognitive strategies

1) Leave out the unknown words

This metacognitive strategy (leaving the unknown words) was reportedly used 12 times by 4 participants in current incidental vocabulary acquisition. Metacognitive strategies are useful for both learning and problem-solving (Sigelman & Rider, 2014). The comments from the participants reveal how learners use this strategy to control their acquisition of novel words while reading. The following comments reflect on the use of this strategy:

- *I don't spend time on unknown words, because I have no ideas about them in my head, like (استبدادية/es'tib'da'dy'yah/ 'authoritarianism') and (سياج/siyāj/ 'fence'), and nothing came on. (participant 1)*
- *المفاوضات/almofāwadhāt/ 'negotiations': I think in my head about what this means? Then I try to connect it to previous words that I know, then I use the morphological scale of the word (مفاعلة، مفاضلة mūfādh.lah, mūfāclah), although I didn't follow the meaning I don't need this word, so I try to merely understand the context, so I don't need to know the exact meaning of the word. (participant 1)*
- *I skipped some words because I don't know the meaning, so for the safety of the bigger picture I left out these words, or maybe because I skimmed it because I know it. (participant 3)*
- *استبدادية/es'tib'da'dy'yah/ 'authoritarianism': I did not focus on this word because it's new and too long, I'm not familiar with it, instead of looking at that, I quickly read the rest, it may be given in the context, and when I get that I return to the word that I didn't know. (participant 3)*

- السلطات/assulutat, 'authorities': *I did not follow the meaning of this word at all, so I just continued...*- بون/bawn/ 'contrast': *I couldn't get the meaning of this word, I tried but I couldn't... The word I don't know I did not spend time on it, so I continued reading* (participant 2).
- استحوذ/estahwath.a/ 'to take one's entire attention': *sometimes when I find a word that I don't know, I leave it to finish reading the story then I return to it, because when I have got more information I can grasp the meaning.* (participant 4)

The above comments revealed how learners effectively negotiate the meaning of target words (both when it is known and unknown) by employing the metacognitive tactic of leaving out the unknown words and returning to them subsequently. Different rationales were used to explain the use of this strategy; for instance, to preserve the bigger picture of textual comprehension, to access a broader understanding of the context, and choosing not to focus on getting the precise meaning of the word. Another reason for leaving out unknown words is to allow scope to attain further knowledge or clues from the context, to figure out the target words' meaning. Furthermore, some learners reported omitting unknown words when they are unfamiliar with their form and they cannot relate them to their mental lexicon. Additionally, due to the complexity of some of the target words themselves, such as استبدادية/es'tib'da'dy'yah/ 'authoritarianism', which comprises five syllables, the learners reported avoiding the word to save time and to maintain their focus on understanding and connecting the text.

Having answered the first research question with evidence from the eye-tracking experimental study, and with a full qualitative discussion of the stimulated verbal recall interviews, the researcher answers the second research question below.

5.5.2 The second research question relating to the third experiment:

RQ2: Can the duration of L2 learners' eye fixation on novel words during incidental learning predict their retention of these words in an unannounced vocabulary post-test?

Before answering the research question, an investigate for any relationship could be detected between the eye-tracking measures (i.e., first fixation duration, fixation count, and total reading time) and learning gain (i.e., score), based on each independent target word variable (i.e., word frequency, type (verb/noun) and subtypes (abstract/concrete and action/state), a Pearson correlation test was used to find any correlation between each eye-tracking measure and learners' scores for each predictor variable. The results revealed no significant relationships, except for one of negative significance between first fixation duration and score for abstract nouns as demonstrated in Table 5.42. Additional correlation tests were conducted and the results added in Appendix D due to the thesis' word limit.

Table 5.42. Pearson correlation between first fixation duration and words' subtype

Words' subtype		First Fixation Duration in ms.	
Abstract	post_test_Score	Pearson Correlation	-.360*
		Sig. (2-tailed)	.026
		N	38
Concrete	post_test_Score	Pearson Correlation	-.106
		Sig. (2-tailed)	.537
		N	36
State	post_test_Score	Pearson Correlation	.203
		Sig. (2-tailed)	.215
		N	39
Action	post_test_Score	Pearson Correlation	-.291
		Sig. (2-tailed)	.085
		N	36

*. Correlation is significant at the 0.05 level (2-tailed).

The negative correlation between first fixation duration and the results for abstract nouns, might highlight a particular difficulty with this type of Arabic words. This might mean that the more time learners spend focusing on these words, the more confused they become, and the more likely their concentration is to wane. This relationship might also explain why

learners spent less time during the first fixation duration when encountering this type of target words relative to other types as shown in Table 5.43, since they realised that focusing on such difficult new words might hinder their learning of others. We cannot get a clearer explanation of this without considering the results from the stimulated verbal recall interviews.

Table 5.43. Mean processing times (in ms, with standard deviations in parentheses) per word subtype

<i>Fixation time measure</i>	<i>Abstract-N</i>	<i>Concrete-N</i>	<i>State-V</i>	<i>Action-V</i>
First fixation duration	296 (143.89)	312.56 (284.02)	345.85 (184.55)	347.61 (223.99)
Number of fixation	5.15 (3.89)	4.55 (3.60)	4.58(2.94)	4.9 (3.48)
Total time	118270.6 (37813.06)	114292.15 (34790.41)	114010.5 (35407.79)	115221.6 (37480.61)

To answer the second research question regarding the relationship between eye-fixation times in general and learning gain (total of post-test score), a regression test was used to track the independent variable: total reading time and the dependent variable: score on the vocabulary test.

Table 5.44. Regression test between total time and vocabulary post-test scores

Effect	Estimate	Std. Error	Wald	df	Sig.	Exp(B)
Constant	.293	.533	.302	1	.583	1.340
Total time	.000	.000	.331	1	.565	1.000

As revealed in Table 5.44, the *P-value* (sig) for the regression test between total fixation time and score is $0.565 > 0.05$; therefore, at the 5% level of significance the result shows that total time has no significant effect on post-test scores. That is, the total amount of time L2 Arabic learners spent processing the target words did not affect their scores, as no statistically significant relationship was found in the results. Hence, it appears that learning gain was affected by other factors, such as the use of VLSs, which have been discussed fully when answering research question one.

5.6 Summary of the chapter

This chapter presented the evidence collected in all three experimental studies to answer the research questions posed. It also provided an analysis of data collected in the first and second studies concerning intentional and incidental vocabulary learning, and then detailed the findings of the eye-tracking study. The six questions posed in reference to the intentional and incidental experimental studies altogether aimed to identify the VLSs used by learners and to establish their frequency of use and how they influence immediate and delayed word retention in two groups of L2 Arabic learners: English and Chinese. The relationship between the number of strategies used and the uptake of vocabulary knowledge was measured by immediate and delayed post-tests. A further research question probed the relationship between frequency of strategies and acquisition of vocabulary type (noun/verb) and subtype (*abstract/concrete* nouns and *state/action* verbs).

Three sets of analyses were performed to answer the six research questions relative to the two modes of vocabulary learning. The first analysis covered research questions 1 to 4 and was divided into three parts: *Part one*: a descriptive analysis of the different types of VLSs reportedly used by both groups, with their relative success assessed by immediate and delayed post-tests. This included a quantitative analysis, which revealed the main significant effects of predictor variables (mode of learning, test time, group) on the number of strategies. *Part two*: A qualitative analysis of the most frequently used strategies, as reported by participants when answering the second question (*which strategy did you use most frequently? Why?*). This was assessed relative to *mode, group, test time*, as well as in terms of the presence/absence of context. *Part three*: A descriptive qualitative analysis performed to reveal the differences, frequencies, and recall means for strategies reportedly used by each L2 group under different incidental conditions in isolation and in context (evaluated with an immediate and delayed words retention tests). The results for both groups revealed the *number of strategies* reported

in the isolated words test condition was much higher compare than in the context condition in immediate and delayed post-tests.

Analysis two covered RQ 5, the relationship between the *number of strategies* used and uptake of vocabulary in post and delayed post-test tasks, and the differences between learner groups (quantitative analysis). Mixed effect models were run on the data to assess the impact from the dependent variable and fixed and random factors. The results showed that in the immediate vocabulary test, *number of strategies* had a significant effect on vocabulary acquisition, and there was also a three-way interaction between *learning mode*, *group* and *number of strategies*, meaning the scores for each group were affected by the number of different strategies reported in the immediate post-tests. In the delayed post-test, the results showed a main effect from *number of strategies* used in delayed post-tests, and a three-way interaction between *number of strategies*, *mode*, and *group* (Chinese/English), which was caused by the English learners using more strategies in the intentional learning mode than the Chinese group, whereas the reverse was the case in incidental learning mode.

Analysis three referred to RQ 6, the effectiveness of strategies for the acquisition of different types of vocabulary (*concrete/abstract nouns*, *action/state verbs*). This analysis was threefold. *Part one*: A quantitative analysis of the frequency of strategies and uptake of nouns in a post-test and delayed post-test. *Part two*: A quantitative analysis of the frequency of strategies and uptake of verbs in a post-test and delayed post-test. *Part three*: A qualitative analysis of the different types of strategies used for nouns and verbs revealed almost all L2 learners treated the word types (noun/verb) equally in terms of strategy use.

The third experimental study used the eye-tracking technique to acquire more details about the qualitative aspects of strategy use. It included data collected from five participants and retrospective questions about the employed strategies in stimulated verbal recall interviews. Two analyses were conducted; the first to considered RQ1 and aimed to explore

the cognitive processing strategies that participants engage with during incidental vocabulary learning through reading, to identify potential reasons for strategy choice. The results revealed the participants used different types of strategies to learn new Arabic words incidentally through reading. A further qualitative analysis of the data revealed that the strategies reported fit into the four main categories proposed in Schmitt's (1997) taxonomy of VLSs. Namely, discovery and meaning determination strategies, memory strategies, cognitive strategies, and metacognitive strategies. The second aim of the eye-tracking study was to establish the relationship between learners' eye fixation on novel words and their retention of the words in an unannounced vocabulary post-test. Ultimately, no significant relationship was found.

6 Discussion

6.1 Overview

Three experimental studies produced four main outcomes detailing the consequences of the use of VLSs on intentional and incidental vocabulary learning. Discussions about these principal findings are organised in this chapter according to the previous results chapters, which were ordered according to the research questions posed in the study.

First: The discussion will centre on how learning modes and task design shape self-selected VLS use in general, as used by L2 learners in the contexts of intentional and incidental vocabulary learning. Accordingly, a list of VLSs will be identified, and then systematically classified into four categories. The researcher will then consider the main significant effects and interactions arising from the predictor variables: group (English/Chinese), mode of learning (intentional/incidental), and test time (immediate/delayed) on the number of strategies used. The qualitative data produced in the stimulated verbal recall interviews will further demonstrate different ways of implementing VLS and understanding learners' cognitive processing strategies when learning vocabulary incidentally through reading. Subsequently, the discussion concerning the identified VLSs will be followed by two subsections concerning: (1) diversity in the most frequent strategies (MFS) (core strategies) reportedly used by each group, as the MFS can be used to recall target words immediately, and word retention after one-week, tested according to both modes of learning. Additionally, (2) the results for recalling word knowledge from context in the incidental learning mode (in which words that appeared in and are tested in short sentences taken from the original text), which were better in comparison to recalling word knowledge under isolation conditions for both groups of L2 learners.

Second: Significant relationship between the number of strategies used and uptake of vocabulary in post and delayed post-test tasks; in addition, a significant three-way interaction was revealed between *learning mode*, *group* and *number of strategies*.

Third: There is a significant relationship between VLSs and the acquisition of vocabulary type (noun/verb) and subtype (concrete/abstract noun, and action/state verb). Interestingly, a discussion of the differences between the acquisition of the two target words' types (noun/verb) and their subtypes will be addressed in conjunction with the effect of the predictor variables on the number of strategies, group, mode, and words' subtype (*concrete/abstract* and *action/state*). This assesses the outcome variable post-test and delayed scores.

Fourth: A discussion of the relationship between eye-tracking fixation time measures and the learning gains for differing vocabulary types.

6.2 The classification of the identified VLSs in both modes of learning

Comparing self-selected VLSs in the intentional mode of learning to VLSs reportedly used in incidental mode, we can identify that type, and number of VLSs were influenced by learning mode and the design of vocabulary learning tasks. The intentional learning experiment was designed to identify the VLSs self-selected by L2 learners to learn target Arabic words intentionally by viewing word–picture pairs for concrete nouns and action verbs and establishing the meanings of abstract nouns and state verbs. Meanwhile the incidental mode of learning was designed to identify the VLSs used to learn vocabulary incidentally through reading. Consequently, some VLSs were only used in intentional vocabulary learning and not in incidental learning mode and vice versa. Considering the types of all the VLSs reportedly used in all three experimental studies (i.e., intentional/incidental vocabulary learning, and eye-tracking), and in view of Schmitt's (1997) taxonomy of VLS, the VLSs fit into four main categories. The first category includes strategies focused on discovery and meaning

determination. The other three categories are linked to strategies for consolidating a word once it has been encountered, including memory strategies, cognitive strategies, and metacognitive strategies. Thus, Table 6.1 below presents the VLSs generally identified under these categories, irrespective of group and test time, with indication given to the mode of learning the strategy was used in, and specifically whether it was intentional, incidental, or both?

Table 6.1. Categories of identified VLSs in different mode of learning

Category	VLS	Mode of learning that VLS used in
Discovery and meaning determination strategies	Analyse part of speech	Incidental
	Connect word to another that is similar in sound-form	Incidental
	Finding out if it is plural or single	Incidental
	Focus on short vowels (الحَرَكَات, hāarakat)	Incidental
	Reading for general understanding	Incidental
	Associate word with its root (derivation)	Both
	Use words' morphological scale	Both
	Noticing and spending time on the unknown and interesting words	Both
	Guess from textual context	Both
Consolidation-Memory strategies	L2 word–picture association	Intentional
	L2–L1 association	Intentional
	Focus on presentation order	Intentional
	Using physical action when learning a word	Intentional
	Keyword method	Intentional
	Focusing on the abstract meaning	Incidental
	Focusing on the story characters	Incidental
	Remembering the story line	Incidental

	Paraphrase the word's meaning	Incidental
	Learn words as collocations	Incidental
	Associate words spoken forms with meaning	Both
	Connect the word to its synonyms and antonyms	Both
	Connect word to personal experience and previous knowledge	Both
	Use new words in sentences	Both
	Visualise target word and picture	Both
Consolidation-Cognitive strategies	Written repetition	Intentional
	Note taking	Intentional
	Rehearsal (verbal repetition)	Intentional
	Reading repetition	Incidental
	Reading for thorough understanding	Incidental
	L2-L1 translation	Both
Consolidation-Metacognitive strategies	Use spaced word practice (expanding rehearsal)	Both
	Self-generate target words	Intentional
	Leave unknown words	Incidental

Table 6.1 presented the first major findings of this study, in which thirty-three VLSs were employed by learners of Arabic as a second language (ASL) to acquire vocabulary in two different modes of learning, both intentionally and incidentally. The VLSs identified in all three experimental studies were chosen based on the task design for each mode of learning. Accordingly, only nine specific strategies were reportedly used when learning vocabulary intentionally, for example, L2 word-picture association, focus on presentation order, using physical action when learning a word, written repetition, rehearsal (verbal repetition), and the keyword method. Moreover, only thirteen strategies were reportedly used to learn vocabulary incidentally through reading, examples of these strategies include: analysing the part of speech,

reading for general understanding, remembering the storyline, paraphrasing the word's meaning, and leaving out unknown words. Additionally, there were eleven VLSs used in both modes of vocabulary learning; including associate word with its root (derivation), use the word's morphological scale, guess from textual context, connect word to personal experience and previous knowledge, and use knew words in sentences. This finding correlates with previous findings that efficient learners use numerous strategies, rather than depending on just one (Ahmed, 1989; Gu & Johnson, 1996; Hulstijn, 1993) and they choose strategies according to the nature of the task (Bogaards, 1998; Yang, 2017). One interesting finding here is that the VLSs reportedly used in both modes of vocabulary learning reflect the significance of these types of strategies, since they work for both modes of learning. Accordingly, we can infer that this finding signifies which type of VLSs can be chosen, enhanced, and focussed on by both learners and teachers to facilitate vocabulary learning in a specific timeframe, in a particular mode of learning.

In the results chapter, a qualitative analysis of frequency and the recall means of the VLSs reported by both groups, in both modes of learning (incidental/intentional) has been presented to show the differences between groups and modes in terms of VLSs. Thus, in this section, a discussion will be conducted concerning some key VLSs that result in better recall means, and those VLSs reportedly used in both learning modes.

A. Discovery and meaning determination strategies

Nine strategies were reportedly used that fit this category. Five of these were implemented merely to discover the meaning of the target words learned incidentally through reading, these involved analysis of part of speech, connecting words that are similar in sound-form, focusing on short vowels in target Arabic words, finding out if it is plural or singular, (these four strategies were identified by means of eye-tracking), and reading for general understanding. The remaining four VLSs were employed in both intentional and incidental

modes of vocabulary learning. These strategies were associate the word with its Arabic root, use the word's morphological scale, spending time on unknown and interesting words, and guessing from textual context. This finding indicates that the majority of discovery and meaning determination strategies are incidental mode related strategies. One explanation of this, could relate to the nature of the incidental mode itself and the task design, as this informs how ASL learners employ additional strategies (from inside and outside the words) to discover the meaning of any new words encountered. While in the intentional mode, learners are provided with the meaning of novel words, and then later need to employ additional consolidation strategies (Barcroft, 2009), as discussed elsewhere in reference to the other categories.

Considering the nature of the discovery and meaning determination strategies mentioned above, VLSs relate to source strategies used to gain access to new ASL words and to accrue more information about a word's meaning. Based on the type of VLSs reported to discover meanings, different aspects of word knowledge were explored, involving knowledge from inside the words themselves (e.g., analyse part of speech, connect word to another that is similar in sound-form, focus on short vowels, associate word with its root (derivation), and use word's morphological scale). Source based strategies also involve discovering knowledge about target words from outside the words and from the context in which novel words occur (Nation, 2013). Another source strategy revealed involves noticing and focussing on target words in order to initially analyse the word and plan for appropriate strategies as the next step. This was explained by learners in the stimulated verbal recall interviews (see comments about this strategy in Subsection 5.5.1.2 for more details). This strategy in particular, is akin to a similar tactic discovered in Yang's (2017) study; in that case, English learners of Chinese reported used this strategy to choose words based on their beliefs regarding the general usefulness and relevance of other words; hence, they employ suitable strategies to learn them.

Due to the implementation of the eye-tracking technique for incidental vocabulary learning, qualitative data for stimulated verbal recall successfully yields a valuable explanation and justification of the strategies behind incidental vocabulary acquisition. The motivations behind strategy use in the incidental learning mode were discussed in the results chapter; here I am going to summarise and refer to some reasons for strategy use to compare this study's findings to those in literature. Fortunately, eight of the VLSs reported under the first category (discovery and meaning determination strategies) were used during the stimulated verbal recall interviews in incidental learning (see Table 5.41). Considering their motivations when using the source strategy of noticing and spending time on unknown words first, the participants specified key factors that inform their use of this strategy, including interest in some target words or their sound-form, and being confused about the close similarities in sound-form that arise between the target words and other words from the text, or from their previous knowledge, as reported by participants 1 and 4 in relation to stimulated verbal recall. This factor in particular led participants to use an additional in depth analysis strategy, i.e., *connecting a word to another that is similar in sound-form* to deduce its meaning. This finding supported Yang's (2017) assertion that some of his participants reported using their knowledge of spoken Chinese to infer the sound and meaning of new characters in written form. Another consideration reported in reference to spending time on new words is to think and plan about how to use an appropriate strategy to manage the target words they focussed on, as clarified by participants 2 and 5 in the stimulated verbal recall (see Subsection 5.5.1.2 for details and examples).

The findings of this study are representative of expectations in the context of incidental learning, where chief vocabulary gains arise as a by-product of the activity of reading, as the reader has not been intentionally directed to learn a specific set of target vocabulary (Hulstijn, 2003; Pellicer-Sánchez, 2016). However, as shown by online reading behaviour, and as argued by Godfroid et al. (2013) and Pellicer-Sánchez (2016), this is not to suggest that learners do

not respond to unknown items by attempting to employ different strategies to perceive their meaning. Indeed, the VLSs identified in the incidental learning mode; particularly, the source strategy of noticing and spending time on new words, confirms Schmidt's (2012) statement, and a finding by Godfroid, Boers, et al. (2013b), that vocabulary learning requires the reader to notice and direct attention towards new lexis.

In the current study, attention and the duration of the reader's focus on target words was gauged with eye-fixation measurements. The evidence presented here supports Paribakht and Wesche's (1999) claim that "vocabulary learning through reading is in some fundamental sense not 'incidental,' at least from the learner's perspective" (p. 215). Thus, based on the differences reported in VLSs use when learning vocabulary incidentally through reading, the current study demonstrates that incidental learning involves conscious processing, underlining the significance of VLS use for incidental acquisition. This finding contrasts with previous suggestions that incidental learning is not a conscious process; although many researchers claim learning strategies are typically intentional and conscious actions (e.g. Chamot, 1987; MacIntyre, 1994). However, some researchers (i.e. Oxford, 1990; Purpura, 1999) argue that much like any other skill or behaviour, the intentional use of learning strategies can be rendered 'automatic', or subconscious. Nevertheless, the latter argument was not supported by the current study, as learners' comments clarified that they engaged in conscious step by step implementations of VLSs during incidental learning.

Among the words, features and analytical strategies used in incidental vocabulary learning, one specific Arabic language strategy required *focusing on the words' short vowels* (أَلْحَرَكَاتِ, *hāarakat*). As acknowledged previously, advanced L2 Arabic learners were aware of the significance of these Arabic word features and their role in determining the meaning of some Arabic words, so that they spend time analysing the positions of short vowels. This

reflects on the importance of short vowels in reading, understanding, and gaining Arabic lexical items, as indicated by Abu-Rabia (1997, 2001).

The strategy of associating a word with its root was used frequently in both modes of learning (intentional/incidental), and seemed to possess the ability to help learners seeking to discover the meaning of new Arabic words, as well as recalling them in immediate and delayed vocabulary tests (see Table 5.1 for frequency and means of this strategy). The data relating to stimulated verbal recall provided more processing details concerning employment of this strategy; participants 5 and 1 primarily referred to the roots of unknown words when establishing broad meaning, and then got the exact meaning from context (see Subsection 5.5.1.2 for details). The qualitative analysis also revealed the strategy of associating a word with its root requires some previous knowledge of the root itself and its meaning; obviously learners differ in their ability to determine the exact root of each word. Participant 2, for example, reported an inability to determine the right root of the target word *استبدادية/estibdadyyah/ 'authoritarianism'*, because of the length of the word. The results also reflect that advanced learners can be aware of this tactic when learning ASL. They justify the significance and benefits of knowing a word's root in Arabic, in the way that most words in Arabic comprise of just three or four letters, and from these roots/letters they can derive many words and meanings. Asadi et al. (2017) noted that the derivative procedures and patterns of roots, as well as inflectional procedures, shape the majority of Arabic words. Therefore, expanding one's Arabic vocabulary might be facilitated significantly by mastering an understanding of a word's roots.

The strategy of using a word's morphological scale or pattern was reported in relation to vocabulary in both modes of learning; however, it was only reported once in the intentional mode, so could prove to be more an incidentally oriented mode strategy. The qualitative data revealed that advanced learners in the present study demonstrated knowledge of the Arabic

word's morphological scale and its different semantic meanings possess the ability to determine the meaning of general words. To access the exact meaning of the word, learners can employ other useful strategies from inside the word (e.g., *word part analysis*) and from outside the target word (*use the context clues*). The data also reflects that this strategy is an advanced one, requiring specialised previous knowledge of the morphological *scale* and its indicators, and involving deeper processing than if it were merely connecting the word to its root. Words in Arabic, whether verbs or nouns, have different morphological scales, and each scale/pattern determines the exclusive category of a word's meaning; accordingly, the participants demonstrated their familiarity with the indications of different morphological scales' (or meanings).

It is suggested here that having knowledge of the general meaning of each morphological scale in Arabic assists learners in two ways; for example, in terms of determining the words' meaning and in-depth processing, since they transfer the meaning of the target words from general to the specific. Using a morphological strategy has been found to support the formation of a precise mental model, and so is valuable for vocabulary retention (Liu, 2014). Knowledge and awareness of word morphology in the current study echoes the previous findings concerning how the efficient use of a word's morphological scale/pattern assists L2 learners to understand unfamiliar words and improves their ability to memorise words (Goodwin, Lipsky, & Ahn, 2012). This finding concerning successfully utilising Arabic's word morphology patterns confirms the suggestion by Boudelaa and Marslen-Wilson (2011, 2013, 2015) that the process of perceiving and identifying Arabic words is highly influenced by morphology, in that Arabic morphology provides a structural concept in the mental lexicon. Components of words can be used to facilitate vocabulary development, and relevant strategies have been identified in previous studies into learning Indo-European languages (e.g., Schmitt, 1997). Nation (2013) suggests that using this type of strategy helps

forge connections between related words, check guesses from context and strengthen form-meaning connections, as well as facilitating working out the meaning of a word, thereby promoting vocabulary learning and use. The findings from the current study show that the word-part, or morpheme-related strategies are key tactics for learning Arabic vocabulary.

Some participants reported connecting each word to another that is similar in sound-form. A qualitative analysis of students' comments about this strategy revealed that after noticing and spending time on unknown words, some learners realised they could gain insights by analysing the target word's phonological-form and connecting it to similar phonologies they had already learned. This strategy was classified as consolidation-memory strategy in Schmitt's (1997) VLS taxonomy (i.e., studying the word's sound); however, learners in the current incidental learning context used it as a source strategy to determine the meaning of target words. A similar strategy was reportedly used for the same purpose in Yang's (2017) study, the details of which are provided above.

The strategy of guessing from context seems to be more an incidentally oriented mode strategy, because it was only reported once in reference to intentional vocabulary learning. Notably, this strategy, that is external to the word, was favoured by almost all participants (in both groups) in the second experimental study (incidental vocabulary learning) and in the third experimental study (eye-tracking and incidental vocabulary learning). For example, the guessing strategy gathered the highest number of comments (38) in the third experiment when compared to the other strategies reported across all categories. Frequent use of guessing from context, can be attributed to the enormous number of unknown words that learners as Arabic majors encounter when reading or listening both inside and outside of class. A qualitative analysis conducted upon comments related to this strategy revealed that the guessing strategy somewhat overlaps with other strategies. The comments revealed that learners refer to guessing from textual context when they are unable to identify the meaning of target words from inside

the word itself (e.g., through analysing words part of speech, short vowels, finding out if its singular or plural, and analysing roots and morphological scales). Comments about this strategy clearly expressed how learners consciously process and employ guessing strategies when they are unable to deduce the meaning by using strategies internal to the target word itself. Moreover, learners reported employing guessing strategies as a tactic to support other strategies, only to insure the correct meaning of the target words expressed by some participants. For example, when considering the word خلّاط /khllāt/ ‘mixer’, participant 5 focussed initially on its root then on the sentences before and after the target word, which enabled him to obtain the exact meaning.

The qualitative analysis of the comments about guessing strategies further revealed that diversity and interest in the context itself in incidental vocabulary learning allowed learners to infer the correct meaning. This study finds that when context matches the levels of learners/readers, this assists them to correctly guess the meaning of the new words, as clarified by their comments (see more comments about the guessing strategy under Subsection 5.5.1.2). The guessing strategy, when used by participant 1, for instance, seemed to be supported by previous knowledge of the surrounding words, this previous knowledge narrowed down delivery of the new words’ meaning. This finding supports the suggestion by Waring and Takaki (2003) and Nation (2013), that in order to assist readers in incidental vocabulary learning, and to guess the meaning of new words properly, context should be rich, interesting and suited to the learners’ levels.

Acknowledging that vocabulary learning is an incremental process (Schmitt, 2008b) that involves acquiring different aspects of knowledge (Nation, 2013), learners engaged in incidental learning engage in various types of strategies/processes to acquire different aspects of word knowledge incrementally. Based on the comments and multiple strategies employed from inside the target words, learners initially recognise the *form knowledge* of target words

(i.e., the spoken form, written form, and word-part knowledge). Subsequently, in order to digest aspects of meaning associated with word knowledge (i.e., having the form and meaning connection, understanding the concept or reference the word represents, and being able to associate it with other words, such as coordinates, synonyms and antonyms) (Nation, 2013), learners choose to employ other strategies from outside the word, with the result that the first strategy they relied on is guessing from context. Moreover, others reported comments about words' roots and morphological scales' analysis, showing that L2 learners can also obtain clues about meaning from the word's root and morphological scales. This finding confirms the point made by Boudelaa and Marslen-Wilson (2013) and Gor and Jackson (2013), that effective guessing from context when learning vocabulary can result from awareness of an array of morphological patterns. The results for the qualitative data also revealed that the word-guessing process involves activating knowledge about prior roots and morphological scales, and hence could serve to reinforce form and features knowledge about prior words (Craik & Tulving, 1975; Gu & Johnson, 1996). The use of analytical strategies includes activating prior knowledge, and comparing and making associations, which can increase the depth of processing and contribute to better learning outcomes (Craik & Lockhart, 1972).

B. Consolidation-memory strategies

Fifteen types of memory strategies were reportedly used by L2 learners in all three studies; as shown in Table 6.1. Five of these involved learning vocabulary intentionally, these were L2 word–picture association, L2–L1 association, focusing on the order of the presentation, using a physical action when learning a word, and the keyword method. Five strategies were identified as used to learn vocabulary incidentally; these VLSs included focusing on abstract meaning, focusing on the characters in a story, remembering the story line, paraphrasing the meaning of the word, and learning word collocations. Moreover, five of the VLSs were used for both modes of vocabulary learning; i.e., associate the word's spoken form

with its meaning, connect the word to its synonyms and antonyms, connect the word to personal experience and previous knowledge, use new words in sentences, and visualise the target word and picture.

When evaluating the nature of learner-selected VLSs within the second category, the strategies were viewed as types of consolidation strategy, as categorised by Schmitt (1997) in his VLS taxonomy. Some strategies mentioned in Nation's (2013) VLS taxonomy parallel Schmitt's (1997) consolidation strategy groups; in particular the cognitive and memorisation strategies. Learners primarily utilise these sets of strategies to remember a word after it has been taught or encountered. In particular, the last class of Nation's (2013) VLS taxonomy processes, establishing vocabulary knowledge, involve tactics for remembering vocabulary and making it available. This class includes three subsets of learning strategies: (1) noticing, (2) retrieving, and (3) creative use. All three sub-strategies relate to the various strategies selected and used in the current study. Reflecting on the memory-strategies reported above, it is apparent that the sub-strategies of retrieving and generating groups might directly relate to the deep mental processing of new words to negotiate immediate and delayed word retention. A generation strategy (creative use) is similar to a retrieval strategy, and involves associating new knowledge of words with known knowledge (Nation, 2013). Thus, some of the associative strategies in the current study, such as L2–L1 association, and L2 word–picture association, associate the word's spoken form with its meaning, as it falls into these groups of strategies.

The results of the stimulated verbal recall interviews provided further qualitative aspects for five consolidation-memory strategies, which were reported as mechanisms to learn vocabulary incidentally while reading. The strategy of connecting a target word to its synonyms assisted advanced L2 learners with learning and remembering target words in an unannounced vocabulary test. These sense relationships connected meaning between new words and previously known words, and so are typically used to help consolidate vocabulary (Schmitt,

1997), hence this can help as a mechanism to recall words over a longer period of time (Oxford, 1990). The comments about this strategy show awareness of the benefits when combining target words with their synonyms, because synonyms explain the meaning of target words.

Referring to the strategy of connecting words to personal experiences and previous knowledge, the qualitative data clearly expresses how L2 learners use and refer to their personal experiences to learn and remember the meaning of target words. Learners provide additional details regarding types of experiences and the knowledge they refer to. For example, participant 4 explained how he referred to specific personal and vivid experiences to learn and later recall the meaning associated with a target word; i.e., *يطرب/yatrabo/* ‘to be enraptured’. These reported experiences reflected the participant’s knowledge of the cultural background to the Arabic language, providing information from which to deduce the correct meaning of new words, or related words with different meanings (polysemy). Participant 4 remarked that, to know the exact meaning of the target word (*بيارز/ūbarizo/ to fence*), he chose to connect the word to traditional Arabic culture.

The comments also revealed knowledge of other languages that can prove useful, as was the case for participant 5, who understood the target Arabic word because of his knowledge of Urdu and Farsi. Other participants linked target words to specific sources of knowledge, including the holy *Qur’an*. Additional comments showed L2 learners might usefully link target words to their own previous partial knowledge of them. Some learners reported having integrated a new word, despite having incomplete knowledge of the word itself. For instance, learners might do this by connecting the target word with information relating to its morphological scale, so as to narrow down its meaning; as stated in a comment given by participant 1 regarding the target word *مقلاة/miqlāh/* ‘pan’, “*I know from its morphological scale that it is the name of a piece of equipment or machine, then I connected it to the word cooking, so I thought its meaning is spoon, because it’s the nearest meaning and relates to cooking*”.

Furthermore, the comments emphasised that learning words is an incremental process, as learners need to employ different strategies and find ways to integrate new words into their existing knowledge (e.g., personal experiences, and previous partial knowledge of the target word itself). This finding agrees with previous findings (e.g., Ahmed, 1989; Gu & Johnson, 1996; Sanaoui, 1995; Schmitt, 2008b; Yang, 2017) demonstrating that good vocabulary learners can employ different VLSs to control and cover different aspects of word knowledge. However, previous familiarity with a word's root or morphological scale is not always sufficiently reliable to convey its meaning, as indicated by participant 1 above. Thus, learners might ultimately move on to employ a tactic from another category (*meta-cognitive strategies*).

Focussing on abstract meaning to learn vocabulary incidentally is a new strategy reported during stimulated verbal recall interviews. Based on the comments reported by the participants regarding how to negotiate abstract and metaphorical meanings, the researcher considers this strategy to be a memory consolidation strategy. This is because it involves integrating and associating abstract meaning between L1 and L2, or between the concrete meaning of a target word and its abstract use in a specific context. The comments reported about this strategy (see Section 5.5.1.2) demonstrates that L2 learners of Arabic employed different tactics to deal with abstract words and to negotiate the metaphorical use of the concrete words. Strategies include trying to find a meaning that is similar, or in between the target language and L1 (L2 – L1 association), getting the exact meaning from the context (guess from context), connecting the partial knowledge of abstract words with previous knowledge. Thus, focussing on the abstract meaning of words might be considered a memory strategy, because it demands the association and integration of knowledge of L2 and L1.

Using consolidation-memory strategies, participants reported being able to group words together according to context and story line. Participants 2 and 3 in the third experiment mentioned that, to comprehend the meaning of entire sentences and paragraphs they linked

words and sentences together based on the story line. The strategy of creating a narrative chain (linking words together into a sentence or a story) (Oxford, 2016), appears to help learners understand the meaning of words' during incidental reading, enabling them to recall them during vocabulary tests. By using words and grouping them together, learners create a firmer association between the new words and those stored in their memories (Amiryousefi & Ketabi, 2011; Holden, 1999; Nation, 2013; Oxford, 2016).

Considering the strategy of focussing on a story's characters, an earlier qualitative discussion revealed that learners reported remembering the characters in stories in such a way that enabled them to prepare for a text comprehension test. However, this behaviour helps learners create sequences and connections between words, sentences, and paragraphs, which enable them to understand meaning. Additionally, this process facilitates the word grouping strategy, since participants associate and organise words according to the relationships between story characters/names.

A well-known strategy used in both modes of learning was visualising target words and pictures. This VLS, reflects how new words, even in incidental learning, seem to be visualised and linked to pictures. The results from qualitative analyses suggest some participants have previously employed visualisation in a number of different ways; i.e., 1) to visualise specific target words alone by associating them mentally with reference pictures and previous knowledge, such as *مقلاة/miqlāh/* 'pan', and *الحذوة/alhadwah/* 'horse shoe'); or 2) to visualise all the content involving the target words. Mentally envisioning the target words in conjunction with live pictures that stimulate meaning and maximise learners' likelihood of focussing on each target word form as *input*, connect the word form with its *referent* (Barcroft, 2009). According to Dual Coding Theory (DCT), and its applications, imaging concrete words can be considered relatively easy, although adding pictures to abstract words might prove more challenging (Sadoski, 2005). Nevertheless, the L2 learners in the present study mentioned

having been able to concretise abstract words by creating visual memories of a story line, and then using that to create sequential connections. Activating imagery in this way provides a more complete picture, which supports learners to better understand, store and retrieve the target word subsequently. According to Barcroft (2009), this type of strategy allows learners to process and encode target word forms as input. Compared to shallower processes, such as verbal repetition, this deeper, richer processing of the word form is more likely to enhance retention (Schmitt & Schmitt, 1993). This finding highlights the importance of using images to achieve long-term recall of items. As Oxford (2016) argued, the mind's storage capacity for visual information exceeds that for verbal material; thus, a significant proportion of students utilise visual images.

To summarise, memory strategies or mnemonics can help learners recollect target words that are new to them, utilising verbal and pictorial subsystems (Makni, 2013). Linking target words to other related words, such as synonyms was also reported as valuable. Further, the learners' comments also revealed that new words can be connected to unrelated words; namely, through memorising and grouping words according to a story line or characters in a story, or by visualising words with pictures, and connecting them to vivid experiences and previous knowledge.

C. Consolidation-cognitive strategies

As displayed in Table 6.1, six VLSs were classified as cognitive strategies. Three of these strategies were reported as designed to learn vocabulary intentionally (i.e., written repetition, note taking, and rehearsal), and two were reported as useful for learning vocabulary incidentally, (i.e., reading repetition, and reading for through understanding), and the L2 – L1 translation strategy was reportedly used in both learning modes.

The cognitive strategies in Schmitt's VLS taxonomy also evoke memorisation strategies, although they do not necessarily focus specifically on manipulating processing (Al

Qahtani, 2005). The audio verbal repetition and written repetition strategies highlighted in the present study parallel Schmitt's classification of verbal repetition and written repetition strategies. Moreover, 'noticing strategies' in Nation's (2013) classification of VLSs includes the repetition of words, both aloud and silently, as well as writing words on word cards, making lists, and keeping vocabulary notebooks. Despite the significance of repeating words, according to Nation (2013), these acts are only the first step "towards a deeper processing of words" (p. 331). Rehearsal or verbal repetition is one of the most reported of L2 vocabulary strategies, and this proved the case in the intentional mode of vocabulary learning, in which a rehearsal strategy was reportedly used by 9 English and 10 Chinese learners in the immediate words retention test, as well as appearing to affect retention in the delayed vocabulary test, as reported by 7 English and 10 Chinese learners. As all the Chinese learners used rote memorisation in the intentional mode for immediate and delayed word retention, this finding matches the prototypical profile of Asian learners who employ rote memorisation more frequently than other strategies (Atherton, 1995; Politzer & McGroarty, 1985). Generally speaking, this frequent use could be attributed to the ease encountered when using them as a rote strategy, this finding corresponds to the result of Aljdee (2008), and that L2/FL learners tend to use repetition strategy, because of its ease, regardless of the target language. It could also refer to the demand placed by intentional task design on studies of word-picture pairs. However, this was not the case with written repetition strategy, since it was only reported once in each group (see Table 5.1 for frequency and means).

By comparing rehearsal (rote memorization) to other mnemonic strategies reported and used in the current study, such as the keyword method, the findings confirm one of the study's hypotheses, that there are many strategies in addition to the keyword method that can affect word retention on immediate and delayed tests. The rote memorization strategy is a favourite strategy among learners of L2 Arabic vocabulary; whereas each group only reports the keyword

method once. One explanation of this could be the complexity of the strategy itself, as numerous studies have revealed that L2 learners avoid strategies that require deeper processing or mental manipulation of new vocabulary items (O'Malley & Chamot, 1990). An additional factor could be the shared and differing linguistic features of the learners' L1s (English and Chinese) and the target language Arabic, which as mentioned above is a Semitic language. Arabic has fundamental distinctions from English and other Indo-European languages; for example, its structure is inflectional or synthetic, as opposed to analytic. These fundamental linguistics differences can render the implementation of a keyword method inefficient. The findings of the present study (in the intentional mode in particular) confirm assertions by Degroot et al. (1994) that suggest the keyword method is unhelpful in the context of productive recalls, as rote rehearsal is a more beneficial mechanism for productive tests. Although mnemonic devices generally facilitate faster learning and easier retrieval of lexical items, not all devices can be employed effectively to assist in the long-term recall of new words. In this study, the keyword method produced less success with L2 target word recall than other strategies, such as those concerning self-generated target words and rehearsal. Indeed, generally, the effectiveness of the keyword method depends on multiple variables, such as the time invested in acquiring the mnemonic, learner's training about how to use the strategy, the learner's proficiency level, meta-memory, cultural factors, and the context in which word retrieval is being demanded (Takač, 2008).

With regard to note taking strategies in the intentional mode of learning, a high ranking of frequency of use emerged among both groups of learners (English/Chinese), and resulted in good word retention scores immediately and after a delay of one week. This finding concurred with the findings of other research, reflecting on the significance of note taking strategy, including that of Gu and Johnson (1996), and Al-Shuwairekh (2001). Frequency of use here also has implications for the intentional learning task, in which participants were asked to learn

target words intentionally, while viewing words alongside defined pictures or meanings on a screen. Thus, the students reported taking notes as quickly as they could, including drawing pictures.

Considering repeated reading, this strategy is considered an incidental mode strategy, at least in terms of the perspectives and findings of the current study, since it was reportedly used 29 times in the third experiment (eye-tracking and incidental vocabulary learning). The stimulated verbal recall interviews, undertaken while showing participants a video recording of their eye-movements during the incidental learning session, refreshed learners' memories about how they behaved when reading and encountering the new words. Consequently, the participants reported additional details pertaining to aspects of the reading repetition strategy and for the reasons behind their behaviour. The results of the qualitative data revealed three factors motivated repeated reading in incidental vocabulary learning. The first factor was the great desire of L2 learners to integrate novel words into their knowledge of the L2, in order to boost their confidence and understanding, by forging links between the targets words or between paragraphs. Participant 1, for example, when justifying his repeated reading stated that "because the bit at the end clarified the bit before". These comments also emphasise that during repeated readings learners employed cognitive processing to maintain "tracks" and "links" between words, sentences and paragraphs. Examples of strategic processing include linking unknown words or the words they have partial knowledge of, with others that they recognise, or controlling similarities and/or differences between words that are similar in sound-form.

Subsection 5.5.1.2 collates all the comments about the reading repetition strategy, detailing the reasons given for using the strategy. It reveals the second factor motivating learners to read repeatedly is a need to do so to recall the characters in the story to understand the relationships between them, in preparation for comprehension questions. The third factor

mentioned in relation to reading repeatedly was to compare the structures between L1 and L2. The reported comments show advanced L2 learners might tend to strengthen their knowledge of the target language by not only focusing on novel words, but also by comparing the structures between the L1 and L2.

The patterns found in the current study of employing reading repeatedly and various types of strategies to acquire different aspects of word knowledge incrementally could also be interpreted by the five-step model of vocabulary learning suggested by Brown and Payne (1994, cited in Hatch & Brown, 1995, p. 383). This model proposes that after encountering a new word (first stage), learners catch a clear visual image of the word (second stage) and then connect that form with the meaning (third stage) and consolidate this form-meaning link (fourth stage) until they can use those learned words (fifth stage). Through this incremental process, L2 participants in this study might have reached the fourth stage by employing multi-strategies from inside and outside the target words. As clarified earlier, learners initially encounter and notice the target word, then they recognise *form knowledge* of the target words (i.e., the spoken form, written form, and word-part knowledge). Then in order to digest meaning aspects of word knowledge (i.e., having the form and meaning connection, understanding the concept or reference the word represents and being able to associate it with other words, such as coordinates, synonyms and antonyms) (Nation, 2013), learners turn to employ other strategies from outside the word, and among those strategies they relied on are reading repeatedly and guessing from textual context. This finding of using reading repetition and other VLSs emphasises the conscious processes involved in the incidental vocabulary learning. Furthermore, this finding of utilising reading repetition strategy when learning vocabulary incidentally echoes previous findings (e.g., Brown et al., 2008; Godfroid, Boers, et al., 2013b; Pellicer-Sánchez, 2016; Waring & Takaki, 2003) of the significant effect of encountering target words many times during reading. Pellicer-Sánchez (2016) reported that her L2 participants

might have reached the third stage of Brown and Payne' (1994) model of vocabulary learning, by the third to fourth encounter with the target words, whereas L1 readers (in her study) may have reached it by the second exposure. Moreover, she mentioned that the fourth stage of consolidation may have been reached by both L1 and L2 readers by the eighth exposure to the target words. Hence, employing reading repeatedly to encounter and process target words many times in the incidental vocabulary learning seems to be efficient for lexical items' acquisition and retention.

Examinations of the L2 – L1 translation strategy found it was adopted by each group in both modes of vocabulary learning. Translation from L2 into L1 is a common cognitive strategy for learning L2 vocabulary in many languages, because it supports rote learning, or 'mechanical practice' (Schmitt, 1997). Through the use of eye-tracking and stimulated verbal recall, my study reveals the reasons for using this strategy. For example, some learners use translation because it is their preferred learning style. However, other learners reported using translation aids to understand target words and text. Though translation is seen by many as a mechanical transfer of meaning from one language to another and not a creative strategy, it can assist learners to revise and expand their vocabulary to attain a high level of proficiency (O'Malley & Chamot, 1990; Schmitt, 1997).

D. Consolidation-metacognitive strategies

Three VLSs were reported within this category. The first was the strategy of using a spaced word practice (expanding rehearsal), and was reported used in both modes of learning. The self-generated target words strategy was reportedly used to learn and recall words intentionally. Meanwhile, the third metacognitive strategy (i.e., leave the unknown words) was apparently used in incidental vocabulary learning.

The strategy of using a spaced word practice (expanding rehearsal), was only used by one English and one Chinese learner to recall their words after a week of intentional learning,

and was mentioned by one Chinese learner who used it to recall words after one week of incidental vocabulary learning. This low frequency use of expanding rehearsal could be due to lack of awareness about delayed word retention tests; notably, just two participants reported controlling and expanding their Arabic vocabulary by practicing newly learned words over time. This strategy parallels a planned repetition strategy under planning strategies developed by Nation's (2013) VLSs taxonomy. Expanding rehearsal has previously been found to be one of the most important strategies to encourage remembering (Baddeley, 1999).

On the strategy of self-generating target words, which coded by the following response "I memorize the target word myself without looking to the word", a similar strategy was reported in Barcroft's (2009) study, in which participants closed their eyes and attempted to recall words from memory. This strategy parallels the metacognitive strategy of testing oneself with words tested and listed in metacognitive strategies reported in Schmitt's (1997) VLSs taxonomy. This strategy functions as a retrieval strategy enabling recall of items previously encountered in Nation's (2013) taxonomy. Self-generated target words were reported by two English learners in an immediate intentional vocabulary test; this resulted in an exceptional vocabulary score 19.50 (13.43) out of 32. It was also reported by two Chinese learners in immediate and delayed vocabulary tests; their scores were 24.00 (1.41) and 14.00 (1.41) out of 32 respectively. Historically, the strategy of self-generating target words has produced observable positive effects in a variety of memory studies (Barcroft, 2007, 2009; Royer, 1973). In the present study, the participants reported that had they received additional time to learn target words independently during the intentional vocabulary learning stage, they would then have been able to remember the words better long-term. Barcroft (2009, p. 85) cited Roediger and Guynn's (1996) explanation of the positive effects of self-generating target words, stating "the process of retrieving an item alters one's existing knowledge by strengthening the

encoding process". Therefore, self-generating target words will enhance the production of lexical items, evoking processes that evolve from short and long-term memory retention.

Considering the last strategy in this group of VLSs, i.e. omitting unknown words, the qualitative analysis revealed how learners use this tactic to control their acquisition of novel words while reading (see learners' comments under Subsection 5.5.1.2). This strategy can also be classified as a planning strategy under the Nation' (2013) taxonomy of VLSs, which involve making a decision about where and how often to direct attention towards target words. Different rationales were used to explain the use of this strategy; for example these included, to preserve the bigger picture as regards textual comprehension, to access a broader understanding of the context, and choosing not to focus on obtaining the precise meaning of the word. Another reason for leaving out unknown words is to allow scope to attain further knowledge or clues from context, and to guess the target words' meaning, all learners' comments were represented in the results chapter 5.5.1.2. Furthermore, some learners reported omitting unknown words when they found themselves unfamiliar with their form and unable to relate them to their mental lexicon. Additionally, the complexity of some of the target words themselves, such as استبدادية/*es'tib'da'dy'yah/* 'authoritarianism', which comprise five syllables, led learners to avoid those words to save time and maintain their focus on understanding and connecting the text overall. Use of this metacognitive strategy attests to the advanced ability of the learners in the current study, as evaluative selective attention was acknowledged as common to successful learners in Gu and Johnson' (1996) study.

Noticeably, some of the more general VLSs resulted in better word recall in both modes of learning than other strategies did. In intentional learning, *associate words spoken form with meaning* was only reported as useful by two English participants, although it correlated with a high score mean of 27.00 (5.65) out of 32 in the immediate post-test, and 20.00 (7.07) in the delayed post-test. Whereas, the *self-generate target words* strategy, which was reported by two

Chinese learners, resulted in the highest target word recall, as shown in Table 5.1. Under the condition of incidental learning, *visualise target word and picture*, was only used by two of the English learners, but it then resulted in the greatest success with target words recall in the immediate test [23.00 (4.24)] and the delayed post-tests [18.50 (4.95)]. By examining the strategies used by the Chinese group, we found the strategy, *associate word to its root* resulted in the best target words recall in the immediate post-test [25.00 (2.00)]. Whereas, in the delayed post-test, the strategy, *using the word's morphological scale* helped produce the highest mean scores [20.00 (1.00)], reflecting the significance of this strategy in assisting learners' ability to recall target words after a significant time has elapsed.

6.2.1 Effect of fixed factors Group, Mode of learning, and test time on number of strategies

The results related to quantitative data revealed the number of strategies were key to the significant effects from predictor variables; i.e., group, mode of learning, and test time. As illustrated in Table 5.2 in the result chapter, and as shown by the main effect of *group*, the Chinese speakers used a broader selection of strategies than the English speakers. There was also a main effect from *learning mode*, because there were more strategies used in the incidental than in the intentional mode. Specifically, the overall mean for number of strategies used in the incidental learning mode was [5.75 (1.50)], compared to [4.05 (1.49)] for strategies used in the intentional learning mode. One interpretation of this finding is that learners in the intentional mode of vocabulary learning can directly access the target words' meaning through learning concrete and action target words, as well as words-picture associations, which is consistent with the findings of Barcroft's (2009) intentional vocabulary learning study, and by reading definitions and sentences that use the terms for abstract and state target words directly, as was the case of L2 learners in Lawson and Hogben's (1996) study (reviewed fully in 3.5.2.1). This direct access to the words' meaning in the intentional mode meant learners relied heavily on just a few specific strategies, such as L2 word-picture association and rehearsal (root

memorisation), citing these as the most frequently chosen strategies. Whereas, in the context of incidental learning, the learners had no direct access to the words' meanings; thus they tended to employ and trial multiple strategies, particularly context association strategies from the discovery and meaning determination category, as shown in Table 6.1.

A further important variable was found to be *test time*, where it was noted that more strategies were used under the delayed than the immediate time conditions (5.15 vs. 4.65) (particularly in the incidental learning mode), as demonstrated in Table 5.2. This finding differed from our expectations, as the L2 learners were expected to employ additional strategies in the immediate post-test, and then rely on some of the used strategies to recall words for the Delayed word retention tests. Instead, the learners were found to employ more strategies overall for recalling words in the delayed post-tests, particularly under the incidental mode of learning, as the participants needed to evaluate different types of strategy from inside and outside the target words, to make it possible to recall the words' meanings in the delayed post-tests. Employing multiple and deeper processing strategies in the context of incidentally oriented vocabulary learning, indicates how successful L2 learners are and reveals their awareness of the significance of VLSs. This concurs with many findings, such as Ahmed (1989), Al-Shuwairekh (2001), Gu and Johnson (1996) and Sanaoui (1995). These studies have been reviewed fully in the literature review.

A significant three-way interaction between *group*, *learning mode* and *test time* occurred, because, for both test-time conditions (immediate and delayed) the Chinese used more strategies than the English in the incidental learning mode. However, the English group used more strategies than the Chinese in the intentional learning mode, for both test-time conditions (immediate and delayed), as exposed by the means in Table 5.2. This finding was particularly significant in terms of how far the following results regarding the relationships between VLSs and vocabulary gain were affected by the number of strategies each group used

under different conditions associating mode and test-time, as discussed below. A further explanation for this finding might be the effect of L1 background (English or Chinese) on the group's learning style. The English group seemed to comprise of more decontextualised learners, who preferred to implement additional VLSs in the intentional learning modes (also including five types of strategies not used by the Chinese learners). Whereas, the Chinese group seemed to include more contextualised learners, and they chose to implement more VLSs in the incidentally oriented mode of learning than the English, particularly in relation to context association strategies.

6.2.2 Discussion of the most frequently used strategies (MFS)

As clarified previously, the MFS in this study concern a self-selected 'core' set of strategies, in which each learner (based on his beliefs) recognises one strategy as the most effective one for them, as determined by response to the question (*which strategy did you use most frequently? Why?*). The findings pertaining to the MFS clarify which the most used and most effective VLSs are. When reporting on strategy use in the intentional mode, some strategies were reported as being the most frequently used by each group during the immediate and delayed post-tests. The strategies most frequently reported by English learners in the immediate and delayed word retention tests were: *associate word to its root (derivation)*, *L2 word-picture association*, and *rehearsal (rote memorisation)*. Meanwhile, the strategies reported most frequently by Chinese learners when discussing initial uptake and the delayed post-tests were: *L2 word-picture association*, and *rehearsal (rote memorisation)* (see Table 5.4 for the means for each of the strategies).

The strategy *associate word to its root (derivation)* resulted in the highest target word recall among the English group, in both immediate [24.75 (3.54)] and delayed post-test scenarios [19.00 (3.02)]; significantly more so than *L2 word-picture association*, and *rehearsal*. This finding reflects the strategy of associating words with their roots as a means to

contribute successfully to recalling new lexical Arabic words in immediate and delayed word retention, even with the existence of word and picture association during intentional learning. The English group in the intentional mode seemed to be aware of the benefits of using the root to derive, deliver, and retrieve the meaning of the target Arabic words. This finding concurs with the suggestion made by Asadi et al. (2017), that expanding one's Arabic vocabulary can be facilitated significantly by mastering an understanding of word roots. (More details about this strategy mentioned above).

By contrast, *L2 word–picture association* produced the highest target word recall for the Chinese learners', as measured by vocabulary uptake both immediately after the learning phase [17.75 (3.03)] and during the delayed post-test [10.80 (1.28)], as compared with the *rehearsal* strategy. The results pertaining to *L2 word–picture association* emphasise the robust effect of this memory association strategy upon word retrieval in the context of intentional short and long-term retention. This finding is in line with the DCT and the principle of using imagery for the teaching and learning of meaningful vocabulary in experimental studies (see e.g., Sadoski & Paivio, 2013; Smith et al., 1994; Smith et al., 1987). The results of these studies (reviewed in 2.4.2) revealed that learners who received support from visual image illustrations scored significantly higher than those who did not receive picture illustrations. Likewise, the current study and Barcroft's study identified L2 word–picture association as the most frequently implemented strategy. Both studies considered L2 word–picture association as an intentional learning strategy, resulting in favourable target word recall.

Interestingly, although the strategies of rote memorisation and repetition did not result in high target word recall (see Barcroft, 2009; Lawson & Hogben, 1996), the current study identified repetition as the strategy used most often. For instance, Lawson and Hogben found that 14 out of 15 students used repetition, with a frequency of use of 137 of 177. In Barcroft's study, 13 out of 83 students reported using repetition as their most frequently used strategy.

Accordingly, this finding enhances the significance of rehearsal or root mesmerisation as a strategy associated with intentional learning, backing up other studies that identified repetition as the strategy most preferred by students from different cultures and levels. The result also confirms the widespread finding that second language learners use repetition extensively (Ahmed 1989; O'Malley & Chamot 1990; Lawson & Hogben 1996; Gu & Johnson 1996; Schmitt 1997; Al-Qani 1997).

The data for the incidental mode of learning can be seen at Table 5.7. It shows that some of the MFSs resulted in higher target word recall than others. The strategy, *visualising target word and picture* produced the highest target word recall rate for any strategy among the English group, despite only being used by two learners (compared to the other most frequently used strategies, such as guessing from textual context) for recalling words under isolation conditions; in the post-test 23.00 (3.00) and after the one-week delayed post-test 18.50 (3.50). This result for *visualising target words and the picture* strategy clarifies that visualisation can be used successfully for incidental vocabulary learning, which can result in superior word acquisition and retention over a longer-time frame. When reviewing the conditions associated with context, English learners tended to use approaches such as *guessing from context*, which produced high scores on both the immediate post-test 23.20 (1.80) and the delayed post-test 21.90 (1.71). For the Chinese group, *guessing from textual context* resulted in the highest rate of target word recall; i.e., 16.88 (2.58) when compared to the other most frequently reported strategies, which were identified relative to the immediate retention of isolated words. Whereas, in conditions involving a delayed isolated words test, the strategy *associate word to its root (derivation)* produced the highest recall for target words 20.00 (0.57), when compared to other strategies reported by the Chinese in relation to this condition. The results provided further evidence that the strategy of associating target Arabic words with their root can enhance L2 learners' intentional and incidental vocabulary learning and retrieval.

6.2.3 Discussion about differences between scores and strategies of the two conditions of incidental learning

It is well known that guessing from context can play a significant role in incidental vocabulary learning, and a decision was made to investigate this learning strategy closely, by examining how learners benefit from guessing when examined on target words presented in context (Hulstijn et al., 1996), and to determine whether any differences exist between learners' approaches to guessing, and their assessment of how well they might utilise a guessing as a strategy to recall new vocabulary items long term. The methodology chapter explains the participants were asked (in the incidental mode) to provide the meanings of 32 target words in isolation, (i.e., testing words separately without context), and in context. For this task, the target words were presented in short sentences taken directly from the original text. At the end of each word recall test, both in isolation and in context, the participants were instructed to complete the second part, which involved answering two questions about the strategies employed during the learning tasks. The results revealed a variety of strategies were used by each L2 group to recollect newly acquired lexis in the incidental learning mode when completing immediate and delayed post-tests. (To avoid repetition here, see Table 5.8, which illustrates the frequencies and recall means for strategies reported under different incidental conditions.)

An additional finding arose from this investigation concerning, i.e. that the results for recalling word knowledge from context were better when compared to recalling word knowledge in isolation, for both groups of L2 learners. This finding is in line with previous research (e.g. Hulstijn et al., 1996) that suggests providing L2 learners with contextual information clues in short sentences during word recall tests affects learners' ability to recall the meanings of words', both in the short and long term. Furthermore, this finding is consistent with numerous bodies of research in that it reflects the effects of context on inferencing

regarding the meaning of unknown words (Hulstijn, 2003; Nagy, 1997; Pulido & Hambrick, 2008; Webb, 2008).

When reviewing the frequency of the strategies reported used by both groups (English/Chinese) in incidental mode, it emerges that the total number of strategies reported were higher under isolated words' tests conditions than in context-based conditions for immediate and delayed post-tests. Consequently, there was more diverse VLS use occurs in isolated conditions relative to context conditions, as shown in the results chapter, Table 5.8.

By reviewing the strategies employed under context conditions, the findings confirm that all the English and Chinese learners used the *guessing from textual context* strategy for the immediate- and delayed post-test. This could explain why participants in both groups drew on a greater number and variety of strategies, when aiming to recall the meaning of novel words under isolated conditions. Again, this finding confirms that L2 learners tend to employ and trial multiple strategies; when they have no direct access or even clues from the context.

These findings regarding the incidental learning experiment confirmed there are other effective strategies, aside from guessing strategies, which worked for the participants in each L2 group, even when context was provided. For example, in immediate post-test conditions, some strategies were only reported by two English participants. Nevertheless, these are notable, as they resulted in high target word recall; i.e., *reading for general understanding* 26.00 (2.82), *remembering the story line* 25.00 (4.24), *connecting word to its synonyms* 25.00 (2.82), *reading repeatedly* 19.50 (4.95), and *associating word with its root (derivation)* 17.00 (3.78). See Table 5.8, for additional effective strategies that contributed positively towards the final scores, and for strategies that were reported by the Chinese group. This finding confirms that many additional strategies, aside from the guessing strategy, were chosen and implemented successfully by L2 learners in the incidental learning mode.

6.3 Relationship between the number of strategies used and the uptake of vocabulary in post and delayed post-test tasks

Considering the results from both post-tests (*immediate/delayed*), mixed effect models were run on the data twice applying the dependent variable, *Post-test scores* or *Delayed-test scores*. Fixed factors in this case were *number of strategies*, *group* (*Chinese/English*) and *learning mode* (*intentional/incidental*). Random factors relevant here are participant and item. As revealed in the results chapter, there was a main significant effect from *number of strategies* used on both post-tests scores. In addition, a two-way interaction between *number of strategies* and *group* (*Chinese/English*), caused by the fact that the English learners used more strategies in the intentional learning mode than the Chinese did. Whereas, the reverse was true in the incidental learning mode, as the Chinese used more strategies than the English. These results support patterns observed in the means in Table 5.9 and Table 5.13; i.e., the greater the number of strategies used by the English group in the intentional mode, the better their results in both post-tests (*immediate/delayed*), relative to the Chinese. Meanwhile, the use of more strategies by the Chinese group in the incidental learning mode meant that they performed better on both post retention tests (*immediate/delayed*) than the English group. This specific finding could be referred to as the effect of L1 background (English or Chinese) on the group's learning style and their choice of VLSs under a certain mode of learning. Acknowledging that context plays a crucial role in reading and comprehension in Chinese language (Chen, 1992), could explain why Chinese students used more contextualization. It could further explain why they chose to implement more VLSs in the incidentally oriented mode of learning than the English students did, particularly in relation to context association strategies. This finding, based on this empirical comparative study between two groups (English/Chinese), confirms Chen's (1992) statement, that according to the Chinese linguistic features (reviewed fully in 2.3.4), a Chinese reader needs to depend heavily on context, compared to a reader of an alphabetic language (e.g. English). In contrast, reading in English (as an alphabetic language) supports a larger

dependence on (a) phonological skills and (b) orthographic processing skills when decoding lexical items (Katz & Frost, 1992). This may clarify why English learners have a more intentional focussed strategy, such as giving substantial attention to processing the specific phonologic (associating spoken words with meaning), morphologic (using morphological scale), and semantic components of each word.

Consequently, it is likely that the English and Chinese ASL learners' primary L1 processing skills and strategies as developed through exposure to distinct languages and literacy practices have influenced their ASL processing skills and VLSs.

Moreover, there was a significant three-way interaction between learning mode (*intentional/incidental*), group (*Chinese/English*), and number of strategies used, reflected in the scores for each group. In other words, the more strategies the participants used to learn vocabulary intentionally or incidentally in both post-tests, the more effective the word retention. This finding concurs with other research, such as that conducted by Ahmed (1989), Gu and Johnson (1996), Hill (1994), Kelly (1992) and Lawson and Hogben (1996). This all concludes; actively employing and combining extensively diverse strategies (direct and indirect) stimulates better vocabulary acquisition, as compared to using an individual strategy.

6.4 Relationship between VLSs and acquisition of vocabulary type (noun/verb) and their subtypes

The sixth research question investigated the effectiveness of VLSs with regard to the acquisition of different types of vocabulary (*concrete/abstract* nouns, *action/state* verbs). By applying a linear mixed-effects model, the researcher was able to investigate the effects of fixed factors (predictor variables); including *Number of strategies*, *group (English/Chinese)*, *learning mode (intentional/incidental)*, and *noun type (abstract/concrete)* or *verb type (action/state)* on the outcome variable post-test scores, or delayed-test scores, where the participants and items were random factors. The analysis conducted was threefold.

Part one: A quantitative analysis of the frequency of strategies and uptake of nouns in a post-test and delayed post-test context. The post-test scores demonstrate no difference between the groups, nor any effect from the *number of strategies* and scores for nouns. However, there was a significant interaction between learning mode (*intentional/incidental*) and noun type (*concrete/abstract*) arising from the considerable difference between the scores in the intentional and incidental learning modes for *concrete* words type, with the former eliciting higher scores in terms of the immediate post-tests retention [.74 (.438) as compared to .49 (.502)]. Meanwhile, there was no difference between the results for the two learning modes (*intentional/incidental*) for the *abstract* words type. When the subtypes of nouns are looked at separately, there was no effect from the *learning mode* on *abstract* nouns, although there was a significant effect from learning mode on *concrete* nouns, with a considerable influence on intentional learning from *concrete* nouns when the target words were paired with pictures. This could be explained by the task design for the learning phase of the intentional and incidental learning modes, since concrete words were learned intentionally through paired pictures, and abstract words were learned through reading definitions and example sentences relating to the item. The way that abstract words are learnt in intentional learning contexts, is similar to the way they are learned in incidental mode, except that learners have no expectation of the upcoming tests when learning in incidental mode. Thus, this study confirms the power of learning concrete words intentionally as paired pictures, rather than learning them incidentally in context. This finding also raises the significance of using the intentional learning method for advanced L2 learners, as it evidently, contributed to learning a large number of target words (concrete nouns in particular) over a short period of time. Hence, this finding supports the suggestion by Allothman (2014) and Nation (2013) that some intentional focus is essential to assist in the development of skills and strategies, even for advanced L2 learners; such as L2 word–picture association and guessing from context, which appear to empower

learners to progress their language learning successfully, and recollect words even after a long period of time, as revealed in delayed assessments of word retention.

The results of the analysis run on the delayed post-test scores, indicating the key effects and interactions that arise with a number of strategies, group (*English/Chinese*), and noun type (*concrete/abstract*). The effect on the data from the group variable arose from the fact that the results for English learners show improved accuracy, relative to the Chinese group, on the delayed post-tests, in terms of retention. Considering *noun type* separately, focusing on only abstract nouns, the English group scored higher than the Chinese group [.44 compare to .38]. However, for the concrete nouns, mean accuracy for both groups was relatively similar [.51 (.501)] vs. [.48 (.501)], showing a slight advantage among the Chinese group (see Table 5.21 in results chapter).

A significant effect from the predictor variable, *number of strategies* on the retention of nouns was noted because there was a gradual improvement in retention relative to the number of strategies learners used, as displayed in Figure 6 in the results chapter.

The principal effect from *noun type* was caused by the fact that the accuracy for concrete nouns was greater (50%) than the accuracy for abstract nouns (41%). This means that concrete nouns are retained better and retrievable for longer than abstract words. This finding correlates with implications presented by the DCT, which suggest that thoughts and concepts that signify concrete items, actions, and observable qualities are comparatively easy to deduce and recall. In contrast, words that signify abstract items, actions, qualities, or relations can be memorised less readily (Ellis & Monaghan, 2002; Sadoski, 2005). Concrete lexical items in the present study were retrieved more effectively in the delayed vocabulary retention test, because they enjoyed a natural advantage over abstract lexical items, and can be more easily represented and processed according to two codes (i.e., verbal and nonverbal codes) (Sadoski,

2005). These findings are also in line with Steingart and Glock's (1979 cited in Schmitt, 1997) findings that imagery has proved to be effective in learning.

The two-way interaction between group (*English/Chinese*) and *noun type* (*abstract/concrete*) shows both groups performed better with concrete nouns [.50 (0.501)] than abstract nouns [.41 (0.493) nouns]. Further, the mean accuracy for concrete nouns was quite higher for the Chinese group (51%) than for the English group (48%), and that could be referred to the use of L2–word picture association as the MFSs by the Chinese learners. In the case of abstract nouns, the English group received higher scores than the Chinese group [.44 compare to .38]. This explains why patterns occurred in opposing directions, affecting the results for the two-way interactions between group and *noun type*. One explanation for why the English groups performed better with abstract words was the large number of strategies used in the intentional mode, 18 versus the 11 types of strategies used by Chinese group. Some of the strategies employed by English, but not Chinese, were context association strategies (e.g., guessing from textual context, using the word's morphological scale, and associating the word's spoken form with meaning). Therefore, based on this finding, I can conclude that training and encouraging learners to use context association VLSs could assist them in coping with the acquisition of abstract words in the intentional and incidental learning modes.

A significant two-way interaction between *number of strategies* and *noun type* (*abstract/concrete*) also occurred in an opposing direction, as for *abstract* nouns, a higher number of strategies were found to deliver better retention scores, as demonstrated previously in Figure 8. In contrast, for *concrete* nouns, there were no noticeable effects in terms of retention scores when employing a higher number of strategies; thus, it seems that participants can successfully rely on employing one or two good strategies (e.g., L2 word – picture association) as a means to recall concrete nouns.

To carefully evaluate the effect of *group* and *number of strategies* on noun type, the data was broken down (*abstract & concrete*), and the analysis revealed significant effects and interactions arise from the variables *group* and *number of strategies* with abstract nouns. The principal effect from *group* on *abstract* nouns was due to the English learners performing better on the retention of abstract nouns in this case [.44 (.498) vs. .38 (.487)], as explained above. The significant effect from *number of strategies* resulted from the progressive relationship between the number of strategies employed and the scores obtained. Figure 10 in the results chapter, clearly presented this relationship, noting that the more strategies utilised, the better the scores for the number of abstract words acquired.

Considering there was no effect of number of strategies on concrete items, these results support the two patterns previously observed; i.e., that concrete items enjoy a natural advantage over abstract lexical items. Hence, concrete items can be more easily retrieved, even with a lesser number of strategies, while abstract items required additional efforts and strategies to be processed and retrieved.

Part two: a quantitative analysis of the frequency of strategy use and the uptake of verbs as determined by the post-test and delayed post-test. Analysis of the post-test scores demonstrated notable effects from *learning mode*, *number of strategies*, and a three-way interaction between *group*, *mode*, and *number of strategies*. The effect of learning mode on verb acquisition is denoted by the fact that the mean accuracy scores for the intentional learning mode was higher than the mean accuracy scores for incidental learning [48% vs. 42%]. This supports the pattern observed above with concrete nouns; i.e., that the intentional learning mode significantly affects the learning of a large number of target words relative to the incidental mode, over a short period of time.

The main effect from *number of strategies* on verb acquisition, as displayed in Figure 12, reflecting the steady relationship between *number of strategies* used and scores obtained,

such that the higher the *number of strategies* used in the immediate post-test, the better the scores gained in terms of verb acquisition. By comparing the effect of this variable (number of strategies) on both word types (noun/verb), no effect was found on nouns, there was also only a significant two-way interaction between mode and noun type (concrete/abstract) in the context of immediate vocabulary scores. Thus, it appears that the learning mode was the only variable directly influencing the retention of noun words.

There was also two-way interaction between the *learning mode* and the effect of *number of strategies*, because the latter variable results in significantly better verb acquisition in the intentional mode of learning. This significant interaction might justify the previously observed pattern (i.e., the score for the verb was significantly greater in the intentional mode). The awareness of upcoming vocabulary tests in the intentional mode seemed to increase learners' choice of "effective" strategies when learning novel words (verbs in particular) intentionally.

The three-way interaction between *group*, *learning mode*, and *number of strategies* is caused by the fact that for the English group the *number of strategies* resulted in higher scores on the intentional learning mode (mean scores presented in Figure 14 in the results chapter). Whereas, for the Chinese group, the *number of strategies* resulted in better scores in the incidental mode of learning, as demonstrated in Figure 15. This finding supports patterns previously observed with retention when considering the general effect proceeding from *number of strategies*, and the greater *number of strategies* used by the English group in the intentional mode, leading to better results in the post-test relative to the Chinese group [.65 (.48), vs. .47 (.50)]. In addition, the more strategies the Chinese used in the incidental learning mode, the higher their scores in the post-test, significantly outperforming the English group [.52 (.50) vs. .40 (.49)].

When examining the effect of learning mode and number of strategies on verbs' subtypes (*action/state*) individually, no effect was found for the Chinese group for the *action* type, although for the English group, there was a significant effect detected from *number of strategies*. One explanation can be given here regarding the additional number of strategies employed by English learners, learning action verbs intentionally through paired pictures. This was not the case with Chinese learners who relied on a lesser number of strategies in the intentional mode.

For state verbs, there was a significant main effect from *learning mode* for both groups. The English learners performed better in the intentional mode; i.e. 50% compare to just 29% in the incidental learning mode; whereas, the Chinese learners achieved higher scores in the incidental mode; i.e. 44% compared to a relatively meagre 24% in the intentional learning mode. However, as apparent from the logistic regression tests, patterns also manifested in the opposite direction, since we expected that the intentional mode of learning would have a major effect on both groups; however, this was not the case with the Chinese group who received better scores in the incidentally oriented mode of learning when recalling state verbs. This might refer to the higher number of strategies the Chinese employed in the incidental mode of learning, particularly in the case of context association strategies. We can identify the same patterns with the English learners who performed better on state verbs in the intentional mode because their VLSs was greater; i.e., 20 strategies compared to only 13 VLSs used by the Chinese in the intentional learning mode.

In the delayed test, the results for a linear mixed effect model revealed three-way interaction between predictor variables *group*, *learning mode*, and *number of strategies*.

The three-way interactions between *group*, *learning mode*, and *number of strategies* increased in number, because the *number of strategies* had a strong effect on the scores of the English group in the intentional learning mode. Whereas, for the Chinese group, the variable

number of strategies had a strong effect on scores in the incidental vocabulary learning mode only. Thus, the use of additional strategies by each group (i.e. English in intentional and Chinese in incidental); i.e., immediately and after a one-week delay, impacted their recall of verbs. Again, this finding supports patterns previously observed with retention when considering the general effect proceeding from *number of strategies*. Additionally, it refers to the effect of L1 background (of both groups) on their learning style, as identified and explained above.

It was also found that a variable *number of strategies* resulted in better scores for action verbs than for state verbs. Here, a further explanation might be given, alongside the effect of strategy use; this might be an effect from the action verb itself and its concrete representation in memory. As action verbs were learnt intentionally through words' picture associations, this procedure for dual coding processing (verbal and pictorial) allowed learners to implement a variety of VLSs significantly, which then helped to enhance word processing and retrieval over a considerable period of time.

In general, through addressing the differences within each group, the results revealed a combination of effective strategies produce the best results. In other words, learners who used and combined more than one good strategy achieved higher grades, and were able to remember target words long-term. Conversely, learners who used one strategy frequently did not achieve high grades, even when they found it beneficial. For instance, with respect to the self-generated target word strategy, although some participants achieved good results employing this strategy, others achieved poor results. Thus, the researcher believes the issue is not the strategy itself, but rather the student's ability to use the strategy optimally, by effectively integrating it with other strategies. Thus, students who received high scores were able to combine several distinct strategies effectively. Ahmed's (1989, p. 9) study supports this finding concerning the effectiveness of combining strategies; it argues, "good learners not only use more strategies,

but they rely more heavily on different strategies than the poor learners use". Indeed, overall the results indicated a positive relationship between employing multiple strategies and vocabulary learning proficiency, as well as the actual influence of these strategies on immediate and delayed words recall.

Part three: A qualitative analysis of the different types of strategies used for nouns and verbs revealed almost all the L2 learners treated the word types (noun/verb) equally when deciding on strategy use. This result was supported by the means for the eye-tracking and stimulated verbal recall interviews when reviewing learning of target words.

6.5 Relationship between fixation time and vocabulary gain

The researcher, initially ran an investigation to establish if any relationship could be identified between the eye-tracking measures (i.e., first fixation duration, fixation count, and total reading time) and learning gain (i.e., score), based on each independent target word variable (i.e., word type (verb/noun) and subtype (abstract/concrete and action/state). Thus, a Pearson correlation test was used to establish whether there was any correlation between each eye-tracking measure and the learners' scores for each predictor variable. The results revealed there were no significant relationships, except for one of negative significance between the first fixation duration and the score for abstract nouns, as demonstrated in Table 5.42. This negative correlation between the first fixation duration, and the results for abstract nouns, might highlight the presence of a particular difficulty with this type of Arabic words. This might mean the more time learners spend focusing on such words, the more confused they become, and as a result, the more likely their concentration will wane. However, the mean for number of fixations and total reading time on abstract target words appeared to be the greatest, implying that learners frequently only fully cognised this group of words after revisiting them many times, thereby increasing the total fixation time. This finding supports the findings of previous studies that conducted eye-tracking in reading research; it was also noted that some lexical

variables, such as part of speech and concreteness/abstractness also influenced fixation times (e.g., Liversedge & Findlay, 2000; Rayner, 1998, 2009; Starr & Rayner, 2001). When the participants in the current study found the abstract items difficult to learn or guess from context, they used metacognitive strategies, to avoid spending so much time on unknown words. This negative relationship might also explain why learners spent less time during the first fixation duration when encountering category of target words, relative to other types, as shown in Table 5.43; since they realised that focusing on difficult new words could be a barrier to learning others. We cannot explain this more clearly without considering the results from the stimulated verbal recall interviews.

Therefore, to clarify the relationship between eye-fixation times in general and learning gain (total of post-test score), a regression test was conducted, to track the independent variable: total reading time and the dependent variable: score on the vocabulary test. The *P-value* (sig) for the regression test evaluating total fixation time and score was $0.565 > 0.05$; therefore, at the 5% level of significance the results concluded that total time had no significant effect on the post-test scores. That is, the total amount of time L2 Arabic learners spent processing the target words did not influence their scores, as no statistically significant relationship was found. Hence, learning gain can be judged to have been affected by additional factors, i.e. VLSs, which have been discussed fully when answering research question one. However, there is a need for further research, with a larger numbers of participants from different cultural and linguistic backgrounds, if we are to establish a more solid base for the relationship between fixation time and the vocabulary gain of different lexical variables.

6.6 Summary of the chapter

This chapter discussed the results from the three experimental studies conducted to reveal the adoption of self-selected VLSs in two modes of vocabulary learning (intentional/incidental). It consisted of four sections. The first section presented and discussed

the classification of the identified VLSs under both learning modes. The classifications involved four categories of VLSs; discovery and meaning determination strategies, memory consolidation strategies, cognitive consolidation strategies, and metacognitive consolidation strategies. The discussion about the VLSs was supported by the qualitative data provided in the stimulated verbal recall interviews that explained different types of VLSs' implementations, and the motivations behind strategy use. Three subsections were then created to discuss: 1) the finding of the effect of three predictor variables on number of strategies, i.e., group, mode of learning, and test time; 2) the most frequently used strategies; and 3) the differences between strategy use and the scores for the two test conditions of incidental learning (isolation/context). The second section discussed the relationship between number of strategies and the uptake of vocabulary in post and delayed post-tests, and the differences that emerged between learner groups. The third section discussed the relationship between number of strategies and the acquisition of vocabulary type (noun/verb) and subtype (concrete/abstract noun and action/state verb). The final section considered the relationship between fixation time and vocabulary gain.

7 Conclusion

There is currently increasing interest in learning Arabic as a second/foreign language. One of the central components remains the acquisition of vocabulary, with many studies focusing on VLSs as an aspect of the intentional learning method. However, no previous study has been undertaken concerning the role of VLSs in the incidental mode of vocabulary learning. This thesis has therefore focussed on establishing VLSs and the most frequently strategies used by L1 English and Chinese speakers to acquire Arabic vocabulary in both the intentional and incidental modes of learning. The study investigated the VLSs employed by both groups, along with how they are used, and the impact of VLSs upon the immediate and delayed retention of words.

Three experiments were conducted to fulfil the purposes of this study, focussing on the following methods: (1) intentional; (2) incidental; and (3) eye-tracking. The experiments employed a mixed method, based on a triangulation design requiring: (1) quantitative methods (i.e. vocabulary tests and retrospective reporting of strategies) and (2) qualitative methods (i.e. interviews and stimulated recall interviews using eye-tracking).

1. Intentional learning was examined by twenty participants being introduced to Arabic words in a learning session, while viewing word-picture pairs for concrete nouns and action verbs and reading the meaning of abstract nouns and verbs. The participants subsequently completed two tests: (1) an immediate test immediately following the learning task and (2) a delayed test, taken one week later.
2. Incidental learning was examined by twenty Chinese and English participants being divided in to two equal groups and reading an Arabic short story. On completion, two tests were conducted in two phases. The first test was assessed by firstly, focussing in words in isolation, and secondly, on words in context. The second test addressed

incidental delayed word retention, following the identical procedure used in the first test. During all four assessments, the participants answered questions regarding the strategies used, with their responses coded to identify each participant's VLSs, and the strategy most frequently employed.

3. The third experiment revealed that the data extracted from the stimulated verbal recall by means of eye-tracking was of considerable significance in revealing the strategies used by L2 learners for processing target words during incidental vocabulary learning through reading.

These results generated a number of suggestions and implications concerning the study of VLSs in both intentional and incidental vocabulary learning, as discussed in the following sections of this chapter.

7.1 Summary of the main findings

7.1.1 A variety of VLSs used in intentional and incidental vocabulary learning

Thirty-three VLSs were employed by learners of Arabic as a second language (ASL) in order to acquire vocabulary both intentionally and incidentally. The identified VLSs in all three experimental studies were chosen in response to the task design of each mode of learning. Consequently, some VLSs were used in intentional vocabulary learning, but not in incidental learning, and vice versa. In addition, a number of key strategies were reported as being used in both modes of learning. The VLSs were classified under four main categories, based on Schmitt's (1997) taxonomy of VLS, with the first category including discovery and meaning determination strategies and the further three categories being linked to strategies for consolidating a word once it has been encountered, i.e. memory strategies; cognitive strategies; and metacognitive strategies.

A. Discovery and meaning determination strategies

These VLSs are related to source strategies used to access to new ASL words, including additional information concerning their meaning. Nine VLSs were reportedly used under this category: five were being solely used to learn vocabulary incidentally, including: (1) analysing parts of speech; (2) connecting one word to another with a similar sound-form; (3) focusing on short vowels of target Arabic words; (4) finding out if it is plural or single; and (5) reading for general understanding. The further four VLSs were employed in both modes of learning: (1) associating a word with its Arabic root; (2) employing a word's morphological scale; (3) focussing on unknown and interesting words; and (4) guessing meaning from the textual context. The majority of strategies related to discovery and determination of meaning tend to relate to the incidental mode.

B. Consolidation-memory strategies

Learners primarily utilise these sets of strategies to remember a word once it has been taught or encountered. Fifteen types of memory strategies were used by L2 learners in all three studies. Five VLSs were reported as being employed to learn vocabulary intentionally: (1) L2 word–picture association; (2) L2–L1 association; (3) a focus on presentation order; (4) using physical action when learning a word; and (5) the keyword method. Five strategies were reported as being employed to learn vocabulary incidentally: (1) focusing on the abstract meaning; (2) focusing on the story's characters; (3) remembering the story line; (4) paraphrasing the word's meaning; and (5) learning words as collocation. Five VLSs were also identified as being used in both modes of vocabulary learning: (1) associating a word's spoken form with its meaning; (2) connecting a word to its synonyms and antonyms; (3) connecting a word to personal experience and previous knowledge; (4) using new words in sentences; and (5) visualising the target word and image.

C. Consolidation-cognitive strategies

Six VLSs were classified as cognitive strategies: (1) three strategies were reported as used for learning vocabulary intentionally (i.e. written repetition, note taking and rehearsal); (2) two strategies were reported as used for learning vocabulary incidentally (i.e. reading repetition, and reading to achieve a thorough understanding); and (3) a L2–L1 translation strategy was reported as being employed for both modes of learning.

D. Consolidation-metacognitive strategies

Three VLSs were reported under this category. The strategy of using spaced word practice (i.e. expanding rehearsal) was reported as being used in both modes of learning. The strategy of a self-generation of target words was reported as being used to learn and recall words intentionally. In addition, the third metacognitive strategy (i.e. leave any unknown words) was reported as being used in incidental vocabulary learning.

7.1.2 Factors impacting on learners' use of strategy

This study identified a number of factors influencing personal, mode and task factors for strategy use, which are further discussed in relation to quantitative and qualitative data. Quantitatively, the number of strategies were key to the significant effects arising from predictor variables, including: (1) group (i.e. English/Chinese); (2) mode of learning; and (3) length of test. Qualitatively, these factors included: (1) learners' motivation for employing specific VLS, for example, an interest in choosing and focusing on target words; (2) learning styles and previous background, based on L1 (i.e. English or Chinese); (3) mode of learning Arabic (i.e. intentionally/incidentally); (4) the design of the learning task; and (5) language features and characters of Arabic, i.e. the role of the short vowel, word's rote and morphological scale.

7.1.3 A variety of the most frequently-used strategies

The study also revealed the most frequently used strategy for each learner, based on frequency and his belief in its effectiveness. These were considered the self-selected ‘core’ set of strategies (Barcroft, 2009), in which each learner reported a single strategy as being the most effective for recalling the meaning of words in both modes of learning. The strategies in the intentional mode most frequently reported by English learners during both immediate and delayed word retention tests were: (1) *associate word to its root (derivation)*; (2) *L2 word–picture association*; and (3) *rehearsal (i.e. rote memorisation)*. In addition, the strategies reported most frequently by Chinese learners in the initial uptake and delayed post-tests were: (1) *L2 word–picture association* and (2) *rehearsal (i.e. rote memorisation)*. Moreover, a variety of the most frequently preferred strategies were utilised by the L2 group in the incidental mode to recall newly acquired vocabulary for the incidental (immediate/delayed) retention tests, under both isolation and context conditions. Furthermore, the findings revealed that a number of the MFSs resulted in a higher target word recall.

7.1.4 Differences in scores and number of strategies between the two incidental words tests conditions, i.e. isolation and context

The findings of the testing of words incidentally in isolation and context conditions for both groups of L2 learners revealed improved scores for recalling words from context in comparison to recalling words in isolation. This finding suggests that providing L2 learners with contextual information clues in short sentences during word recall tests has a positive impact on learners’ immediate and delayed ability to recall meaning. This investigation further revealed that a higher number of strategies was reported for both groups (i.e. English/Chinese) under isolated words’ tests conditions than in context-based conditions. This was due to the majority of English and Chinese learners most frequently employing the strategy of *guessing*

from textual context for the immediate- and delayed post-test in the context-based conditions. These findings from the incidental learning experiment confirmed the effectiveness of a number of further strategies (i.e. in addition to guessing strategies) for the participants in each L2 group, even when context was provided.

7.1.5 Significant relationship between the number of strategies used and uptake of vocabulary in post and delayed post-test tasks

The most significant effect in both post- and delayed-test scores resulted from the *number of strategies* used, as well as a three-way interaction emerging between *learning mode*, *group*, and *number of strategies*. This led to the scores for each group being influenced by the number of different strategies reportedly used, i.e. the greater the number of strategies used by participants to learn vocabulary (intentionally or incidentally) in both post-tests, the greater the word retention. This finding indicated the significant impact of VLSs on both modes of vocabulary learning, and in particular when it came to the incidental mode, which was previously believed to involve only the unconscious processes of natural language activities, i.e. the guessing strategy. However, the current study revealed that conscious VLSs processes were employed in the incidental mode (even the guessing strategy itself), while the qualitative data identified how learners consciously processed and employed a guessing strategy when unable to establish meaning by using strategies from inside the target word. Moreover, learners consciously reported employing a guessing strategy as a support tactic for further strategies, solely to confirm the correct meaning of the target words.

7.1.6 Significant relationship between VLSs and the acquisition of vocabulary type

(noun/verb) and their subtypes

A significant interaction was identified in the post-test score of noun target words between learning mode (*intentional/incidental*) and noun type (*concrete/abstract*). This resulted from the considerable difference between the scores in the intentional and incidental learning modes for the *concrete* words type, with the former eliciting higher scores for immediate post-test retention. However, no differences emerged between the results for the two learning modes (*intentional/incidental*) for the *abstract* words type. This finding: (1) confirms the power of learning concrete words intentionally, as paired pictures, over learning such words incidentally in context; and (2) highlights the significance of the intentional learning method for advanced L2 learners, due to acquiring a large number of target words (in particular concrete nouns) over a short period of time. This finding therefore supports the suggestion of previous studies that, even for advanced L2 learners, a degree of intentional focus is essential for the development of skills and strategies.

The results of the analysis of the delayed post-test score of nouns indicated the effects and interactions with a number of strategies between groups (i.e. *English/Chinese*), and noun type (*concrete/abstract*). One of the most significant results concerned the main effect from *noun type (concrete/abstract)* resulting from the accuracy score for concrete nouns (50%) being significantly higher than that of abstract nouns (41%). This reflected the improved retention and retrieval of concrete nouns (in comparison with abstract words) over a greater length of time. This result accords with previous findings, as well as with the implications of DCT. The analysis also exposed a number of significant effects and interactions on abstract nouns between *group* and *number of strategies*. The principal effect of *group* on *abstract* nouns resulted from the improved performance of the English group in relation to abstract words, due to their greater use of strategies in the intentional mode (i.e. eighteen, as opposed to the Chinese

group, which only employed eleven types of strategies). The English group employed context association strategies, which appeared to improve their recall of abstract words. The significant effect of the *number of strategies* on abstract nouns is caused by the progressive relationship between the number of strategies employed and the scores obtained, i.e. the greater the number of strategies, the higher the scores for the number of abstract words acquired. This result in particular, reflects that abstract items require additional effort and strategies to be processed and retrieved.

The analysis of the post-test score of verb target words revealed the impact of *learning mode*, *number of strategies*, and a three-way interaction between *group*, *mode*, and *number of strategies*. The influence of *learning mode* on verb acquisition resulted from the mean accuracy scores for the intentional learning mode being higher than the mean accuracy scores for incidental learning. This finding was found to support the pattern observed in concrete nouns, i.e. that the intentional learning mode has (in comparison to the incidental mode) a significant impact on the acquisition of a large number of target words over a short period of time. The three-way interaction between *group*, *learning mode*, and *number of strategies* resulted from the *number of strategies* used by the English group in the intentional learning mode leading to higher scores. However, when it came to the Chinese group, the *number of strategies* resulted in improved scores in the incidental mode of learning. This finding supports the patterns previously observed during an examination of the general effect of the *number of strategies* upon retention, and that the greater *number of strategies* used by the English group in the intentional mode led to improved results in the post-test, in comparison to the Chinese. Furthermore, the greater the number of strategies used by the Chinese in the incidental learning mode the higher their performance in the post-test, significantly outperforming the English group. These results again confirm the benefits of VLSs for both modes of learning.

The delayed-test scores of verb target words revealed a three-way interaction between *group*, *learning mode*, and *number of strategies*. This was due to the strong effect of the *number of strategies* on the scores of the English group in the intentional learning mode. However, the variable *number of strategies* for the Chinese group had a strong effect on scores for the incidental mode of vocabulary learning. This signifies the role of VLSs in both modes, with the number of strategies used by each group (i.e. English in intentional and Chinese in incidental mode), both immediately and following a period of one week, influencing their ability to recall verbs. The results also indicate that the variable *number of strategies* resulted in improved scores for action verbs in contrast to state verbs. Accordingly, alongside the use of strategy, this may result from the nature of action verb itself, and its concrete representation in memory, since action verbs were learnt intentionally in association with pictures. This method of dual coding processing (i.e. both verbal and pictorial) may allow learners to improve their processing and retrieval of words over considerable period of time.

The study also confirmed that the combination of effective strategies led to satisfactory results, i.e. learners combining more than one effective strategy achieved high grades and were able to remember target words on a long-term basis.

7.2 Implications of the study

The findings of this study resulted in a number of implications.

7.2.1 VLSs are key for successful intentional and incidental L2 vocabulary acquisition

The findings of the three experimental studies present the theoretical development and empirical evidence in VLSs and their significance for the learning of vocabulary in both the intentional and incidental mode. Through identifying, describing, evaluating, and comparing VLSs under the intentional and incidental modes of vocabulary learning, this study has provided empirical evidence based on the mode and task design of vocabulary learning,

concerning: (1) the type of strategies selected; (2) their method of selection; and (3) why they are used in certain ways. The original contribution of this study in the field of SLA and VLS is the identification of different VLSs underlying vocabulary acquisition in the incidental mode. The first and second experiments of intentional and incidental vocabulary learning identified the types and frequencies of reported VLSs by means of quantitative analysis, while the third experiment (i.e. eye-tracking and incidental vocabulary learning) identified the qualitative aspect of strategy use, i.e. whether strategies are well chosen and implemented in appropriate steps. A number of general strategy types were identified in the current study (i.e. guessing from context and reading repeatedly) and were used in different ways for various purposes.

This study has also provided in-depth qualitative evidence to describe the use of vocabulary learning strategies specifically within the Arabic context. The study identified a number of similarities and differences between VLSs used for Indo-European languages and those used for Arabic. The successful implementation of the eye-tracking technique and stimulated verbal recall in incidental vocabulary learning yielded justification of the strategy use and the factors behind these choices. In addition, the views of the learners, and the researcher's analysis further identified a number of potentially influencing factors for strategy use.

7.2.2 The essential need for intentional vocabulary learning for advanced L2 learners

In comparison to the incidental mode of learning, intentional vocabulary acquisition revealed a greater and more rapid gain. This invalidates any incorrect assumptions potentially leading teachers to believe that (due to their high levels of proficiency) advanced learners require lower levels of intentional learning/teaching of vocabulary (Allothman, 2014), as discussed in section 3.3.3. The results of this current study have established that both modes of vocabulary learning are essential for mastering advanced learners' vocabulary.

7.2.3 A number of key VLSs L2 learners should focus on and be trained to use

This study has established that, in the incidental mode of vocabulary learning, context association strategies result in improved scores for abstract and state words. L2 learners should therefore be trained to employ these strategies in incidental vocabulary acquisition, including: (1) associating a word with its root; (2) using a word's morphological scale; (3) guessing from textual context; and (4) associating a word's spoken form with its meaning. Moreover, the strategy of visualising target words and pictures was reported as one of the most frequent strategies employed in incidental vocabulary learning, resulting in high target word scores. This strategy should therefore be adopted by incidental and intentional learners, and teachers should be trained to encourage their learners to successfully process and retrieve target words through the use of rich context and sequential stories, in order to facilitate imaging representation in memory. On the other hand, rehearsal (i.e. root memorisation) and L2 word picture association have been found to result in improved scores for the intentional mode of learning. In addition, the results revealed that eleven VLSs were effectively employed within both modes of learning, and therefore L2 learners and their teachers should be encouraged to focus on these key strategies.

7.2.4 DCT implications

DCT has been found to account for some of the most effective VLSs used in current methods of intentional and incidental vocabulary learning, with its effectiveness resulting from the positive impact of concreteness and imagery on memory. Pictures are valuable for delivering cues for novel words and meaningful elaboration in the form of nonverbal context (e.g., Bisson et al., 2015; Carr & Mazur-Stewart, 1988; Jared et al., 2013; Smith et al., 1987; Stahl et al., 1992). Traditionally, meaningful vocabulary has been acquired intentionally through direct instruction and incidentally through contextual analysis. The current study has found that conscious vocabulary learning strategies employing imagery (e.g. visualisation of

target words and pictures, along with illustrations) are effective for both intentional and incidental vocabulary learning. Furthermore, DCT, in this study, not only assists in establishing *what* strategy works for intentional and incidental vocabulary acquisition, but also in understanding *why* it works within a specific context (both verbal and nonverbal). This study has thus made a substantial contribution to the understanding of strategy use.

7.2.5 Methodological implications

This study established the innovative use of the triangulation method of eye-tracking, verbal reports and stimulated recall, as a productive method of studying VLSs of both intentional and incidental vocabulary learning. The study employed a combination of online measures of eye-tracking and stimulated recall, offline vocabulary tests and verbal reports of the strategies used, to successfully examine: (1) the incidental acquisition of knowledge of unknown words from reading and (2) the cognitive processing strategies used during online reading of novel words in context. These sets of data highlighted the importance of the simultaneous use of the eye tracking tool and the stimulated verbal recall as supporting materials to provide the researcher with the opportunity to explore the deeper effects of employing VLSs in incidental vocabulary learning. A sole reliance on the quantitative data would have misled the inferences concerning the qualitative aspect of strategy use, due to quantitative data (i.e. type/number of strategies and vocabulary scores) generally stating the final outcome of the types and frequencies of reported strategies without any exploration of the processes undertaken by learners/readers while processing the new lexical items in incidental learning.

In the current study, the use of the eye-tracking technique enabled a systematic investigation of the participants' strategies without any interruption to their learning session. In addition, the use of stimulated verbal recall prevented the loss of information as a result of participants forgetting exactly how they employed the strategy when engaging with target

words in the learning session. Moreover, an eye-tracking video was used to refresh their memories of their behaviour when reading and encountering new words. This resulted in the participants noting additional strategies and further details concerning the key aspects of strategy use and the reasons for their behaviour. This technique was beneficial to the researcher and the participants, enabling both to focus on the area of interest by firstly, determining each target word and its surrounding context in advance and secondly, monitoring participants' concentration on areas of interest.

7.3 Limitations of the study

7.3.1 The use of a single type of vocabulary assessment

The current study positively identified VLSs used by two groups within two modes of learning, and examined the impact on different aspects of word knowledge (e.g. parts of speech and concreteness/abstractness). However, it only used one type of vocabulary test (i.e. a meaning recall/definition test), which was first taken immediately, and then following a gap of one week. Any further investigations should therefore use multiple tests to assess the impact of VLSs upon different aspects of word knowledge. There is also one of the influential limitations of the study that no control group (e.g. beginners) and control words (known words) were involved. Further research is needed including a control group and control words studying the impact of VLSs in incidental and intentional learning on vocabulary acquisition.

7.3.2 Generalisability

A total of forty participants took part in the first and second experimental studies (intentional/incidental), with twenty participants in each experiment, and ten participants in each group (English/Chinese). This is a relatively small number of participants for the generalisability of the results to the wider population of L2 learners, and this may also have influenced the reasonability of the results. It is thus recommended that any future research

should use a larger number of participants, in order to increase the validity of the scores, VLSs frequency, and the effect on word retention.

7.4 Suggestions for future research

The findings, implications and limitations of this current study has identified a number of suggestions for future VLS research.

7.4.1 Comparative research concerning VLSs between intentional and incidental modes

This study established that L2 learners consciously use VLSs in the incidental vocabulary learning mode. In addition, it examined the significance of VLSs for both modes of learning, in particular for incidental learning through reading. This identified a need for additional in-depth research to compare the effect of employing VLSs in both modes of vocabulary learning, i.e. intentional and incidental. In particular, the limited number of participants in the current research highlights the need for additional comparative studies to establish whether VLSs can influence learning and retention of lexical items in both the intentional and incidental mode.

Moreover, this study used only a single type of vocabulary assessment to investigate the effect of VLSs on some aspects of word knowledge. It is therefore recommended that future studies employ multiple tests (i.e. different measures of productive or receptive knowledge) to assess the impact of VLSs upon different aspects of word knowledge.

In addition, more specifically targeted experimental studies will be able to focus on training learners to employ the strategies identified in this current study (in particular those used in the incidental mode) in relation to learners' vocabulary knowledge, in order to establish the influence of training on firstly, learners' use of strategies and secondly, their vocabulary acquisition. Furthermore, the strategies used by advanced learners of Arabic can be transferred to beginners.

7.4.2 The use of triangulation of eye-tracking, stimulated recall, and verbal recall in VLSs

The fruitful use of this methodological triangulation in the incidental mode of learning has resulted in a number of suggestions for future research in the use of eye-tracking and stimulated verbal recall interviews. The eye-tracking technique was found to be a robust method, with the potential to investigate variant aspects of vocabulary knowledge, as well as the impact of vocabulary learning strategies. The use of stimulated verbal recall following the vocabulary test prevented the loss of aspects of information as a result of participants forgetting their exact use of the strategy when engaging with target words in the learning session. Future studies should consider running the eye-tracking technique in intentional vocabulary learning research with two different groups of learners, in order to identify the exact VLSs used, and how they differ when used intentionally rather than incidentally. This could be achieved by designing an intentional/direct vocabulary learning on a computer screen, to enable researchers to compare the intentional learning of pictorial and concrete items with verbal and abstract items.

This technique has been proven to systematically investigate participants' strategy use without the need to interrupt the learning session. It may also prove beneficial for future research exploring the behaviour of participants while answering the vocabulary tests, in order to observe the difference between testing words in isolation and context. This could be achieved by simultaneously providing the vocabulary test and the learning materials by means of a single split-screen. In the current study, the identified qualitative aspects of strategy use were only gathered from English participants by means of stimulated recall. Therefore, gathering qualitative aspects of strategy use from different L1 backgrounds will result in additional detail, and thus a clearer vision of strategy use in both intentional and incidental vocabulary learning.

7.5 Conclusion

The current study employed both quantitative and qualitative methods to identify vocabulary learning strategies used by L1 English and Chinese learners of Arabic in two modes of vocabulary learning, i.e. intentional and incidental. It further investigated the influence of these strategies upon word retention, both immediately and following a gap of one week.

The research firstly, identified thirty-three VLSs employed by L2 learners in response to the demands of the task design of each mode of vocabulary learning (i.e. intentionally/incidentally). Secondly, it discussed and classified the identified VLSs based on four main categories, according to previous taxonomies of VLSs (i.e. Nation, 2013; Schmitt, 1997). The qualitative analysis of the data gathered from eye-tracking and stimulated recall provided valuable and comprehensive details concerning learners' method of strategy selection and implementation, while the findings outlined the motivation for this strategy, which, in turn, reflected on the effectiveness of the learners' strategy use.

The findings of the linear mixed-effects model run on the quantitative data (i.e. vocabulary scores and number of strategies) further emphasised the significance of vocabulary learning strategies for both intentional and incidental modes of learning, and confirmed that the combination of effective VLSs can result in improved scores for immediate and delayed post-tests. The study further examined how learning concrete items in the intentional mode resulted in good scores over long period of time. The results also confirmed the implications of DCT, i.e. that abstract and state items require additional effort and a greater number of strategies, in contrast to concrete items that can be easily processed and retrieved, even with a low number of strategies. These findings therefore result in the conclusion that VLSs are essential for both intentional and incidental modes of learning.

Appendices

Appendix A Ethical issues and Pilot studies

A1 Ethical issues for pilot and main studies (department committee approval)



Education Ethics Committee
Ethical Issues Audit Form

This questionnaire should be completed for each research study that you carry out as part of your degree. Once completed, please email this form to your supervisor. You should then discuss the form fully with your supervisor, who should approve the completed form. **You must not collect your data until you have had this form approved by your supervisor (and possibly others - your supervisor will guide you).**

Surname / Family Name:	Al-Hakami
First Name / Given Name:	Ali Mohammed Y
Programme:	PhD Student
Supervisor (of this research study):	Prof Leah Roberts
Topic (or area) of the proposed research study:	
Self-Selected Strategies of L2 Learners: Effects on Immediate- and Delayed Word Retention in Intentional and Incidental Vocabulary Acquisition	
Where the research will be conducted:	
At the Institute of Teaching Arabic Language (ITAL), which is affiliated with Al-Imam Muhammad Ibn Saud Islamic University in Riyadh, Saudi Arabia.	
Methods that will be used to collect data:	
<p>The pre-test: experimental words determination</p> <p>In order to ensure that words are unfamiliar to the learners; learners will be required to complete a pre-test prior to the treatment phase. The pre-test will include a list of 40 words; 30 of them (the experimental words) will be selected according to three main criteria: (1) 15 words will be concrete and abstract nouns, to use them for intentional vocabulary test; and (2) the other 15 words will be consisted of abstract and concrete words, to be used at incidental vocabulary learning. (3) There is a strong probability that the participants will not know the words, the reverse is the case with the control words (the remaining 10 words).</p> <p>At the task of the pre-test stage the participants will be instructed to write the meaning next to any of the 40 Arabic words that they knew or think they might know.</p> <p>Intentional vocabulary learning tests:</p> <p>The first post-test: Intentional immediate Test</p> <p>At the beginning, the participants will be informed that they will be tested on the experimental words after the learning phase. The learning phase includes viewing word-pictures pairs for six seconds each on a screen. All of the target words will be presented twice in this manner, each time in the same order.</p> <p>After the learning phase the participants will take the short-term test, which is a picture-to-L2 recall test that requires the participants to write target Arabic words when present with pictures. At the end of this test, the participants will be instructed to answer two questions about the strategies they used during the learning phase.</p>	

The questions will be given to the students all with the pre-test papers, they will be also presented on the screen at the front of the class. These two questions will be as follows:

1. Please list and describe the strategies that you used when attempting to learn the new Arabic words.
2. Which strategy did you use most frequently? And why?

The second post-test: Intentional Delayed Test

The long-term test will be conducted a week after as a final phase at intentional vocabulary learning; it will be a same as the short test (a picture-to-L2 recall test). Also two questions will be used for this test.

Incidental vocabulary learning tests:

The third post-test: Incidental immediate test.

In the incidental part, the participants will be provided with a short story from Arabic Literature, including 15 target words. The story and the 15 target words will be chosen according to the results of the pre-test. Learners will be provided also with marginal glosses including the 15 target words and additional 15 words from another story, in order to reduce the salient of the 15 target words. After the learning phase, two post-tests regarding incidental acquisition will be administered.

At the beginning of this test, the subjects will be instructed; 1) to spend 25 minutes on reading the text, 2) there will be comprehension questions to test their comprehension knowledge of the text. 3) The text will no longer exist during their comprehension test. However, instead of assessing their knowledge of the whole meaning of the text, they will be tested on their knowledge of the 15 target words. At the end of this test, the participants will be instructed to answer two questions about the strategies they used during the learning phase.

The questions will be given to the students all with the short-test papers, they will be also presented on the screen at the front of the class. These two questions will be as follows:

1. Please list and describe the strategies that you used when attempting to learn the new Arabic words.
2. Which strategy did you use most frequently? And why?

The forth post-test: Incidental Delayed test.

The long-term test will be conducted a week after as a final phase at incidental vocabulary learning; it will be a same as the incidental short test (test on vocabulary knowledge learned incidentally through reading). Also two questions will be used for this test.

As noted in the methodology above, two types of instruments will be used to collect the data in the present study: tests and questionnaires. Most of the data will be analysed quantitatively.

If you will be using human participants, how will you recruit them?

The study will recruit 40 Arabic Second Language (ASL) students from the Institute of Teaching Arabic Language (ITAL), which is affiliated with Al-Imam Muhammad Ibn Saud Islamic University in Riyadh. All participants will undertake five tests over five phases: a *pre-test*, which will be conducted to determine which experimental words (those unknown to all the participants) will be used. After the pre-test, four post-tests will be administered over the following four phases; two of them (a *short-term* and *long-term tests*) will be used at intentional learning. The other two (a *short-term* and *long-term tests*) will be used at incidental vocabulary learning.

Supervisors, please read *Ethical Approval Procedures: Students*. Note: If the study involves children, vulnerable participants, sensitive topics, or an intervention into normal educational practice, this form must also be approved by the programme leader (or Programme Director if the supervisor is also the

Programme Leader); or the TAP member for Research Students. It may also require review by the full Ethics Committee (see below).

First approval: by the supervisor of the research study (after reviewing the form):

Please ✓ one of the following options.

I believe that this study, as planned, meets normal ethical standards	✓
I am unsure if this study, as planned, meets normal ethical standards	
I believe that this study, as planned, does not meet normal ethical standards and requires some modification	

Supervisor's Name (please type):	Prof Leah Roberts
Date:	18-2-2014

Supervisor - If the study involves children, vulnerable participants, sensitive topics, or an intervention into normal educational practice (see *Ethical Approval Procedures: Students*), please email this form for second approval to the Programme Leader (or Programme Director if the supervisor is also the Programme Leader); or the TAP member for Research Students. For this second approval, other documents may need to be sent in the same email e.g. the proposal (or a summary of it) and any informed consent and participant information sheets.

If the study has none of the above characteristics, the supervisor should email this completed form to the Programme Administrator.

Second approval: by the Programme Leader; or Programme Director; or TAP member for Research Students:

Please ✓ one of the following options:

<u>I believe that this study, as planned, meets normal ethical standards</u>	✓
<u>I am unsure if this study, as planned, meets normal ethical standards</u>	
<u>I believe that this study, as planned, does not meet normal ethical standards and requires some modification</u>	

<u>Name of Programme Leader; or Programme Director; or TAP member (please type):</u>	<u>Chris Kyriacou</u>
<u>Date:</u>	<u>18-2-2014</u>

The supervisor should now email this completed form to the Programme Administrator, unless approval is required by the full Ethics Committee (see below).

Approval required by the Full Education Ethics Committee?

Note to Programme Leader, UG/PG director, or TAG member: If the study involves a) deception, or b) an intervention and procedures could cause concerns, or c) if the topic is sensitive or potentially distressing, review by the full Education Ethics Committee is required. Please pass to the Chair of the Education Ethics Committee via the Research Administrator.

FOR COMPLETION BY THE STUDENT

Data sources

- 1 If your research involves collecting secondary data only, *please go to SECTION 2.*
- 2 If your research involves collecting data from people (e.g. by observing, testing, or teaching them, or from interviews or questionnaires), *please go to SECTION 1.*

SECTION 1: For studies involving people

- 3 Is the amount of time you are asking research participants to give reasonable? **YES**
- 4 Is any disruption to their normal routines at an acceptable level? **YES**
- 5 Are any of the questions to be asked, or areas to be probed, likely to cause anxiety or distress to research participants? **NO**
- 6 Are all the data collection methods used necessary? **YES**
- 7 Are the data collection methods appropriate to the context and participants? **YES**
- 8 Will the research involve deception? **NO**
- 9 Will the research involve sensitive or potentially distressing topics? (The latter might include abuse, bereavement, bullying, drugs, ethnicity, gender, personal relationships, political views, religion, sex, violence. If there is lack of certainty about whether a topic is sensitive, advice should be sought from the Ethics Committee.) **NO**

If YES, what steps will you take to ensure that the methods and procedures are appropriate, not burdensome, and are sensitive to ethical considerations?

- 10 Does your research involve collecting data from vulnerable or high risk groups? (The latter might include participants who are asylum seekers, unemployed, homeless, looked after children, victims or perpetrators of abuse, or those who have special educational needs. If there is a lack of certainty about whether participants are vulnerable or high risk, advice should be sought from the Ethics Committee. Please note, children with none of the above characteristics are not necessarily vulnerable, though approval for your project must be given by at least two members of staff; see above). **NO**

If YES, what steps will you take to ensure that the methods and procedures are appropriate, not burdensome, and are sensitive to ethical considerations?

- 11 Are the research participants under 16 years of age? **NO**
If NO, go to *question 12.*

If YES, and you intend to interact with the children, do you intend to ensure that another adult is present during all such interactions? YES/NO

If NO, please explain, for example:

i) This would seriously compromise the validity of the research because [*provide reason*]

ii) I have/will have a full Criminal Records Bureau check) YES/NO

iii) Other reasons:

Payment to participants

12 If research participants are to receive reimbursement of expenses, or any other incentives or benefits for taking part in your research, please give details, indicating what or how much money they will receive and, briefly, the basis on which this was decided:

£7 for each participant and free biscuit and coffee.

If your study involves an INTERVENTION i.e. a change to normal practice made for the purposes of the research, go to question 13 (this does not include 'laboratory style' studies i.e. where ALL participation is voluntary):

If your study does not involve an intervention, go to question 20.

13 Is the extent of the change within the range of changes that teachers (or equivalent) would normally be able to make within their own discretion? YES/NO

14 Will the change be fully discussed with those directly involved (teachers, senior school managers, pupils, parents – as appropriate)? YES/NO

15 Are you confident that *all* treatments (including comparison groups in multiple intervention studies) will potentially provide some educational benefit that is compatible with current educational aims in that particular context? (Note: This is *not* asking you to justify a non-active control i.e. continued normal practice) YES/NO

Please **briefly** describe this / these benefit(s):

16 If you intend to have two or more groups, are you offering the control / comparison group an opportunity to have the experimental / innovative treatment at some later point (this can include making the materials available to the school or learners)? YES/NO

If 'NO', please explain:

- 17 If you intend to have two or more groups of participants receiving different treatment, do the informed consent forms give this information? YES/NO
- 18 If you are randomly assigning participants to different treatments, have you considered the ethical implications of this? YES/NO
- 19 If you are randomly assigning participants to different treatments (including non-active controls), will the institution and participants (or parents where participants are under 16) be informed of this in advance of agreeing to participate? YES/NO

If NO, please explain:

General protocol for working in educational institutions

- 20 Do you intend to conduct yourself, and advise your team to conduct themselves, in a professional manner as a representative of the University of York, respectful of the rules, demands and systems within the institution you are visiting? YES
- 21 If you intend to carry out research with children under 16, have you read and understood the Education Ethics Committee's *Guidance on Working with Children Under 16*? YES

Informed consent

- 22 Have you prepared Informed Consent Form(s) which participants in the study will be asked to sign, and which are appropriate for different kinds of participants? YES

If YES, please attach the informed consent form(s).

If NO, please explain:

- 23 Does this Informed Consent Form:
- a) inform participants in advance about what their involvement in the research study will entail? YES
 - b) inform participants of the purpose of the research? YES
 - c) inform participants of what will happen to the data they provide (how this will be stored, who will have access to it, whether and how individuals' identities will be protected during this process)? YES

d) if there is a possibility that you may wish to use some of the data publicly (e.g. at research conferences or online), have you told the participants how identifiable such data will be and given them the opportunity to decline such use of data? YES

e) give participants the names of two people to whom any concerns or complaints should be directed to, including the contact details of these people (email addresses or work telephone numbers)? YES/NO

f) in studies involving interviews or focus groups, inform participants that they will be given an opportunity to comment on your written record of the event? YES

If NO, have you included this on your consent form? YES/NO

If NO, please explain why not:

g) inform participants how long the data is likely to be kept for? NO

h) inform participants if the data could be used for future analysis and/or other purposes? YES

24 Who will be asked to sign an Informed Consent Form? Please **tick all** that apply:

CATEGORY	<input checked="" type="checkbox"/>
Adult research participants	<input checked="" type="checkbox"/>
Research participants under 16	<input type="checkbox"/>
Teachers	<input type="checkbox"/>
Parents	<input type="checkbox"/>
Head/Senior leadership team member	<input type="checkbox"/>
Other (please explain)	<input type="checkbox"/>

25 In studies involving an **intervention** with under 16s, will you seek informed consent from parents? YES/NO

If NO, please explain:

If YES, please delete to indicate whether this is 'opt-in' or 'opt-out'

If 'opt-out', please explain why 'opt-in' is not being offered:

SECTION 2

Data Storage, Analysis, Management and Protection

26 I have read and understood the Education Ethics Committee's *Guidance on Data Storage and Protection* YES

27 I will keep any data appropriately secure (e.g. in a locked cabinet), maintaining confidentiality and anonymity (e.g. identifiers will be encoded and the code available to as few people as possible) where possible. YES

28 If your data can be traced to identifiable participants:

a) who will be able to access your data?

Me – the researcher.

b) approximately how long will you need to keep it in this identifiable format?

Three years.

29 If working in collaboration with other colleagues, students, or if under someone's supervision, please discuss and complete the following:

We have agreed:

- a) [Me- the researcher and my Supervisor] will be responsible for keeping and storing the data
- b) [Me- the researcher and my Supervisor] will have access to the data
- c) [Me- the researcher and my Supervisor] will have the rights to publish using the data

Reporting your research

30 In any reports that you write about your research, will you ensure that the identity of any individual research participant, or the institution which they attend or work for, cannot be deduced by a reader? YES

If the answer to this is 'NO', please explain:

Conflict of interests

31 If the Principal Investigator or any other key investigators or collaborators have any direct personal involvement in the organisation sponsoring or funding the research that may give rise to a possible conflict of interest, please give details:

Potential ethical problems as your research progresses

- 32 If you see any potential problems arising during the course of the research, please give details here and describe how you plan to deal with them:

--

Student's Name (please type):	Ali Mohammed Y Al-Hakami
Date:	10/02/2014

Please email this form to your supervisor. They must approve it, and send it to the Programme Administrator by email.

NOTE ON IMPLEMENTING THE PROCEDURES APPROVED HERE:

If your plans change as you carry out the research study, you should discuss any changes you make with your supervisor. If the changes are significant, your supervisor may advise you to complete a new 'Ethical issues audit' form.

For Taught Masters students, on submitting your Masters Dissertation to the programme administrator, you will be asked to sign to indicate that your research did not deviate significantly from the procedures you have outlined above.

For Research Students (MA by Research, MPhil, PhD), once your data collection is over, you must write an email to your supervisor to confirm that your research did not deviate significantly from the procedures you have outlined above.

A2 Form of consent to take part in a research project

Title of project: Self-Selected Strategies of L2 Learners: Effects on Immediate- and Delayed Word Retention in Intentional and Incidental Vocabulary Acquisition.

Brief outline of project

The project aims to examine the impact of different modes of learning L2 vocabulary deliberately and incidentally, along with the influence of self-selected strategies of L2 learners upon short and long-term retention of new lexical items.

Procedures

Thank you for agreeing to participate in this study. You will be subjected to seven tests over five phases: each phase will take place on a different day. In a *pre-test*, you will take a proficiency test then you will be asked whether you know or not some Arabic words. After the pre-test, six post-tests will be administered over the following four phases.

Participation

Participation in the project is voluntary, and you are free to withdraw at any time. Data will be anonymous and your identity will not be revealed when we publish the findings of our research.

نموذج الموافقة على المشاركة في مشروع بحثي

عنوان البحث: أثر الاستراتيجيات (الطرق) المستخدمة من قبل متعلمي اللغة الثانية – أثناء اكتساب المفردات بشكل مقصود أو عرضي – على تذكر الكلمات على المدى القصير والبعيد للذاكرة.

لمحة مختصرة عن البحث

تهدف الدراسة لاختبار نوعين مختلفين من أنواع اكتساب المفردات (الاكتساب بشكل مُنَعَّم [مقصود] أو عَرَضِي [غير مقصود]) وأثر الاستراتيجيات المستخدمة من قبل متعلمي اللغة الثانية على تذكر المفردات الجديدة على المدى القصير والبعيد للذاكرة.

الإجراءات المتبعة

شكراً على قبولك المشاركة في هذا البحث، ستكون هناك سبعة اختبارات موزعة على خمس مراحل، كل مرحلة في يوم مختلف.

في الاختبار الأول: ستختبر اختباراً عاماً في الكفاءة اللغوية، ثم سَتُسأل عن مدى معرفتك لبعض الكلمات العربية الجديدة.

بعد الاختبار الأول ستكون هناك ستة اختبارات موزعة على أربع مراحل.

المشاركة

المشاركة في هذا البحث تطوعية، وللمشارك الحق في الانسحاب أي وقت شاء. كما أن جميع البيانات ستكون محفوظة بشكل آمن، ولن تظهر هوية المشارك عند نشر نتائج البحث.

FORM OF CONSENT TO TAKE PART IN A RESEARCH PROJECT

نموذج الموافقة على المشاركة في مشروع بحثي

Please tick the statements you agree with

الرجاء وضع علامة صح على الفقرات التي توافق عليها

I confirm that I have read and understand the information sheet dated / /201 explaining the above research project and I have had the opportunity to ask questions about the project.

أؤكد أنني قرأت وفهمت صفحة المعلومات بتاريخ / / 201 والتي تشرح مشروع البحث المذكور أعلاه، وقد أتيت لي فرصة طرح أي استفسار عن البحث.

I agree for the data collected from me to be used in relevant future research.

أوافق على استخدام البيانات المأخوذة مني في الأبحاث ذات الصلة مستقبلاً.

I agree to take part in the above research project and will inform the lead researcher should my contact details change.

أوافق على المشاركة في مشروع البحث المبين أعلاه، وسأقوم بإعلام الباحث عند تحديتي لمعلومات الاتصال في حال الحاجة إلى ذلك.

Name of participant اسم المشارك	
Participant's signature توقيع المشارك	
Mother tongue اللغة الأم	<input type="checkbox"/> English language اللغة الإنجليزية <input type="checkbox"/> Chinese language اللغة الصينية
Age العمر	
Length of studying Arabic مدة دراسة العربية	<input type="checkbox"/> 1-2 years / سنة إلى سنتين <input type="checkbox"/> 2-3 years / سنوات <input type="checkbox"/> 3-4 years / سنوات <input type="checkbox"/> more than 4 years / أكثر من أربع سنوات
Purpose of studying Arabic الهدف من دراسة العربية	
Date التاريخ	
Name of lead researcher or person taking consent اسم الباحث الرئيس أو من أخذ الموافقة	ALI ALHAKAMI علي الحكمي
Signature التوقيع	
Date التاريخ	

A3 Intentional learning phase

Learning phase:

At the following slides you will view word-pictures pairs for six seconds each.
All of the target words will be presented twice in this manner.

All slides will run in less than three minutes.

Please do your best to learn the following new Arabic words and memorise them, because you will be tested on the 14 experimental words after the learning phase.

مِرْسَاة



مُنْخَل



إِجْتَاخ

• إجتاح: ذاهم وعم وأهلك.

إجتاحت الجيوش البلاد: غزتها، احتلتها ونمزتها.

اجتاح الجراد المزرعة: أهلكها ودمرها.

فِطْر



ثَمْرَةُ الْقَرْع



مُواكِبَةٌ

- المُواكِبَةُ: هي المُتَابِعَةُ لِلشَّيْءِ، والمُواظِبَةُ عَلَيْهِ.
- مُواكِبَةُ الْعَمَلِ: مُتَابِعَتُهُ وَالْمُواظِبَةُ عَلَيْهِ.

مِجْرَفَةٌ



جُنُوبٌ



رُوجٌ

- رُوجُ الشَّيْءِ: جِطَهُ زَالِجًا، أَيْ مُنْتَشِرًا.
- رُوجُ الْأَخْبَارِ: أَشَاعَهَا وَنَشَرَهَا.

مِيزَةٌ



مِزْهَرِيَّةٌ



وَتِيْرَةٌ

• الوتيرة هي الطريقة والأسلوب والنظام المطرد المستمر.

الوتيرة: هي المداومة على الشيء، والطريقة المطردة المستمرة.

ستواصل العمل على وتيرة أسرع من الأشهر الماضية.

مِرْسَاة



مُنْحَل



اِحْتَاخ

• احتاخ: ذاهم وعم وأهلك.

احتاحت الجيوبن البلاد: غزتها، اختلتها ونقرتها.

احتاخ الجراد المزرعة: أهلكها ودمرها.

فَطْرٌ



ثَمْرَةُ الْقَرْع



مُواكِبَةٌ

- المُواكِبَةُ: هي المُتَابِعَةُ للشَّيْءِ، والمُواظِبَةُ عَلَيْهِ.
- مُواكِبَةُ الصَّلَاةِ: مُتَابِعَتُهُ وَالْمُواظِبَةُ عَلَيْهِ.

مِجْرَفَةٌ



جُنْدَبٌ



رَوْجٌ

- رَوْجُ الشَّيْءِ: جَعَلَهُ زَائِجًا، أَيْ مُنْتَشِرًا.
- رَوْجُ الْأَخْبَارِ: أَشَاعَهَا وَنَشَرَهَا.

مِبْرَدٌ



مَزْهَرِيَّةٌ



وَتِيْرَةٌ

• الوتِيْرَةُ هي الطريِقةُ والأسلوبُ والنظامُ المُتَّبعُ المُستَمرُّ.

الوتِيْرَةُ: هي المُداوِمَةُ على الشئِ، والطريِقةُ المُتَّبعَةُ المُستَمرَّةُ.

سَلُوَاصِلُ العَمَلِ على وتِيْرَةٍ أُنزِعَ مِنَ الأَشْهُرِ العَاضِيَةِ.

The end of learning phase:

- Now you will take a rest for three minutes.
- Then you will be tested on how well you remember the words.

قصة معلم

قلت لصديق لي أديب: إنني لأقرأ لك منذ عشر سنوات، فما رأيك أسنفت إنسافك في هذه الأيام، وإنني لأشك أنت تكتب ما تكتبه، أم يجري به قلمك وأنت نائم، فتأخذه فتضع عليه اسمك؟ فماذا عزاك أيها الصديق فأضاع بلاغتك ومخا آيتك؟

قال: دعني يا فلان دعني... فإن سراج حياتي يخبو، وشمعتي تنوب، وما أخالني إلا ميتاً عمًا قريب، أو دائراً في الأسواق مجنوناً... انتهيت... بعث رأسي وقلبي برغيف من الخبز. قلت: أزيغ عليك أيها الرجل وأخبرني ما بك، فلقد والله أزعيتني.

قال: وماذا بي إلا أنني معلم. إنني معلم في مدرسة ابتدائية، نهاري نهار المجانين، وليلي ليل القتلى، فمتى أفكر، ومتى أكتب، وأنا أروح العشيّة إلى البيت مهذود الجسم، مصدوع الرأس، جاف الحلق، فلا أستطيع أن أنام حتى أقرأ منة حماقة، وأصحح منة كراسة، فأعمي عيني بقراءتها، والإشارة إلى خطيها، وبين صوابها، وتقدير درجاتها، فإذا انتهيت من هذا كله -ولا يقرأ تلميذ من كل هذا شيئاً، ولا ينظر فيه- عمدت إلى دفتر تحضير الدروس، وهو الموت الأحمر، والبلاء الأزرق، الذي صبب علينا هذا العام صبا، فكتبت فيه ماذا أنا فاعل غدا في الفصل، دقيقة دقيقة، ولحظة لحظة، وماذا أنا قائل من كلمة، أو مقرر من قاعدة، أو ضارب من مثل، حتى إذا بلغت آخر كلمة فيه، استنفذت آخر قطرة من ماء حياتي، فسقطت في مكاني قليلاً، فحملت إلى السرير حملاً، فتمت يوماً مضطرباً تملؤه الأحلام المزعجة، والصور المرعبة، فأجس كان أمامي زكام الدقائر التي سأصخخها غداً، فلا أنجو منها حتى أبصر المفتش يتكلم من فوق الماذن، فلا يدع قاعدة من قواعد التربية، ولا نظرية من نظريات التعليم، ظهرت في فرنسا أو إنكلترا، إلا أردني على تطبيقها، في فصل فيه سبعون تلميذاً قد

معاني المفردات:

أسنفت إنسافاً: طلب الصغير والحقير والدني من الأمور. والانساف: الإنجذاب والنزول والتدني وعدم الجودة.

يجري: يسيل، والمعنى هنا ما يخبثه قلمك. عزاك: أصابك.

يخبو: يتطفئ ويضعف نوره ويريقه.

تنوب: نقول ذابت الشمعة إذا سالت وانتبت، والمعنى هنا: كناية عن التعب والانشغال التي يواجهها المعلم في عمله.

ما أخالني: أي وما رأيي وما اظنني.

أزيغ عليك: هوّن عليك، خفف عليك.

أزعيتني: أخفتني.

العشيّة: آخر النهار من زوال الشمس إلى الليل والعتمة.

مهذود الجسم: ضعيف، مثعب.

حماقة: حماقة: قلة العقل وعدم التفكير بشكل صحيح، والمعنى هنا: هو كثرة الأخطاء البسيطة من الطلاب.

عمدت: عمد: قصد وذهب إلى.

صبب علينا: أي فرّض علينا والزمننا به.

بلغت: وصلت.

استنفذت: انفقت وأنهيت.

زكام: الزكام ما اجتمع من الأشياء وتراكم بعضها فوق بعض.

حشيت بهم المقاعد حشوا، وصفوا على الشبابيك، ووضعوا على الرفوف، مما لا يَرْضَى عنه مَنْهَجٌ من مَنَاهِجِ التَّربِيَةِ، ولا قانون من قوانين الصحة، فإذا انْمَحَتْ هذه الصورة، رأيت كائِي أَفْهَمَ تَلْمِيذاً وهو يَصْنَعِي إِلَيَّ ولا يَفْهَمُ، فَأَكْرَزُ وأَعِيدُ فلا يفهم، فأقوم إليه أنظر ما يصنع، فإذا هو مُنْصَرَفٌ إلى دُبَيْرَةِ يَرْبِطُ رِجْلَهَا بِخَيْطٍ. فإذا شَتَمْتُهُ أو أخرجته من الفصل، ذهب يَسْتَنْجِدُ القانونَ فينجده القانون الذي حَرَّمَ العقوبات كلها، وكف يذ المَعْلَمِ، وشذ لسانه بِسِنْعَةٍ.. ولا أزال في هذه الأحلام تُثَوِّءُ بي، فَأَتَقَلَّبُ من جَنْبٍ إلى جَنْبٍ، أُحْسِنُ كأنْ رأسي من الصداع بِثِقَلٍ أُحْدِ، حتى يُصْبِحَ اللهُ بالصباح، فأفِيقُ مَذْغوراً أُحْسِنُ أن يسبقتي الوقت، فلا أدري كم ركعت وكم سجدت، ولا كيف أكلت ولبست، وأهزولُ إلى المدرسة لا أستطيع التأخر ولو طَحْنَتْنِي الأَوْجَاعُ، أو أَحْرَقْتْنِي الحُمَى، لأنَّ المَعْلَمَ لا يسمح له القانون أن يمرض في أيام المدرسة، وعنده أربعة أشهر ((عطلة الصيف)) يستطيع أن يمرض فيها، فإذا خالف ومرض، حُرِّمَ الراتب ومُنِعَ العطاء (كان هذا قانون تلك الأيام)!

أعدو إلى المدرسة، فأدخل على تلاميذ السنة الثالثة الأُولِيَّةِ، وهؤلاء هم تلاميذي، لم يجدوني أهلاً لأكبر منهم... فلا أنفك أقطع من عقلي لأُكْمِلَ عقولهم، وأمزق نفسي لأرَقِّع نفوسهم، ثم لا أفلح في تعليمهم ولا أنجح في تفهيمهم، ولا أدري من أين السبيل إلى مَدَارِكِهِمْ، فَأُنْفِقُ ساعةً كاملةً، أَقَلِّبُ أوجه القول، وأسْتَقْرِ عِبارَاتِ اللغة، لأفْهَمَهُمْ كيف يكون (الاسم هو الكلمة التي تدل على معنى مستقل في الفهم وليس الزمن جزءاً منه) فلا يفهمون من ذلك شيئاً، ولا أقدر أن أطرح هذا التَّعْرِيفَ السَّجِيفَ أو أستبدل به، فأهْذِي ساعةً ثم أقول: من فْهَمَ؟

فيرفع ولدٌ إصْبَعَهُ. فأحمد الله على أن واحداً قد فهم، وأقول: قم يا بني بارك الله فيك، فأخبرني عن معنى هذا التعريف.

فيقول: يا أستاذ هذا دَاسَنٌ قَدَمِي.

فأصبح به: ويحك أيها الخبيث! إنني أسألك عن تعريف الاسم، فلماذا

معاني المفردات:

حَشِيَتْ: مَلِنَتْ.

يُصْنَعِي: يَسْتَمِعُ وَيُنْصِتُ.

شَتَمَ: عَابَ وَسَبَّ.

يَسْتَنْجِدُ: يَسْتَعِيْثُ وَيَطْلُبُ الْمُسَاعَدَةَ وَالنَّجْدَةَ.

تُثَوِّءُ بي: تُثَقِّلُنِي. وَتَمِيلُ بي.

مَذْغوراً: خَائِفاً فَرَعاً.

لا أنفك: لا أزال.

مَدَارِكِهِمْ: أَيْ فَهْمِهِمْ وَاسْتِيغَابَهُمْ لِلدَّرْسِ.

أَطْرَحَ: انْتَزَكَ وَأَتَخَلَّى عَنِ الشَّيْءِ.

هَذَا يَهْذِي: تَكَلَّمَ بِحَلَامٍ غَيْرِ مَفْهُومٍ.

تضع فيه قدمك؟ ألم أقل لكم أن هذه الشكاوى ممنوعة أثناء
الدرس؟
فيقول: ولماذا يدوسن هو على رجلي؟
فأصبح بالآخر: لم دسنت على رجله يا شيطان؟
فيقول: والله لقد كذب، ما دسنت على رجله ولكن هو الذي عضني
في أذني.
فأغضب وأصرخ في وجهه: وكيف يعضك وأنا قاعد هنا؟
فيقول: ليس الآن، ولكنه عضني أمس.
ويتطوع العقابيت الصغار للشهادة للمدعي والمدعى عليه، ويزلزل
الفصل، فأضرب المنصّة بالعصا، وأسكتهم جميعا مهددا من يتكلم
بأقسى العقوبات، ولا أدري أنا ما أقسى العقوبات هذه؟...
فيخسسون ويبتلسون فأعود إلى الدرس فإذا هو قد طار من
رؤوسهم، على أنه ما استقرّ فيها قط !
وينفخ في الصور، فتقوم القيامة، ويخرج الأولاد إلى الفرصة.
ولا أزال في هذا البلاء بياض نهاري، ولا يأتي المساء
وفي بقيّة عقل، أو أثر من قوة، ثم لا أنا أرضيت الوزارة، ولا أنا
نفعت أبناء المسلمين، ولا أنا انصرفت إلى مطالعاتي وكتاباتي.
وهذه مكتبتي لم أدخلها منذ أول العام الدراسي، وهذه
مشروعات المقالات والبحوث التي أكتبها، وهذه مسودّات الكتاب
الجديد الذي أولّفه مبنوثة في جوانب العرفة، ضابغة مهملّة.
أفتلومني - بغد - على أنني لا أجود في هذه الأيام؟
قلت: هذه والله حالي فلست ألومك، فرج الله عني وعنك !

معاني المفردات:

عَضَّ يَعْضُ: أمسك الشيء بأسنانه وشدّ عليه.
المنصّة: طاولة أو مكتب يوضع للمعلم في بداية الفصل.
خَسَنَ: اختفى وغاب، والمعنى هنا: سكت وهذا.
يَبْتَلِسُ: يبتأسن ويَسْتَكْتِ.
اسْتَقَرَّ: ثبّت.
الفرصة: الفسحة.
أثر: علامة.
مطالعاتي: قراءتي، المطالعة: القراءة.
مشروعات: المنشور هو الغزل المخطّط له.
مبنوثة: منتشرة متفرقة.
أجود: أتقن، أحسن.

Appendix B Main study

B1 Slides of intentional learning phase

مرحلة التّلم:

في شرائح العرض التالية ستشاهد كلمات محسوسة مُوضحة بالصور الدالة عليها، كما ستشاهد كلمات مغلوبة مصحوبة بالمعنى والمثال الدال عليها.

كُلّ الكلمات (المحسوسة والمغلوبة) ستعرض مرّتين فقط وبشكل مرّتب.

مُدّة عرض الكلمات المحسوسة ستُتّوّن فقط، ومُدّة عرض الكلمات المعنوية عشرُ ثوانٍ.

مدة عرض الشرائح عشر دقائق.

رجاءُ أبذل ما في وسعك لتُلمّ واكتساب المفردات العربية الجديدة، وحاول أن تتذكّرّها جيداً؛ لأنك ستختبر فيها بعد مرحلة التّلم.

Learning phase:

At the following slides you will view word-pictures pairs and abstract Arabic words combined with their meaning in Arabic.

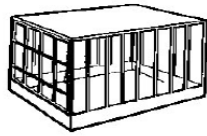
- All of the target words (concretes and abstracts) will be presented twice in this manner.
- The concrete words will be presented for 6 seconds each, and the abstract words will be presented in ten seconds each.
- **All slides will run in ten minutes.**

Please do your best to learn the following new Arabic words and memorise them, because you will be tested on the 32 experimental words after the learning phase.

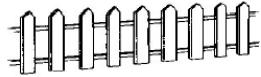
❖ When you are ready to start the learning phase, please press ENTER.

❖ عندما تكون جاهزاً لبدء مرحلة التّلم، فضلاً انقر على ENTER.

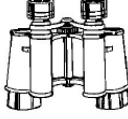
قَصَصٌ

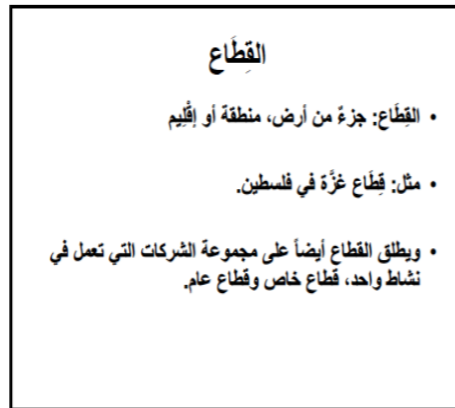
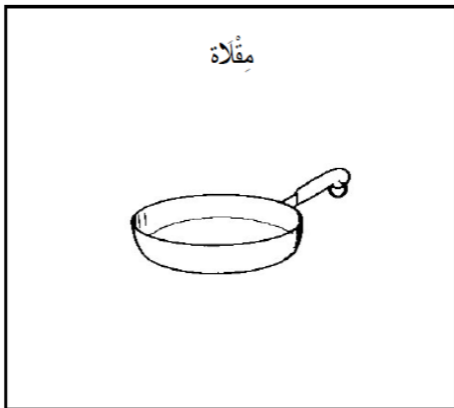
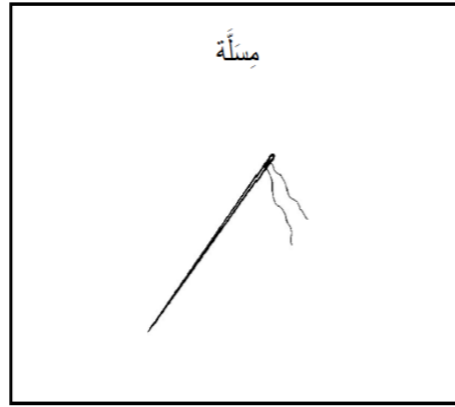
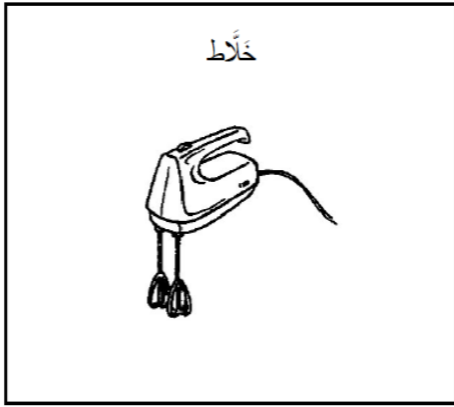
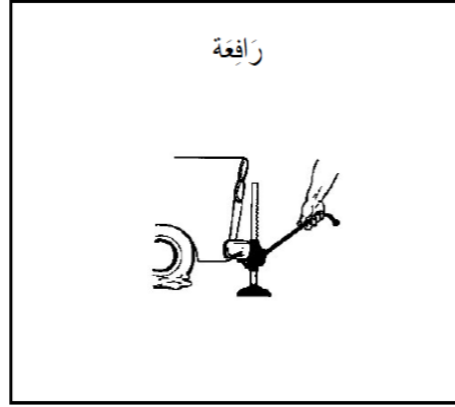
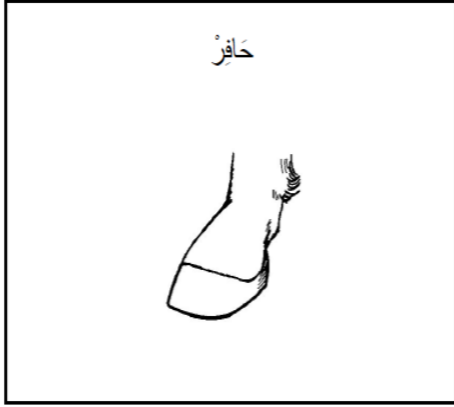


سِيَّاح



مُنْظَار





السُّطَّات

السُّطَّات: هي الحكومة أو المسؤولون عن اختصاص معين

السُّطَّة: هي السِّيادة والسيطرة والتحكُّم

السُّطَّات البريطانية: تعني الحكومة البريطانية

المؤتمرات

المؤتمر: مجلس يكون فيه اجتماع للتشاور والبحث في أمرٍ ما، ويكون غالباً في الأمور العلمية أو السياسية

مثل: مؤتمر جامعة الإمام لتعليم وخدمة اللغة العربية

أُتْعَاب

الأُتْعَاب هي مال يأخذه الإنسان لخدمة أو مشورة يقدمها.

نقول دفعنا للطبيب أتعابه، أي دفعنا له أجرته من المال بسبب خدمته لي.

المُفَاوَضَات

المُفَاوَضَات: هي تبادل وتناقش الآراء بين فريقين أو أكثر؛ من أجل الوصول إلى اتفاق مشترك بينهما

هناك مُفَاوَضَات بين أمريكا وروسيا حول الحرب في سوريا

البؤن

البؤن هو البُعْد، والفرق والمسافة بين شينين.

ويأتي البؤن بمعنى الفرق أو الفارق بين شينين.

نقول: هناك بؤن كبير بين معهد جامعة الإمام وجامعة الملك سعود.

إِسْتِبْدَادِيَّة

إِسْتِبْدَادِيَّة الشَّخْص بالأمر أي انفراد به من غير مشارك له فيه.

حُكُومَةٌ إِسْتِبْدَادِيَّةٌ أو «مُسْتَبَدَّةٌ» أي مُتَسَلِّطَةٌ ظالمة مُنْفَرِدَةٌ بِالْحُكْمِ.

يُقَالُ: حَكَّمَ إِسْتِبْدَادِيًّا، أي انفراديًّا، ظالماً، عُذْوَانِيًّا، تُعَصِّفِيًّا

الْقَرِيحَةُ

الْقَرِيحَةُ مِنَ الْإِنْسَانِ: طَبِيعَتُهُ الَّتِي فَطَرَ وَخَلَقَ عَلَيْهَا.

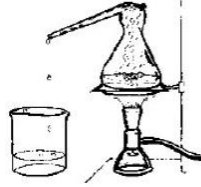
وَالْقَرِيحَةُ هِيَ مَلَكَةٌ وَقُدْرَةٌ فِي الْإِنْسَانِ يَسْتَطِيعُ بِهَا ابْتِدَاعَ وَتَأْلِيفَ الْكَلَامِ وَإِبْدَاءَ الرَّأْيِ.

نَقُولُ: جَاءَتْ قَرِيحَةُ الشَّاعِرِ فَكَتَبَ قَصِيدَةً جَمِيلَةً

يَلُوحُ



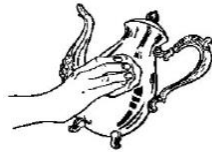
يَقْطُرُ



يَعْتَقِلُ



يَلْمَعُ



يَنْخَبِتُ



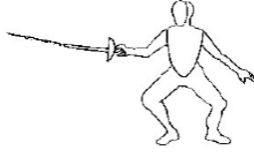
يَحِيكُ



يَسْوُلُ



يُبَارِزُ



اِكْتَفَى (فَعَلَ)

اِكْتَفَى بِالشَّيْءِ: أَي اسْتَعْنَى بِهِ وَقَنَّعَ.

اِكْتَفَى بِأَجْرٍ قَلِيلٍ اسْتَكْفَى بِهِ؛ أَي اسْتَعْنَى بِهِ وَقَنَّعَ.

نَقُولُ: صَالِحٌ اِكْتَفَى بِمَا عِنْدَهُ مِنْ مَالٍ وَلَمْ يَعْتَمِدْ عَلَى الْآخَرِينَ.

تَارَ (فَعَلَ)

تَارَ بِمَعْنَى هَاجَ وَظَهَرَ وَانْتَشَرَ بِسُرْعَةٍ

نَقُولُ: تَارَ الرَّجُلُ إِذَا غَضِبَ غَضَبًا شَدِيدًا.

تَارَ الْبِرْكَانُ: انْفَجَرَ وَقَذَفَ الْجَمَمَ الْمُسْتَعْبِلَةَ مِنْ بَاطِنِهِ.

تَارَ الْغُبَارُ أَوْ الدُّخَانُ أَي ظَهَرَ وَانْتَشَرَ.

شُغِفَ (فَعَلَ)

شُغِفَ بِهِ أَوْ شُغِفَ بِحَيْثُ: أَي أَحْبَبَهُ وَتَعَلَّقَ بِهِ بِشِدَّةٍ.

نَقُولُ شُغِفَ صَالِحٌ بِالْقِرَاءَةِ، أَي أَحْبَبَهَا وَتَعَلَّقَ بِهَا.

وَنَقُولُ الطَّالِبُ الْمُجْتَهِدُ مَشْغُوفٌ بِالدِّرَاسَةِ وَالْاِجْتِهَادِ وَالْعَمَلِ.

يَسْرَحُ (فَعْلٌ)

سَرَحَ الشَّخْصُ مُبَكَّرًا: خَرَجَ فِي الصَّبَاحِ الْبَاكِرِ.

يَسْرَحُ بِأَفْكَارِهِ بَعِيدًا: أَي يَخْلُمُ، يَأْخُذُهُ خَيَالُهُ بَعِيدًا، وَيَأْخُذُهُ الْأَفْكَارُ الْمُخْتَلِفَةَ.

سَرَحَ ذَهْنَهُ وَعَقْلَهُ: أَي ذَهَبَ وَشَرَدَ، وَفَقَدَ الْقُدْرَةَ عَلَى رِبْطِ أَفْكَارِهِ أَوْ تَعْبِيرَاتِهِ.

يَسْتَحْوِذُ (فَعْلٌ)

يَسْتَحْوِذُ عَلَى الشَّيْءِ: يَسْتَوَلِي عَلَيْهِ وَيَجْعَلُهُ لِنَفْسِهِ

اِسْتَحْوِذَ عَلَيْهِ الْمَثُ أَي: غَلَبَ عَلَى تَفْكِيرِهِ، وَأَخَذَهُ.

اِسْتَحْوِذَ الْاِخْتِبَارَ عَلَى اِهْتِمَامِ الطَّلَابِ، أَي شَغَلَهُمْ فَلَا يَفْكَرُونَ إِلَّا فِي الْاِخْتِبَارِ.

اِسْتَحْفَ (فَعْلٌ)

1- اِسْتَحْفَكَ فُلَانًا، أَوْ اِسْتَحْفَكَ بِفُلَانٍ: أَي هَزَى وَاسْتَهَانَ بِهِ، أَهَانَهُ، وَتَجَاهَلَهُ وَعَامَلَهُ بِاِحْتِقَارٍ وَازْدِرَاءٍ، أَهْمَلَهُ.

2- {فَاسْتَحْفَتَ قَوْمَهُ فَأَطَاعُوهُ}: اِسْتَجْهَلَهُمْ وَاسْتَهَانَ بِهِمْ .

يَطْرِبُ (فَعْلٌ)

يَطْرِبُ مِنْهُ، أَوْ لَهُ: أَي يَخْفُ وَيَهْتَرُ مِنْ فَرَحٍ وَسُرُورٍ.

يَطْرِبُ لِلْقِيَاءِ وَالْمُوسِيقَى: أَي يَرْتَاحُ وَيُنْشِطُ وَيَهْتَرُ.

طَرِبَ صَالِحٌ لِنَجَاحِهِ فِي الْاِمْتِحَانِ، أَي فَرِحَ بِنَجَاحِهِ.

تَقَشَّفَ (فَعْلٌ)

تَقَشَّفَ الرَّجُلُ: عَكَسَ تَنَعُّمَ،

أَي تَرَكَ الدُّنْيَا وَنَعِيمَهَا، وَصَبَّقَ عَلَى نَفْسِهِ وَاِكْتَفَى بِمَا هُوَ ضَرُورِيٌّ، وَابْتَعَدَ عَنِ الْمَلَذَّاتِ وَالتَّنَعُّمِ.

تَقَشَّفَ فِي لِبَاسِهِ: اِكْتَفَى بِالخَشْنِ الْبَالِي مِنَ الْبِاسِ.

تَقَشَّفَتِ الرَّجُلُ: سَاعَتْ أَوْالُهُ وَصَاقَ عَيْشُهُ، وَأَصْبَحَ فَقِيرًا.

نَهَائِيَّةُ مَرَحَلَةِ التَّلْعَمِ

The end of the learning phase

• Now you will be tested on your knowledge of the 32 targets words

• الآن سَنَبْتُمُ اِحْتِبَارِكُمْ عَنْ مَدَى قُدْرَتِكُمْ عَلَى تَذَكُّرِ الْمُفْرَدَاتِ الْجَدِيدَةِ.

B2 Vocabulary test: (A) in isolation and (B) in context

B2.1 Vocabulary tests in **isolation** with questions about the used strategies

Name of participant اسم المشارك	
Participant's signature توقيع المشارك	
Mother tongue اللغة الأم	<input type="checkbox"/> English language اللغة الإنجليزية <input type="checkbox"/> Chinese language اللغة الصينية
Other language اللغات الأخرى	
Age العمر	
Length of studying Arabic مدة دراسة العربية	<input type="checkbox"/> 1-2 years / سنة إلى سنتين <input type="checkbox"/> 2-3 years / سنوات <input type="checkbox"/> 3-4 years / سنوات <input type="checkbox"/> more than 4 years / أكثر من أربع سنوات
Purpose of studying Arabic الهدف من دراسة العربية	
Date التاريخ	
Name of lead researcher or person taking consent اسم الباحث الرئيس أو من أخذ الموافقة	ALI ALHAKAMI علي الحكمي
Signature التوقيع	
Date التاريخ	

سيطلب منك الآن:

1- توضيح معاني المفردات التي تعلمتها أثناء قراءتك للنص، وستكون الكلمات مجردة من سياقاتها. (testing)
words in isolation

ثم تجيب عن الأسئلة الخاصة بالاستراتيجيات والطرق المستخدمة لتعلم المفردات أثناء قراءة النص.

2- توضيح معاني المفردات التي تعلمتها أثناء قراءتك للنص، وهي متصلة بالسياق. (testing words in
context)

ثم تجيب عن الأسئلة الخاصة بالاستراتيجيات والطرق المستخدمة لتعلم المفردات أثناء قراءة النص.

يرجى منك توضيح معاني المفردات التالية:

(1) المُوْتَمَر:

(2) القِطَاع:

(3) السُّلْطَات:

(4) المُفَاوِضَات:

(5) اُنْعَاب:

(6) اسْتِنْدَادِيَّة:

(7) البَوْنُ أَوْ بَوْن:

(8) قَرِيحَة:

(9) فَقَص:

(10) رَافِعَة:

(11) سِيَّاح:

(12) مَنظَار:

(13) حَافِر:

(14) مِقْلَاة:

(15) مِسْلَة:

(16) خَلَّاط:

- (17) يُلَوِّحُ:
- (18) يُفَطِّرُ:
- (19) يَعْتَقِلُ:
- (20) يُلْمِعُ:
- (21) يَنْحَتُّ:
- (22) يَحِيكُ:
- (23) يَنْسَوِلُ:
- (24) يُبَارِزُ:
- (25) اِكْتَفَى يَكْتَفِي:
- (26) نَارٌ يَنْوُرُ:
- (27) شُعِفَ:
- (28) اسْتَحَوَذَ يَسْتَحْوِذُ:
- (29) سَرَحَ يَسْرَحُ:
- (30) يَطْرَبُ:
- (31) اسْتَحَفَّ:
- (32) تَفَشَّفَ:

السؤال الأول:
فضلاً قم بذكر وشرح كل الاستراتيجيات والطرق التي استخدمتها لتعلم الكلمات الجديدة أثناء قراءتك للقصة.

The first question:

Please list and describe the strategies that you used when attempting to learn the new Arabic words through reading the text.

السؤال الثاني:
ما هي الاستراتيجية (الطريقة) التي استخدمتها بشكل متكرر لتذكر معاني الكلمات السابقة، ولماذا؟

The second question:

Which strategy did you use most frequently? Why? (only one strategy)

B2.2 Vocabulary test in **context** with question about the used strategies

Name of participant اسم المشارك	
Participant's signature توقيع المشارك	
Mother tongue اللغة الأم	<input type="checkbox"/> English language اللغة الإنجليزية <input type="checkbox"/> Chinese language اللغة الصينية
Other language اللغات الأخرى	
Age العمر	
Length of studying Arabic مدة دراسة العربية	<input type="checkbox"/> 1-2 years / سنة إلى سنتين <input type="checkbox"/> 2-3 years / سنوات <input type="checkbox"/> 3-4 years / سنوات <input type="checkbox"/> more than 4 years / أكثر من أربع سنوات
Purpose of studying Arabic الهدف من دراسة العربية	
Date التاريخ	
Name of lead researcher or person taking consent اسم الباحث الرئيس أو من أخذ الموافقة	ALI ALHAKAMI علي الحكمي
Signature التوقيع	
Date التاريخ	

المهمة الثانية:

في هذه المهمة سيطلب منك توضيح معاني الكلمات المكتسبة في التعلم العرضي (غير المقصود) وهي متصلة بسياقاتها.
(testing words in context)

ثم سيطلب منك توضيح الاستراتيجيات والطرق التي استخدمتها لتذكر الكلمات الجديدة.

يرجى توضيح معاني المفردات التي تحتها خط فيما يلي:

- 1- أعجبتني خطابك الذي ألقينته في المؤتمر الذي أقامته جامعة
- 2- وقد شغف قلبي بحب العربية منذ أن كنت طفلاً
- 3- وكثيراً ما تجود قريحة جدّي فيكتب شِعراً جميلاً جداً
- 4- فاستحوذ الشعر والأدب العربي عليه
- 5- وقد قامت السلطات الباكستانية بتكريمه
- 6- ويطرب قلبي لقراءة وسماع بعض القصائد الجميلة
- 7- ولن أكتفي بذلك، بل سأحاول أن أدرس الفرق بين العربية والإنجليزية
- 8- فكما تعلم هناك يون كبير بين اللغتين
- 9- واستطعت أن أجمع بعض المال عن طريق العمل في القطاع الخاص
- 10- فكنت أنظف وألمع التحف بشكل مستمر
- 11- وكنت أستخدم رافعة خاصة لرفع وتحريك التحف والأواني الثقيلة من مكان إلى آخر
- 12- حيث كنت أشاهده وهو ينحت بعض التحف والهدايا التذكارية من الخشب والمعادن
- 13- فقليل اليوم من يستخدم السيف ليبارز به حين يمارس رياضة المبارزة فقط
- 14- وصناعة الحدوة التي تحمي حافر الخيل
- 15- أرجو منك أن تحضرن لنا مقالة جيدة للطبخ
- 16- وسوف أهديك جهاز خلط أيضاً؛ لتعصير فيه الفواكه وتستمتع بطعم العصير الطبيعي

17- فَأَنَا لَسْتُ مِمَّنْ يَجِبُ أَنْ يَتَسَوَّلَ الْمَالَ مِنَ النَّاسِ وَإِنْ كَانُوا أَهْلِي وَأَقْرَبِي

18- وَالْمَالُ الَّذِي أَخَذَهُ إِنَّمَا هُوَ أَتْعَابُ الْخِدْمَةِ وَالْعَمَلِ فِي الْمَصْنَعِ

19- عَنْ طَرِيقِ بِنَاءِ سِبَاغٍ مِنَ الْخَشَبِ وَمِنَ الْحَدِيدِ يُحِيطُ بِالْحَدَائِقِ وَالْبُيُوتِ وَيَقْصِلُهَا عَنْ بَعْضِ

20- فإِذَا رَأَتْ الشَّرِكَةُ كَانَتْ إِدَارَةَ اسْتِبْدَائِيَّةٍ ظَالِمَةً لَا تَسْتَمِعُ لِأَحَدٍ

21- وَعِنْدَمَا يَجِينُ مَوْعِدُ صَرْفِ الْأُجُورِ كَانَ يُفْطِرُ لَهُمُ الرَّاتِبَ تَقْطِيرًا،

22- اسْتَنَدَمْنَا مَعَهُ بِدَايَةِ اسْتَلُوبِ الْمُفَاوِضَاتِ لِلْوَصُولِ إِلَى حَلٍّ مُنَاسِبٍ يُرْضِي جَمِيعَ الْأَطْرَافِ

23- وَلَكِنَّهُ اسْتَخَفَّ بِنَا وَبِقُدْرَاتِنَا وَسَخَّرَ مِنَا

24- فَلَمْ يَحْتَمِلِ الْعَمَالُ هَذَا الظُّلْمَ وَتَارُوا عَلَيْهِ جَمِيعًا مُطَالِبِينَ بِحُقُوقِهِمْ

25- عِنْدَهَا أَمْرَ الْقَاضِي رَيْبَسَ الشَّرْطَةَ بِأَنْ يَعْتَقَلَ مُدِيرَ الشَّرِكَةِ وَأَعْوَانَهُ

26- وَكَانَ عَقْلِي يَسْرُحُ كَثِيرًا فِي التَّفَكِيرِ وَالتَّسَاوُلِ عَنْ كَيْفِيَّةِ جَمْعِ الْمَالِ لِإِكْمَالِ دِرَاسَتِي؟

27- وَكُنْتُ كَالطَّيْرِ الْمَحْبُوسِ فِي قَفْصٍ

28- فَإِذَا بِصَدِيقِي أَحْمَدَ يُلَوِّحُ إِلَيَّ بِيَدِهِ مِنْ بَعِيدٍ

29- تَعَلَّمْتُ مِنْ أَحْمَدَ كَيْفَ اسْتَعْدَمَ الْمَسَلَّةَ وَالْخَيْطَ وَكَيْفَ اسْتَعْدَمَ آلَةَ الْخِيَاطَةِ

30- وَأَنَا أَرَأَيْتُ صَدِيقِي أَحْمَدَ وَهُوَ يُحِيكُ الْأَقْمِشَةَ وَالْمَلَابِسَ بِمَهَارَةٍ عَالِيَةٍ حَتَّى تَعَلَّمْتُ الْخِيَاطَةَ

31- وَاسْتَنْطَعْتُ أَنْ أَتَقَشِّفَ عَنِ الْكَمَالِيَّاتِ وَالزَّيْنَةِ وَاسْتَعْنَيْتُ بِمَا هُوَ مُهِمٌّ وَضَرُورِي لِلْحَيَاةِ فَقَطْ

32- لَقَدْ تَعَلَّمْتُ أَنْ أَنْظُرَ لِلْحَيَاةِ وَالْأَحْلَامِ الْبَعِيدَةِ بِمَنْظَرٍ بَعِيدٍ وَوَاسِعٍ

السؤال الأول:
فضلاً قم بذكر وشرح كل الاستراتيجيات والطرق التي استخدمتها لتعلم الكلمات الجديدة أثناء قراءتك للقصة.

The first question:

Please list and describe the strategies that you used when attempting to learn the new Arabic words through reading.

السؤال الثاني:
ما هي الاستراتيجية (الطريقة) التي استخدمتها بشكل متكرر لتذكر معاني الكلمات السابقة، ولماذا؟

The second question:

Which strategy did you use most frequently? Why? (only one strategy)

حوار بين صديقين

سليم طالب أمريكي يدرس اللغة العربية في جامعة الإمام محمد بن سعود الإسلامية في مدينة الرياض، تعرّف سليم على طالب آخر من باكستان، اسمه عبد السلام ودار بينهما الحوار التالي:

سليم: أنت تتكلم اللغة العربية بطلاقة يا عبد السلام، وقد سمعت من بعض الزملاء في المعهد أنك تكثب الشعر أيضاً، وقد أعجبتني خطابك الذي ألقيتَه في المؤتمر الذي أقامته جامعة الإمام عن أهمية اللغة العربية. عبد السلام: شكراً لك يا صديقي سليم، نحن في باكستان نحب اللغة العربية حباً شديداً، وقد شغفت قلبي بحبها منذ أن كنتُ طفلاً، حين كنتُ أستمع لقراءة القرآن في مساجد باكستان؛ ولهذا السبب تعلمت اللغة العربية صغيراً. وأما بخصوص الشعر، فقد تأثرت بجدي الشاعر محمد ضياء، الذي كان يكثب الشعر باللغتين الأزدية والعربية، وكثيراً ما تجود قريحة جدي فيكتب شعراً جميلاً جداً، أما أنا فلا أملك قريحة وموهبة مثله.

تعلم جدي محمد اللغة العربية في الجامعة الإسلامية في المدينة المنورة ثم التحق بكليّة اللغة العربية وحصل على درجة البكالوريوس ثم الماجستير في علم البلاغة والنقد، وخلال فترة دراسته كان يقرأ ويستمتع للشعر العربي كثيراً؛ فاستحوذ الشعر والأدب العربي عليه وملك قلبه، فأصبح يكثب الشعر باللغة العربية، وحين عودته أصبح أستاذاً في الجامعة الإسلامية في باكستان، وقد قامت السلطات الباكستانية بتكريمه؛ لما قدمه في خدمة وتعليم اللغة العربية في باكستان. وأنا أحاول أن أكون مثل جدي في كثير من الأمور، ولهذا السبب أقرأ كثيراً في الأدب العربي شعراً ونثراً، ويترب قلبي لقراءة وسماع بعض القصائد الجميلة، وأحاول تقليدها.

سليم: إذا أنت من عائلة مهتمة باللغة العربية وآدابها، هل تعلم؟ لقد شوقتني لدراسة الأدب العربي، فأنا متخصص أصلاً في الأدب الإنجليزي، ولن أكتفي بذلك، بل سأحاول أن أدرس الفروق اللغوية الكثيرة بين العربية والإنجليزية، كما سأتعرف أيضاً على الفنون الأدبية الأخرى، فكما تعلم هناك بون كبير بين اللغتين.

عبد السلام: من الجيد أن تُفكر بدراسة الفرق بين اللغتين في الدراسات العليا، ولكن كيف ستدفع مصاريف الدراسة؟

سليم: لقد فكرت في هذا الأمر كثيراً قبل أن آتي للدراسة، واستطعت أن أجمع بعض المال عن طريق العمل في القطاع الخاص، في مصنع يملكه عمي ناصر، لإنتاج أدوات الزينة والتحف والأواني المنزلية، حيث كنت أذهب للعمل في الفترات المسائية وفي أوقات الإجازات. وكان عملي في البداية هو الاهتمام بالتحف وتنظيفها، فكنت أنظف وألمع التحف بشكل مستمر؛ حتى تظهر بمظهر جميل يُعجب الزوار، كما أنني مسؤول أيضاً عن وضع كل قطعة في المكان المناسب لها؛ وكنت أستخدم رافعة خاصة لرفع ونقل وتحريك التحف والأواني الثقيلة من مكان إلى آخر. ثم انتقلت إلى قطاع الإنتاج في المصنع وتعلمت من عمي فن النحت، حيث كنت أشاهده وهو ينحت بعض التحف والهدايا التذكارية من الخشب والمعادن، كما تعلمت صناعة السيوف الجميلة التي تستخدم غالباً للزينة،

فقليل اليوم من يستخدم السيوف ليبارر به حين يُمارس رياضة المبارزة فقط، وكما تعرف، فقد ترك الناس الرياضات القديمة كالفرسيّة والمبارزة وركوب الخيل، واتجهوا للرياضات الحديثة مثل كرة القدم، ومع ذلك فالمصنع لا زال يوقر بعض الأشياء اللازمة لمحبي الخيل والفرسيّة مثل صناعة السرج الذي يوضع على ظهر الفرس، وصناعة الحدوة التي تحمي حافر الخيل.

عبد السلام: هذا رائع وممتع، لا شك أنك تعلمت الكثير من المهارات خلال عملك في المصنع، في المرة القادمة حين عودتك من أمريكا، أرجو منك أن تحضر لنا مقلاة جيدة للطبخ، ومكثوب عليها اسم المصنع حتى نخبر الزملاء.

سليم: حسناً يا صديقي سأحضر لك ما تريد من أدوات الطبخ، وسوف أهديك جهاز خلط أيضاً؛ لتعصر فيه الفواكه وتستمتع بطعم العصير الطبيعي.
عبد السلام: أنا حقاً مُعجب بك، فرغم كون المصنع لعَمِكَ ناصر، إلا أنك لم تطلب منه المال، واعتمدت على نفسك.

سليم: نعم يا صديقي، فأنا لست ممن يحب أن يتسول المال من الناس وإن كانوا أهلي وأقاربي، وأحب دائماً العمل والاعتماد على نفسي في كل شيء، والمال الذي كنت أخذه إنما هو أتعاب وأجرة الخدمة والعمل في المصنع. والآن أخبرني عن نفسك، هل سبق وأن عملت في قطاع خاص أو عام في باكستان؟
عبد السلام: نعم يا صديقي، سبق لي أن عملت في قطاع خاص بإحدى شركات البناء، والتي كانت تهتم بترتيب وترتيب البيوت والحدائق، عن طريق بناء سياج من الخشب ومن الحديد يُحيط بالحدائق والبيوت ويفصلها عن بعض. ولكن للأسف لم يطل بقائي فيها، فإدارة الشركة كانت إدارة استبدادية ظالمة لا تستمع لأحد، وتحرم الموظفين من حقوقهم، وصاحب الشركة كان يوجز دفع رواتب الموظفين، وكان يعتذر بأعذار غير مقبولة، وعندما يحين موعد صرف الرواتب كان يفتقر لهم الراتب تظهيراً، كالرجل الذي يسئيك الماء قطرة قطرة.
سليم: وماذا فعلتم بعد ذلك؟

عبد السلام: استخدمنا معه بداية أسلوب المفاوضات للوصول إلى حل مناسب يرضي جميع الأطراف، وقلنا له إذا لم تدفع لنا سنرفع الأمر للمحكمة وسوف نخسر الشركة، ولكنه استخف بنا وبفدراتنا وسخر منا، فلم يحتمل العمال هذا الظلم، وانفقوا جميعاً عن التوقف عن العمل في الشركة لمدة إسبوع كامل، ثم تاروا عليه جميعاً مطالبين برواتبهم وحقوقهم، وقلنا برفع أمره للمحكمة، ولكنه لم يحضر موعد المحاكمة، عندها أمر القاضي رئيس الشرطة بأن يعقل مدير الشركة وأعوانه.
سليم: وهل بحثت عن عمل بعد ذلك؟

عبد السلام: نعم، لقد بحثت وكنتي لم أجد عملاً مناسباً، وكان عقلي يسرح كثيراً في التفكير والتساؤل عن كيفية الحصول على عمل مناسب؛ أجمع من خلاله المال لإكمال دراستي؟ وكنت كالطير المحبوس في قفص، فلا هو يستطيع الطيران والسفر، ولا هو يستطيع إيجاد مخرج من هذا القفص.

وفي يوم من الأيام وأنا خارج من المسجد فإذا بصديقي أحمد يلوح إلي بيده من بعيد، فذهبت إليه وسلمت عليه، وأخبرني بأنه وجد لي عملاً في مصنع الملابس الذي يملكه والده. وفي المصنع تعلمت من أحمد كيف أستخدم المسلة والخيط وكيف أستخدم آلة الخياطة، فهو خياط ماهر، وبقيت على هذه الحال قرابة شهر كامل وأنا أراقب صديقي أحمد وهو يحيك الأقمشة والملابس بمهارة عالية حتى تعلمت الخياطة. وبالرغم من قلة الراتب، فقد أحببت العمل في هذا المصنع الجميل، واستطعت أن أتقشف عن الكماليات ومظاهر الزينة واستعنيت بما هو مهم وضروري للحياة فقط؛ حتى أستطيع جمع ما يكفي من المال لمواصلة الدراسة في المملكة العربية السعودية.

سليم: الحمد لله، لقد نجحت يا صديقي، واستطعت تحقيق حلمك.
عبد السلام: الحمد لله، لقد تعلمت أن أنظر للحياة بمنظار بعيد وواسع، وتعلمت بأن الحياة تحتاج لصبر وعمل حتى نحقق أحلامنا.

B4 A sample of the added comments next to the participant's response.

السؤال الأول:
فضلاً فمّ بذكر وشرح كل الاستراتيجيات و الطرق التي استخدمتها لاكتساب الكلمات الجديدة
أثناء قراءتك للقصة.

1. توقع من خلال معاني الألفاظ التي سبق الكلمات الجديدة
أو يأتي بعدها. مع سياقة المعنى

~~تحت الكلمات من المعاني~~

- مرارة النص لضم الخ الغام
- حدود الكلام الجديدة
في قراءته

عندما أقرأ القصة في المرة الأولى. إذا وجدت الكلمة الجديدة
أكتب تحتها خطاً. و أواصل في القراءة. حتى انتهيت من مرة أولى.
و بدأت مرة ثانية. و لا أقرأ القصة كلها. رأيت أغلب الألفاظ
قد فهمتها في مرة سابقة. إلا أقرأ ~~الجملة التي~~ جملة فيها
كلمة التي كتبت تحتها خطاً. و أقرأ هذه الجملة متكرراً
و أحلل السياقة بين الألفاظ حتى أجد كلمة أخرى
لها علاقة مع الكلمة الجديد فتساعدني في فهمها.

- العرادة بدقة الحكا الجمل التي فيها كلام جديد
- رد الكلام لوصفها التلامي أو الفعل الماضي واستخدام الكلمة
- ربط الكلمات الجديدة بالأعراب السابقة.

Appendix C Data Analyses

C1. Means of the predictor variables; age, length of learning Arabic, and other languages on the outcome variable Post- and Delayed Test Scores.

Effects	imm score			Delayed Score		
	Variance	SD		Variance	SD	
Random effects						
Participant	0.00024	0.0153		6.17E-05	0.007857	
Item	8.58E-05	0.0093		0.000135	0.011605	
Fixed effects	Estimate	Std. Error	t value	Estimate	Std. Error	t value
Intercept	4.051504	6.5222	0.621	4.908185	5.640618	0.87
other_language:No	-3.310701	5.2924	-0.626	-2.280395	4.483328	-0.509
Mode: intentional	-3.818503	5.4996	-0.694	-3.629769	4.992107	-0.727
age	-0.192861	0.2792	-0.691	-0.216226	0.241421	-0.896
length_learn_arabic	-0.069132	0.1268	-0.545	-0.076982	0.109884	-0.701
other_language:No* Mode: intentional	0.997455	3.2449	0.307	4.296843	2.793488	1.538
other_language:No ; age	0.133852	0.2289	0.585	0.094334	0.193522	0.487
other_language:No ; length_learn_arabic	0.086169	0.1127	0.764	-0.020105	0.098502	-0.204
Mode: intentional; age	0.164231	0.2383	0.689	0.144474	0.216032	0.669
Mode: intentional ;length_learn_arabic	0.091349	0.1049	0.871	0.06031	0.098164	0.614
age ; length_learn_arabic	0.003802	0.0055	0.697	0.003882	0.004726	0.821
other_language:No ; Mode: intentional ; age	-0.020322	0.1541	-0.132	-0.182798	0.13156	-1.389
other_language:No ; Mode: intentional ;length_learn_arabic	-0.021161	0.0187	-1.132	-0.002969	0.015776	-0.188
other_language:No;age ; length_learn_arabic	-0.003259	0.0046	-0.709	0.000912	0.004015	0.227
Mode: intentional ; age ; length_learn_arabic	-0.003415	0.0046	-0.742	-0.002124	0.004289	-0.495

C2. Means of the predictor variables; age, length of learning Arabic, and other languages on the outcome variable number of strategies in Immediate and delayed post-tests.

Effects	No of strategy imm.			No of strategy Delayed		
	Variance	SD		Variance	SD	
Participant	1.949801427	1.396353		54.87778062	7.407954	
Item	0	0.000000		0	0.000000	
Fixed effects	Estimate	Std. Error	t value	Estimate	Std. Error	t value
Intercept	-6.476921	9.352124	-.693	307.730333	7.006488	43.921
other_language:No	-74.934575	7.410103	-10.112	-270.377629	5.480580	-49.334
Mode: intentional	4.171330	6.921300	.603	-131.566868	5.110701	-25.743
age	.162018	.401015	.404	-13.569744	.297347	-45.636
length_learn_arabic	.235213	.180301	1.305	-5.598302	.133635	-41.892
other_language:No* Mode: intentional	-46.958411	5.701388	-8.236	198.084402	4.259313	46.506
other_language:No ; age	2.971222	.331954	8.951	13.144986	.245949	53.446
other_language:No ; length_learn_arabic	3.551442	.153447	23.144	1.530767	.113461	13.492
Mode: intentional; age	-.104914	.300198	-.349	5.901031	.221648	26.623
Mode: intentional ;length_learn_arabic	-.105640	.120725	-.875	-.268780	.088870	-3.024
age ; length_learn_arabic	-.003998	.007790	-.513	.253635	.005775	43.921
other_language:No ; Mode: intentional ; age	2.443835	.283151	8.631	-10.248179	.211753	-48.397
other_language:No ; Mode: intentional ;length_learn_arabic	-.413399	.035039	-11.798	1.208196	.026201	46.112
other_language:No;age ; length_learn_arabic	-.138231	.006008	-23.008	-.108416	.004433	-24.458
Mode: intentional ; age ; length_learn_arabic	.005736	.005350	1.072	.002104	.003939	.534

C3. Means of all predictor variables (Number of strategies, Group (English/Chinese), Mode of learning (intentional/incidental), and Noun Type (abstract/concrete)) on the outcome variable Post-Test Scores.

Random effects	Variance	SD	
Participant	0.01464	0.1210	
Item	0.03113	0.1764	

Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.418585	0.196777	2.127
Group: E	-0.123254	0.241756	-0.510
Mode: intentional	-0.320404	0.256250	-1.250
No_stra_imm	0.034229	0.033291	1.028
Type: concrete	-0.379789	0.245691	-1.546
Group: E; Mode: intentional	0.052619	0.341794	0.154
Group: E; No_stra_imm	-0.004759	0.046228	-0.103
Mode: intentional; No_stra_imm	0.052513	0.052584	0.999
Group: E; Type; concrete	0.207254	0.295849	0.700
Mode: intentional; Type; concrete	0.665504	0.311907	2.134
No_stra_imm; Type: concrete	0.059866	0.041386	1.446
Group: E; Mode: intentional; No_stra_imm	0.050453	0.070635	0.714
Group: E; Mode: intentional; Type: concrete	-0.258516	0.431080	-0.600
Group: E; No_stra_imm; Type: concrete	-0.014972	0.057331	-0.261
Mode: intentional; No_stra_imm; Type: concrete	-0.062417	0.063195	-0.988
Group: E; Mode: intentional; No_stra_imm; Type: concrete	-0.011084	0.088271	-0.126

C4. Means of all predictor variables (Number of strategies, Group (English/Chinese), Mode of learning (intentional/incidental), and Noun Type (abstract/concrete)) on the outcome variable Delayed Post-Test Scores.

Random effects	Variance	SD	
Participant	0.01323	0.1150	
Item	0.05714	0.2390	

Fixed effects	Estimate	Std. Error	t value
(Intercept)	-0.005721	0.200414	-0.028
Group: E	0.551847	0.248727	2.219
Mode: intentional	-0.085661	0.236168	-0.363
No_stra_delayed	0.129444	0.041919	3.088
Type: concrete	0.623521	0.248239	2.512
Group: E* Mode: intentional	-0.158971	0.313021	-0.508
Group: E* No_stra_delayed	-0.177513	0.063919	-2.777
Mode: intentional* No_stra_delayed	-0.029783	0.060143	-0.495
Group: E* Type; concrete	-0.521248	0.300970	-1.732
Mode: intentional* Type: concrete	-0.050388	0.266840	-0.189
No_stra_delayed * Type: concrete	-0.136834	0.050585	-2.705
Group: E* Mode: intentional* No_stra_delayed	0.124353	0.081638	1.523
Group: E* Mode: intentional* Type: concrete	0.132731	0.381293	0.348
Group: E* No_stra_delayed * Type: concrete	0.117206	0.078312	1.497
Mode: intentional* No_stra_delayed* Type: concrete	0.023764	0.065979	0.360
Group: E* Mode: intentional* No_stra_delayed* Type: concrete	-0.037790	0.097930	-0.386

C5. Means of all predictor variables (Number of strategies, Group (*English/Chinese*), Mode of learning (*intentional/incidental*), and Verb Type (*abstract/concrete*)) on the outcome variable Post-Test Scores.

Random effects	Variance	SD	
Participant	0.01464	0.1210	
Item	0.03113	0.1764	

Fixed effects	Estimate	Std. Error	t value
(Intercept)	-0.184800	0.196344	-0.941
Group: E	0.047642	0.245356	0.194
Mode: intentional	0.499946	0.260155	1.922
No_stra_imm	0.133925	0.033815	3.960
Type: state	0.417625	0.244582	1.708
Group: E; Mode: intentional	-0.494049	0.347255	-1.423
Group: E; No_stra_imm	-0.006161	0.046952	-0.131
Mode: intentional; No_stra_imm	-0.098840	0.053375	-1.852
Group: E; Type; state	-0.330477	0.301188	-1.097
Mode: intentional; Type: state	-0.578339	0.317535	-1.821
No_stra_imm; Type: state	-0.095307	0.042133	-2.262
Group: E; Mode: intentional; No_stra_imm	0.147941	0.071754	2.062
Group: E; Mode: intentional; Type: state	0.723778	0.438859	1.649
Group: E; No_stra_imm; Type: state	0.044250	0.058366	0.758
Mode: intentional; No_stra_imm; Type: state	0.080000	0.064335	1.243
Group: E; Mode: intentional; No_stra_imm; Type: state	-0.120984	0.089864	-1.346

C6. Means of all predictor variables (Number of strategies, Group (*English/Chinese*), Mode of learning (*intentional/incidental*), and Verb Type (*abstract/concrete*)) on the outcome variable Delayed Post-Test Scores.

Random effects	Variance	SD	
Participant	0.03330	0.1825	
Item	0.01102	0.1050	

Fixed effects	Estimate	Std. Error	t value
(Intercept)	0.278065	0.192048	1.448
Group: English	0.116514	0.254033	0.459
Mode: intentional	-0.008424	0.242724	-0.035
No_stra_delayed	0.063277	0.042805	1.478
Type: state	-0.338757	0.228849	-1.480
Group: English; Mode: intentional	-0.197796	0.319182	-0.620
Group: English; No_stra_delayed	-0.076786	0.065069	-1.180
Mode: intentional; No_stra_delayed	-0.042713	0.061954	-0.689
Group: English; Type: state	0.100121	0.302386	0.331
Mode: intentional; Type: state	0.069567	0.268095	0.260
No_stra_delayed; Type: state	0.039941	0.050823	0.786
Group: English; Mode: intentional; No_stra_delayed	0.168508	0.083340	2.022
Group: English; Mode: intentional; Type: state	0.137339	0.383087	0.358
Group: English; No_stra_delayed; Type: state	0.021010	0.078680	0.267
Mode: intentional; No_stra_delayed; Type: state	-0.049277	0.066289	-0.743
Group: English; Mode: intentional; No_stra_delayed; Type: state	-0.069366	0.098391	-0.705

Appendix D Data of Eye-tracking experimental study

D1 Pearson correlation tests between each eye-tracking measure and each predictor verifiable of the target words.

Correlation between first fixation duration and score of words' type

Correlations			
type			IA_FIRST_FIX ATION_DURAT ION
Noun	post_test_Score	Pearson Correlation	-.181
		Sig. (2-tailed)	.123
		N	74
Verb	post_test_Score	Pearson Correlation	-.055
		Sig. (2-tailed)	.639
		N	75

Correlation between Total Time and score of words' type

Correlations			
type			IA_Total_TIME
Noun	post_test_Score	Pearson Correlation	-.070
		Sig. (2-tailed)	.540
		N	80
Verb	post_test_Score	Pearson Correlation	-.072
		Sig. (2-tailed)	.525
		N	80

Correlation between fixation count and score of words type

Correlations			
type			IA_FIXATION_COUNT
Noun	post_test_Score	Pearson Correlation	.085
		Sig. (2-tailed)	.455
		N	80
Verb	post_test_Score	Pearson Correlation	-.045
		Sig. (2-tailed)	.692
		N	80

Correlation between first fixation duration and score of word's frequency

Correlations			
Frequency			IA_FIRST_FIXATION_DURATION
Low	post_test_Score	Pearson Correlation	-.080
		Sig. (2-tailed)	.492
		N	76
High	post_test_Score	Pearson Correlation	-.097
		Sig. (2-tailed)	.414

Correlation between total time and score of words' frequency

Correlations			
Frequency			IA_ total time
Low	post_test_Score	Pearson Correlation	-.169
		Sig. (2-tailed)	.135
		N	80
High	post_test_Score	Pearson Correlation	.050
		Sig. (2-tailed)	.660
		N	80

Correlation between fixation count and score of words' frequency

Correlations			
Frequency			IA_FIXATION_COUNT
Low	post_test_Score	Pearson Correlation	-.078
		Sig. (2-tailed)	.493
		N	80
High	post_test_Score	Pearson Correlation	.134
		Sig. (2-tailed)	.235
		N	80

Correlation between total time and score words' subtype

Correlations			
subtype			IA_DWELL_TIME
abstract	post_test_Score	Pearson Correlation	-.043
		Sig. (2-tailed)	.792
		N	40
Concrete	post_test_Score	Pearson Correlation	-.086
		Sig. (2-tailed)	.598
		N	40
state	post_test_Score	Pearson Correlation	-.194
		Sig. (2-tailed)	.231
		N	40
action	post_test_Score	Pearson Correlation	.008
		Sig. (2-tailed)	.960
		N	40

Correlation between fixation count and score of words' subtype

Correlations			
subtype			IA_FIXATION_COUNT
abstract	post_test_Score	Pearson Correlation	.098
		Sig. (2-tailed)	.547
		N	40
Concrete	post_test_Score	Pearson Correlation	.084
		Sig. (2-tailed)	.605
		N	40
state	post_test_Score	Pearson Correlation	-.112
		Sig. (2-tailed)	.492
		N	40
action	post_test_Score	Pearson Correlation	.004
		Sig. (2-tailed)	.978
		N	40

List of acronyms

ASL: Arabic as a Second Language

DCT: Dual Coding Theory

ELT: English Language Teaching

FL: Foreign Language

ITANA: The Institute of Teaching Arabic to Non-Arabs

L1: First Language

L2: Second Language

MFS: Most Frequent strategy

SLA: Second Language Acquisition

VLSs: Vocabulary learning strategies

References

- Abbott, M. L. (2006). ESL reading strategies: Differences in Arabic and Mandarin speaker test performance. *Language Learning, 56*(4), 633-670.
- Abdelhadi, S., Ibrahim, R., & Eviatar, Z. (2011). Perceptual load in the reading of Arabic: Effects of orthographic visual complexity on detection. *Writing Systems Research, 3*(2), 117-127.
- Abu-Rabia, S. (1997). Reading in Arabic orthography: The effect of vowels and context on reading accuracy of poor and skilled native Arabic readers. *Reading and Writing, 9*(1), 65-78.
- Abu-Rabia, S. (2001). The role of vowels in reading Semitic scripts: Data from Arabic and Hebrew. *Reading and Writing, 14*(1-2), 39-59.
- Abu-Rabia, S. (2002). Reading in a root-based-morphology language: the case of Arabic. *Journal of Research in Reading, 25*(3), 299-309.
- Ahmad, J. (2012). Intentional vs. incidental vocabulary learning. *ELT Research Journal, 1*(1), 71-79.
- Ahmed, M. O. (1988). *Vocabulary learning strategies: A case study of Sudanese learners of English* (Doctoral dissertation, Prifysgol Bangor University).
- Ahmed, M. O. (1989). Vocabulary learning strategies. In P. Meara (Ed.), *Beyond words* (pp. 3-14). London: CILT.
- Ajideh, P. (2003). Schema theory-based pre-reading tasks: A neglected essential in the ESL reading class. *The reading matrix, 3*(1).
- Akamatsu, N. (2003). The effects of first language orthographic features on second language reading in text. *Language Learning, 53*(2), 207-231.
- Al Qahtani, M. (2005). *The use of vocabulary learning strategies by EFL learners at three different educational levels* (Doctoral dissertation, University of Essex).
- Al-Batal, M. (2006). Playing with words: teaching vocabulary in the Arabic curriculum. *Handbook Arabic language teaching professionals in the 21st century, 331-340*.
- Al-Juhani, A. (1990). *Mushkilat tā'alūm allughat al'arabiat lighayr alnnaatiqin biha*. Islamic University in Madina, Saudi Arabia.
- Al-Qarni, I. (1997). *Saudi ESL students' vocabulary learning strategies*. Unpublished MA Dissertation. University of Essex, UK.
- Al-Shuwairekh, S. (2001). *Vocabulary learning strategies used by AFL (Arabic as a foreign language) learners in Saudi Arabia* (Doctoral dissertation, University of Leeds).
- Al-Thubaity, A. O. (2015). A 700M+ Arabic corpus: KACST Arabic corpus design and construction. *Language Resources and Evaluation, 49*(3), 721-751.
- Alahirsh, H. (2014). *Exploring the effectiveness of extensive reading on incidental vocabulary acquisition by EFL learners: an experimental case study in a Libyan University* (Doctoral dissertation, University of Nottingham).
- Alemi, M., & Tayebi, A. (2011). The influence of incidental and intentional vocabulary acquisition and vocabulary strategy use on learning L2 vocabularies. *Journal of Language Teaching and Research, 2*(1), 81-98.
- Aljdee, A. A. (2008). The vocabulary learning strategies of Libyan university students of English and their vocabulary knowledge.
- Alothman, K. (2014). *Investigating the impact of focusing on academic vocabulary using multiple assessment measures* (Doctoral dissertation, University of Roehampton).
- Altarriba, J., Kroll, J. F., Sholl, A., & Rayner, K. (1996). The influence of lexical and conceptual constraints on reading mixed-language sentences: Evidence from eye fixations and naming times. *Memory & Cognition, 24*(4), 477-492.
- Amiryousefi, M., & Ketabi, S. (2011). Mnemonic instruction: A way to boost vocabulary learning and recall. *Journal of Language Teaching and Research, 2*(1), 178.
- Anderson, J. R. (1980). Cognitive Psychology and it's Implications. *San Francisco: Freeman, 119*.

- Asadi, I. A., Khateb, A., & Shany, M. (2017). How simple is reading in Arabic? A cross-sectional investigation of reading comprehension from first to sixth grade. *Journal of Research in Reading, 40*, S1-S22.
- Atherton, L. (1995). *A preliminary investigation into vocabulary memorization strategies used by upper-intermediate students on a university course in England*. Unpublished NIED Dissertation. University of Exeter, UK.
- Atkinson, R. C., & Raugh, M. R. (1975). An application of the mnemonic keyword method to the acquisition of a Russian vocabulary. *Journal of Experimental Psychology: Human Learning and Memory, 1*(2), 126.
- Avila, E., & Sadoski, M. (1996). Exploring new applications of the keyword method to acquire English vocabulary. *Language Learning, 46*(3), 379-395.
- Baayen, R. H., Davidson, D. J., & Bates, D. M. (2008). Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language, 59*(4), 390-412.
- Baddeley, A. D. (1999). *Essentials of human memory*: Psychology Press.
- Ball, L. J., Eger, N., Stevens, R., & Dodd, J. (2006). Applying the PEEP method in usability testing. *Interfaces, 67*(Summer), 15-19.
- Barcroft, J. (2007). Effects of opportunities for word retrieval during second language vocabulary learning. *Language Learning, 57*(1), 35-56.
- Barcroft, J. (2009). Strategies and performance in intentional L2 vocabulary learning. *Language awareness, 18*(1), 74-89.
- Barcroft, J. (2015). *Lexical input processing and vocabulary learning* (Vol. 43). John Benjamins Publishing Company.
- Bartlett, F. C. (1932). Remembering: An experimental and social study. *Cambridge: Cambridge University*.
- Basnight-Brown, D. M., Chen, L., Hua, S., Kostić, A., & Feldman, L. B. (2007). Monolingual and bilingual recognition of regular and irregular English verbs: Sensitivity to form similarity varies with first language experience. *Journal of Memory and Language, 57*(1), 65-80.
- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2014). lme4: Linear mixed-effects models using Eigen and S4. *R package version, 1*(7), 1-23.
- Baumann, J. F., Edwards, E. C., Font, G., Tereshinski, C. A., Kame'enui, E. J., & Olejnik, S. (2002). Teaching morphemic and contextual analysis to fifth-grade students. *Reading research quarterly, 37*(2), 150-176.
- Beaton, A., Gruneberg, M., & Ellis, N. (1995). Retention of foreign vocabulary learned using the keyword method: A ten-year follow-up. *Second Language Research, 11*(2), 112-120.
- Bedell, D., & Oxford, R. L. (1996). Cross-cultural comparisons of language learning strategies in the People's Republic of China and other countries. *Language learning strategies around the world: Cross-cultural perspectives, 47-60*.
- Benthuisen, R. (2003). Explicit vocabulary instruction: Using a word list to focus attention. *Journal of Bunkyo Gakuin University, 2*, 89-96.
- Bialystok, E. (1978). A THEORETICAL MODEL OF SECOND LANGUAGE LEARNING 1. *Language Learning, 28*(1), 69-83.
- Bialystok, E. (1981). The Role of Conscious Strategies in Second Language Proficiency. *The Modern Language Journal, 65*(1), 24-35.
- Bialystok, E. (2009). Bilingualism: The good, the bad, and the indifferent. *Bilingualism: Language and Cognition, 12*(1), 3-11.
- Bisson, M. J. (2013). *Incidental acquisition of foreign language vocabulary through multi-modal situations* (Doctoral dissertation, University of Nottingham).
- Bisson, M. J., Van Heuven, W. J., Conklin, K., & Tunney, R. J. (2015). The role of verbal and pictorial information in multimodal incidental acquisition of foreign language vocabulary. *The Quarterly Journal of Experimental Psychology, 68*(7), 1306-1326.

- Boecker, H., Ceballos-Baumann, A. O., Bartenstein, P., Dagher, A., Forster, K., Haslinger, B., ... & Conrad, B. (2002). A H215O positron emission tomography study on mental imagery of movement sequences—the effect of modulating sequence length and direction. *NeuroImage*, *17*(2), 999-1009.
- Bogaards, P. (1998). Scanning long entries in learner's dictionaries. *EURALEX'98 Actes/Proceedings*, 555-563.
- Boudelaa, S., & Marslen-Wilson, W. D. (2011). Productivity and priming: Morphemic decomposition in Arabic. *Language and Cognitive Processes*, *26*(4-6), 624-652.
- Boudelaa, S., & Marslen-Wilson, W. D. (2013). Morphological structure in the Arabic mental lexicon: Parallels between standard and dialectal Arabic. *Language and Cognitive Processes*, *28*(10), 1453-1473.
- Boudelaa, S., & Marslen-Wilson, W. D. (2015). Structure, form, and meaning in the mental lexicon: Evidence from Arabic. *Language, cognition and neuroscience*, *30*(8), 955-992.
- Broudy, H. S. (1988). Images, words, and thoughts. *Reading Psychology: An International Quarterly*, *9*(4), 315-321.
- Brown, C., & Payne, M. E. (1994). *Five essential steps of processes in vocabulary learning*. Paper presented at the TESOL Convention, Baltimore, Md, USA.
- Brown, R., Waring, R., & Donkaewbua, S. (2008). Incidental vocabulary acquisition from reading, reading-while-listening, and listening to stories. *Reading in a Foreign Language*, *20*(2), 136.
- Brown, T. S., & Perry, F. L., Jr. (1991). A Comparison of Three Learning Strategies for ESL Vocabulary Acquisition. *TESOL Quarterly*, *25*(4), 655-670. doi:10.2307/3587081
- Brysbaert, M., & Nazir, T. (2005). Visual constraints in written word recognition: evidence from the optimal viewing-position effect. *Journal of Research in Reading*, *28*(3), 216-228.
- Calvillo, D. P. (2012). Working memory and the memory distortion component of hindsight bias. *Memory*, *20*(8), 891-898.
- Camps, J. (2003). Concurrent and retrospective verbal reports as tools to better understand the role of attention in second language tasks. *International Journal of Applied Linguistics*, *13*(2), 201-221.
- Carr, E. M., & Mazur-Stewart, M. (1988). The effects of the vocabulary overview guide on vocabulary comprehension and retention. *Journal of Reading Behavior*, *20*(1), 43-62.
- Carrell, P. L. (1983). Some issues in studying the role of schemata, or background knowledge, in second language comprehension. *Reading in a Foreign Language*, *1*(2), 81-92.
- Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies*: Cambridge University Press.
- Carter, R., & McCarthy, M. (1988). Word lists and learning words: some foundations. *Vocabulary and language teaching*, 1-17.
- Ceprano, M. A. (1987). The Effects of Pictures on Children's Initial Effort Toward Learning to Read: Review of Research. *Reading Improvement*, *24*(1), 53.
- Chaffin, R., Morris, R. K., & Seely, R. E. (2001). Learning new word meanings from context: A study of eye movements. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *27*, 225-235.
- Chamot, A. U. (1987). The learning strategies of ESL students. *Learner strategies in language learning*, 71-83.
- Chamot, A. U., & Kupper, L. (1989). Learning strategies in foreign language instruction. *Foreign Language Annals*, *22*(1), 13-22.
- Chen, H.-C. (1992). Reading comprehension in Chinese: Implications from character reading times. *Language processing in Chinese*, 175-205.
- Childers, T. L., & Jiang, Y. (2008). Neurobiological perspectives on the nature of visual and verbal processes. *Journal of Consumer Psychology*, *18*(4), 264-269.

- Chun, E., Choi, S., & Kim, J. (2012). The effect of extensive reading and paired-associate learning on long-term vocabulary retention: An event-related potential study. *Neuroscience Letters*, 521(2), 125-129.
- Chun, M. M. (2000). Contextual cueing of visual attention. *Trends in Cognitive Sciences*, 4(5), 170-178.
- Cohen, A. D. (1998). *Strategies in learning and using a second language*. London: Longman.
- Cohen, A. D. (2014). *Strategies in learning and using a second language*: Routledge.
- Cohen, A. D., & Aphek, E. (1980). Retention of second-language vocabulary overtime: Investigating the role of mnemonic associations. *System*, 8(3), 221-235.
- Conway, A. R., Getz, S. J., Macnamara, B., & Engel de Abreu, P. (2011). Working memory and intelligence. *The Cambridge handbook of intelligence*, 394, 418.
- Cook, G. (1989). Discourse in language teaching: A scheme for teacher education. *Journal of Women's Health*.
- Cook, L. K., & Mayer, R. E. (1983). Reading strategies training for meaningful learning from prose. In *Cognitive strategy research* (pp. 87-131). Springer, New York, NY.
- Coughlin, C. E., & Tremblay, A. (2015). Morphological decomposition in native and non-native French speakers. *Bilingualism: Language and Cognition*, 18(03), 524-542.
- Cowan, N. (2001). Metatheory of storage capacity limits. *Behavioral and brain sciences*, 24(1), 154-176.
- Coxhead, A., & Nation, P. (2001). The specialised vocabulary of English for academic purposes. *Research perspectives on English for academic purposes*, 252-267.
- Craik, F. I., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of verbal learning and verbal behavior*, 11(6), 671-684.
- Craik, F. I., & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *Journal of experimental Psychology: general*, 104(3), 268.
- Daller, H., Milton, J., & Treffers-Daller, J. (2007). *Modelling and Assessing Vocabulary Knowledge [electronic resource]* (Vol. 11). Cambridge: Cambridge University Press.
- Day, R. R., Omura, C., & Hiramatsu, M. (1992). Incidental EFL vocabulary learning and reading. *Reading in a Foreign Language*, 7, 541-541.
- De Groot, A. M., & Van Hell, J. G. (2005). The learning of foreign language vocabulary. *Handbook of bilingualism: Psycholinguistic approaches*, 9-29.
- Degroot, A. M., Dannenburg, L., & Vanhell, J. G. (1994). Forward and backward word translation by bilinguals. *Journal of Memory and Language*, 33(5), 600-629.
- DeKeyser, R. (2008). 11 Implicit and Explicit Learning. *The handbook of second language acquisition*, 27, 313.
- Ehmke, C., & Wilson, S. (2007). *Identifying web usability problems from eye-tracking data*. Paper presented at the Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI... but not as we know it-Volume 1.
- Eichenbaum, H., & Cohen, N. (2001). Oxford psychology series; no. 35. In: From conditioning to conscious recollection: Memory systems of the brain. New York, NY, US: Oxford University Press.
- Ellis, A. W., & Monaghan, J. (2002). Reply to Strain, Patterson, and Seidenberg (2002).
- Ellis, N. (1994a). Consciousness in second language learning: Psychological perspectives on the role of conscious processes in vocabulary acquisition. *Consciousness in second language learning*, 11, 37-57.
- Ellis, N. C. (1994b). Implicit and explicit language learning. *Implicit and explicit learning of languages*, 79-114.
- Ellis, N. (2015). Implicit AND Explicit Language Learning: Their dynamic interface and complexity. In P. Rebuschat (Ed.), *Implicit and explicit learning of languages* (pp. 3-23). Amsterdam: John Benjamins.

- Ellis, N. C., & Beaton, A. (1995a). Psycholinguistic determinants of foreign language vocabulary learning. *Lexical issues in language learning*, 107-165.
- Ellis, N., & Beaton, A. (1993). Factors affecting the learning of foreign language vocabulary: Imagery keyword mediators and phonological short-term memory. *The Quarterly Journal of Experimental Psychology*, 46(3), 533-558.
- Ellis, N. C. (1995b). The psychology of foreign language vocabulary acquisition: Implications for CALL. *Computer Assisted Language Learning*, 8(2-3), 103-128.
- Ellis, N. C. (2005). At the interface: Dynamic interactions of explicit and implicit language knowledge. *Studies in Second Language Acquisition*, 27(02), 305-352.
- Ellis, R. (1994). *The study of second language acquisition*. Oxford University Press.
- Ellis, R. (1999). *Learning a second language through interaction* (Vol. 17). John Benjamins Publishing.
- Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis*: MIT press Cambridge, MA.
- Erten, I. H. (1998). *Vocabulary learning strategies: an investigation into the effect of perceptual learning styles and modality of word presentation on the use of vocabulary learning strategies* (Doctoral dissertation, University of Exeter).
- Eysenck, M. W. (1982). Incidental learning and orienting tasks. In C. Puff (Ed.), *Handbook of research methods in human memory and cognition* (pp. 197-228). New York: Academic Press.
- Fan, M. Y. (2003). Frequency of use, perceived usefulness, and actual usefulness of second language vocabulary strategies: A study of Hong Kong learners. *The Modern Language Journal*, 87(2), 222-241.
- Fender, M. (2003). English word recognition and word integration skills of native Arabic-and Japanese-speaking learners of English as a second language. *Applied Psycholinguistics*, 24(2), 289-315.
- Ferguson, C. (1968). Myths about Arabic. In J. Fishman (Ed.), *Reading on the Sociology of Language*.: The Hague: Mouton.
- Fernald, A., & Marchman, V. A. (2012). Individual differences in lexical processing at 18 months predict vocabulary growth in typically developing and late-talking toddlers. *Child development*, 83(1), 203-222.
- Filippatou, D., & Pumfrey, P. D. (1996). Pictures, titles, reading accuracy and reading comprehension: a research review (1973-95). *Educational Research*, 38(3), 259-291.
- Fitzpatrick, T., Al-Qarni, I., & Meara, P. (2008). Intensive vocabulary learning: A case study. *Language learning journal*, 36(2), 239-248.
- Folse, K. S. (2004). *Vocabulary myths: Applying second language research to classroom teaching*: University of Michigan Press Ann Arbor, MI.
- Foote, R. (2017). The storage and processing of morphologically complex words in L2 Spanish. *Studies in second language acquisition*, 39(4), 735-767.
- Frenck-Mestre, C. (2005). Eye-movement recording as a tool for studying syntactic processing in a second language: A review of methodologies and experimental findings. *Second Language Research*, 21(2), 175-198.
- Friedman, D. A. (2011). How to Collect and Analyze Qualitative Data. *Research Methods in Second Language Acquisition: A Practical Guide*, 180-200.
- Gass, S. (1999). Discussion. *Studies in Second Language Acquisition*, 21(02), 319-333.
- Gass, S., Svetics, I., & Lemelin, S. (2003). Differential effects of attention. *Language Learning*, 53(3), 497-546.
- Gass, S. M., & Mackey, A. (2000). *Stimulated recall methodology in second language research*. Routledge.
- Gazzaniga, M. S. (2000). *Cognitive neuroscience: A reader*. Blackwell Publishing.
- Godfroid, A., Boers, F., & Housen, A. (2013a). An eye for words. *Studies in Second Language Acquisition*, 35(03), 483-517.

- Godfroid, A., Boers, F., & Housen, A. (2013b). An eye for words: Gauging the role of attention in incidental L2 vocabulary acquisition by means of eye-tracking. *Studies in Second Language Acquisition, 35*(3), 483-517.
- Godfroid, A., Housen, A., & Boers, F. (2010). A procedure for testing the Noticing Hypothesis in the context of vocabulary acquisition. *Cognitive processing in second language acquisition, 169-197*.
- Godfroid, A., & Winke, P. (2015a). Investigating implicit and explicit processing using L2 learners' eye-movement data. *Implicit and explicit learning of languages, 48*, 325.
- Godfroid, A., & Winke, P. (2015b). Investigating implicit and explicit processing using L2 learners' eye-movement data. *Implicit and explicit learning of languages, 325-348*.
- Godfroid, A., Winke, P., & Gass, S. (2013). Thematic issue on eye tracking in second language acquisition research. *Studies in Second Language Acquisition, 35*(2).
- Goh, C. M. (1998). How ESL learners with different listening abilities use comprehension strategies and tactics. *Language teaching research, 2*(2), 124-147.
- Goodwin, A., Lipsky, M., & Ahn, S. (2012). Word detectives: Using units of meaning to support literacy. *The Reading Teacher, 65*(7), 461-470.
- Gor, K., & Cook, S. (2010). Nonnative processing of verbal morphology: In search of regularity. *Language Learning, 60*(1), 88-126.
- Gor, K., & Jackson, S. (2013). Morphological decomposition and lexical access in a native and second language: A nesting doll effect. *Language and Cognitive Processes, 28*(7), 1065-1091.
- Grabe, W. P., & Stoller, F. L. (2013). *Teaching and researching: Reading*: Routledge.
- Graddol, D. (2006). *English next* (Vol. 62). London: British Council.
- Green, J. M., & Oxford, R. (1995). A Closer Look at Learning Strategies, L2 Proficiency, and Gender. *TESOL Quarterly, 29*(2), 261-297. doi:10.2307/3587625
- Griffiths, C. (2006). Language learning strategies: Theory and research. Iran. *ILI Language Teaching Journal, 2*(1).
- Gu, P. Y. (2003). Vocabulary learning in a second language: Person, task, context and strategies. *TESL-EJ, 7*(2), 1-25.
- Gu, Y. (1994). Vocabulary Learning Strategies of Good and Poor Chinese EFL Learners.
- Gu, Y., & Johnson, R. K. (1996). Vocabulary learning strategies and language learning outcomes. *Language Learning, 46*(4), 643-679.
- Haastrup, K., & Henriksen, B. (2000). Vocabulary acquisition: Acquiring depth of knowledge through network building. *International Journal of Applied Linguistics, 10*(2), 221-240.
- Halle, M., & Marantz, A. (1993). Distributed morphology and the pieces of inflection.
- Hambrick, D. Z., Oswald, F. L., Darowski, E. S., Rench, T. A., & Brou, R. (2010). Predictors of multitasking performance in a synthetic work paradigm. *Applied Cognitive Psychology, 24*(8), 1149-1167.
- Hardin, J. W., & Hilbe, J. M. (2003). *Generalized estimating equations*: Wiley Online Library.
- Harley, B. (1996). Introduction: Vocabulary learning and teaching in a second language. *Canadian modern language review, 53*(1), 3-12.
- Harrington, D. L., Haaland, K. Y., Yeo, R. A., & Marder, E. (1990). Procedural memory in Parkinson's disease: Impaired motor but not visuoperceptual learning. *Journal of Clinical and Experimental Neuropsychology, 12*(2), 323-339.
- Harshbarger, B., Ross, T., Tafoya, S., & Via, J. (1986). *Dealing with multiple learning styles in the ESL classroom*. Paper presented at the Symposium presented at the Annual Meeting of Teachers of English to Speakers of Other Languages, San Francisco, CA.
- Hatch, E., & Brown, C. (1995). *Vocabulary, semantics, and language education*: ERIC.
- Hedge, T. (2000). *Teaching and learning in the language classroom*. Oxford: Oxford university press.
- Heilman, K. M. (1997). Disorders of skilled movements; Limb apraxia. *Behavioral neurology and neuropsychology, 227-235*.

- Henriksen, B. (1999). Three dimensions of vocabulary development. *Studies in Second Language Acquisition*, 21(02), 303-317.
- Hill, C., & Parry, K. (1989). Autonomous and pragmatic models of literacy: Reading assessment in adult education. *Linguistics and Education*, 1(3), 233-283.
- Hill, C., & Parry, K. (1992). The test at the gate: Models of literacy in reading assessment. *TESOL Quarterly*, 26(3), 433-461.
- Hill, M. (1994). A Word in Your Ear: To What Extent Does Hearing a New Word Help Learners To Remember It?
- Hogben, D., & Lawson, M. J. (1994). Keyword and multiple elaboration strategies for vocabulary acquisition in foreign language learning. *Contemporary Educational Psychology*, 19(3), 367-376.
- Holden, W. R. (1999). Learning To Learn: 15 Vocabulary Acquisition Activities. Tips and Hints. *Modern English Teacher*, 8(2), 42-47.
- Holes, C. (1995). Community, dialect and urbanization in the Arabic-speaking Middle East. *Bulletin of the school of oriental and African studies*, 58(2), 270-287.
- Horst, M. (2005). Learning L2 vocabulary through extensive reading: A measurement study. *Canadian modern language review*, 61(3), 355-382.
- Hsueh-Chao, M. H., & Nation, P. (2000). Unknown vocabulary density and reading comprehension. *Reading in a Foreign Language*, 13(1), 403-430.
- Huckin, T., & Coady, J. (1999). Incidental vocabulary acquisition in a second language. *Studies in Second Language Acquisition*, 21(02), 181-193.
- Hulstijn, J. (2003). Incidental and intentional learning. In C. Doughty & M. Long (Eds.), *The handbook of second language acquisition* (pp. 349-381). Oxford: Blackwell.
- Hulstijn, J. H. (1992). Retention of inferred and given word meanings: Experiments in incidental vocabulary learning. *Vocabulary and applied linguistics*, 113-125.
- Hulstijn, J. H. (1993). When Do Foreign-Language Readers Look Up the Meaning of Unfamiliar Words? The Influence of Task and Learner Variables. *The Modern Language Journal*, 77(2), 139-147.
- Hulstijn, J. H. (1997). 1 Q Mnemonic methods in foreign language vocabulary learning. *Second language vocabulary acquisition: A rationale for pedagogy*, 203.
- Hulstijn, J. H. (2001). *Intentional and incidental second-language vocabulary learning: A reappraisal of elaboration, rehearsal and automaticity*: Cambridge University Press.
- Hulstijn, J. H., & Ellis, R. (2005). Theoretical and Empirical Issues in the Study of Implicit and Explicit Second-Language Learning. *Studies in Second Language Acquisition*, 27(2), 129-352. doi:10.1017/S0272263105050084
- Hulstijn, J. H., Hollander, M., & Greidanus, T. (1996). Incidental vocabulary learning by advanced foreign language students: The influence of marginal glosses, dictionary use, and reoccurrence of unknown words. *The Modern Language Journal*, 80(3), 327-339.
- Hutchison, K. A., Smith, J. L., & Ferris, A. (2013). Goals can be threatened to extinction: Using the stroop task to clarify working memory depletion under stereotype threat. *Social Psychological and Personality Science*, 4(1), 74-81.
- Ibrahim, R., Eviatar, Z., & Aharon-Peretz, J. (2002). The characteristics of Arabic orthography slow its processing. *Neuropsychology*, 16(3), 322.
- Jared, D., Pei Yun Poh, R., & Paivio, A. (2013). L1 and L2 picture naming in Mandarin-English bilinguals: A test of Bilingual Dual Coding Theory. *Bilingualism*, 16(2), 383-396. doi:10.1017/S1366728912000685
- Juffs, A. (2005). The influence of first language on the processing of wh-movement in English as a second language. *Second Language Research*, 21(2), 121-151.
- Juhasz, B. J., & Rayner, K. (2006). The role of age of acquisition and word frequency in reading: Evidence from eye fixation durations. *Visual Cognition*, 13(7-8), 846-863.

- Kane, M. J., Hambrick, D. Z., & Conway, A. R. (2005). Working memory capacity and fluid intelligence are strongly related constructs: comment on Ackerman, Beier, and Boyle (2005).
- Kasahara, K. (2011). The effect of known-and-unknown word combinations on intentional vocabulary learning. *System*, 39(4), 491-499.
- Katz, L., & Frost, R. (1992). The reading process is different for different orthographies: The orthographic depth hypothesis. *ADVANCES IN PSYCHOLOGY-AMSTERDAM-*, 94, 67-67.
- Kayaoglu, M. N. (1997). *An investigation of the learning strategies of Turkish EFL and ESL adult learners and the relationship between their beliefs about different aspects of language learning and their strategy use* (Doctoral dissertation, University of Bristol).
- Keating, G. D. (2013). Eye-tracking with text. *Research methods in second language psycholinguistics*, 69-92.
- Kelly, P. (1992). Does the Ear Assist the Eye in the Long-Term Retention of Lexis? *IRAL*, 30(2), 137-145.
- Khateb, A., Khateb-Abdelgani, M., Taha, H. Y., & Ibrahim, R. (2014). The impact of orthographic connectivity on visual word recognition in Arabic: A cross-sectional study. *Reading and Writing*, 27(8), 1413-1436.
- Khodadady, E., & Hesarzadeh, R. (2014). The Effect of schema-vs-translation-based teaching on learning English in high schools. *Theory and Practice in Language Studies*, 4(1), 143-154.
- Khoii, R., & Sharififar, S. (2013). Memorization versus semantic mapping in L2 vocabulary acquisition. *ELT journal*, 67(2), 199-209.
- Kleider, H. M., Parrott, D. J., & King, T. Z. (2010). Shooting behaviour: How working memory and negative emotionality influence police officer shoot decisions. *Applied Cognitive Psychology*, 24(5), 707-717.
- Kliegl, R., Grabner, E., Rolfs, M., & Engbert, R. (2004). Length, frequency, and predictability effects of words on eye movements in reading. *European Journal of Cognitive Psychology*, 16(1-2), 262-284.
- Kliegl, R., Nuthmann, A., & Engbert, R. (2006). Tracking the mind during reading: the influence of past, present, and future words on fixation durations. *Journal of experimental Psychology: general*, 135(1), 12.
- Knight, S. (1994). Dictionary use while reading: The effects on comprehension and vocabulary acquisition for students of different verbal abilities. *The Modern Language Journal*, 78(3), 285-299.
- Koda, K. (1988). Cognitive process in second language reading: Transfer of L1 reading skills and strategies. *Interlanguage studies bulletin (Utrecht)*, 4(2), 133-155.
- Kojic-Sabo, I., & Lightbown, P. M. (1999). Students' approaches to vocabulary learning and their relationship to success. *The Modern Language Journal*, 83(2), 176-192.
- Krashen, S. (1989). We acquire vocabulary and spelling by reading: Additional evidence for the input hypothesis. *The Modern Language Journal*, 73(4), 440-464.
- Krashen, S. D. (1985). *The input hypothesis: Issues and implications*: Addison-Wesley Longman Ltd.
- Kweon, S.-O., & Kim, H.-R. (2008). Beyond raw frequency: Incidental vocabulary acquisition in extensive reading. *Reading in a Foreign Language*, 20(2), 191.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought*: Basic books.
- Lakoff, G., & Johnson, M. (2003). *Metaphors we live by*. 1980. *Chicago: Uinversity of Chicago Press*.
- Laufer, B. (1986). Possible changes in attitude towards vocabulary acquisition research. *IRAL- International Review of Applied Linguistics in Language Teaching*(24), 69-75.
- Laufer, B. (1989). What percentage of text-lexis is essential for comprehension. *Special language: From humans thinking to thinking machines*, 316323.
- Laufer, B. (1997). What's in a word that makes it hard or eas-y? Intralexical factors affecting the difficulty of vocabulary acquisition. *N. Sehmitt, & M. McCarthy,(eds.'. Vocabulary Description, Acquisition and Peda-gogy*.

- Laufer, B. (2003). Vocabulary Acquisition in a Second Language: Do Learners Really Acquire Most Vocabulary by Reading? Some Empirical Evidence. *Canadian Modern Language Review/ La Revue canadienne des langues vivantes*, 59(4), 567-587. doi:10.3138/cmlr.59.4.567
- Laufer, B. (2005). Lexical frequency profiles: From Monte Carlo to the real world a response to Meara (2005). *Applied linguistics*, 26(4), 582-588.
- Laufer, B., Elder, C., Hill, K., & Congdon, P. (2004). Size and strength: do we need both to measure vocabulary knowledge? *Language testing*, 21(2), 202-226.
- Laufer, B., & Goldstein, Z. (2004). Testing vocabulary knowledge: Size, strength, and computer adaptiveness. *Language Learning*, 54(3), 399-436.
- Laufer, B., & Hill, M. (2000). What Lexical Information Do L2 Learners Select in a CALL Dictionary and How Does It Affect Word Retention?
- Laufer, B., & Hulstijn, J. (2001). Incidental vocabulary acquisition in a second language: The construct of task-induced involvement. *Applied linguistics*, 22(1), 1-26.
- Laufer, B., & Ravenhorst-Kalovski, G. C. (2010). Lexical Threshold Revisited: Lexical Text Coverage, Learners' Vocabulary Size and Reading Comprehension. *Reading in a Foreign Language*, 22(1), 15-30.
- Lawson, M. J., & Hogben, D. (1996). The vocabulary-learning strategies of foreign-language students. *Language Learning*, 46(1), 101-135.
- Leal, T., Slabakova, R., & Farmer, T. A. (2016). The Fine-Tuning of Linguistic Expectations Over The Course of L2 Learning. *Studies in Second Language Acquisition*, 1-33.
- Lehtonen, M., Niska, H., Wande, E., Niemi, J., & Laine, M. (2006). Recognition of inflected words in a morphologically limited language: Frequency effects in monolinguals and bilinguals. *Journal of Psycholinguistic Research*, 35(2), 121.
- Levin, J. R., Levin, M. E., Glasman, L. D., & Nordwall, M. B. (1992). Mnemonic vocabulary instruction: Additional effectiveness evidence. *Contemporary Educational Psychology*, 17(2), 156-174.
- Levine, A., Reves, T., & Leaver, B. L. (1996). Relationship between language learning strategies and Israeli versus Russian cultural-educational factors. *Language learning strategies around the world: Cross cultural perspectives*, 35-45.
- Li, C. N., & Thompson, S. A. (1981). A grammar of spoken Chinese: A functional reference grammar. In: Berkeley: University of California Press.
- Libben, M. R., & Titone, D. A. (2009). Bilingual lexical access in context: evidence from eye movements during reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 35(2), 381.
- Liu, P.-L. (2014). Using eye tracking to understand the responses of learners to vocabulary learning strategy instruction and use. *Computer Assisted Language Learning*(ahead-of-print), 1-14.
- Liversedge, S. P., & Findlay, J. M. (2000). Saccadic eye movements and cognition. *Trends in Cognitive Sciences*, 4(1), 6-14.
- Luke, S. G. (2017). Evaluating significance in linear mixed-effects models in R. *Behav Res Methods*, 49(4), 1494-1502.
- Luppescu, S., & Day, R. R. (1993). Reading, dictionaries, and vocabulary learning. *Language Learning*, 43(2), 263-279.
- Lwin, M. O., Morrin, M., & Krishna, A. (2010). Exploring the superadditive effects of scent and pictures on verbal recall: An extension of dual coding theory. *Journal of Consumer Psychology*, 20(3), 317-326. doi:10.1016/j.jcps.2010.04.001
- Macaro, E. (2003). Second language teachers as second language classroom researchers. *Language learning journal*, 27(1), 43-51.
- Macaro, E. (2006). Strategies for language learning and for language use: Revising the theoretical framework. *Modern Language Journal*, 320-337.
- MacIntyre, P. (1994). Toward a social psychological model of strategy use. *Foreign Language Annals*, 27(2), 185-195.

- Makni, F. (2013). *Teaching polysemous words to Arab learners: A cognitive linguistics approach* (Doctoral dissertation, University of the West of England).
- Marzban, A., & Amoli, F. A. (2012). The effect of mnemonic strategies instruction on the immediate and delayed information retrieval of vocabulary learning in EFL elementary learners. *Procedia-Social and Behavioral Sciences*, 46, 4957-4961.
- Matsumoto, K. (1993). Verbal-report data and introspective methods in second language research: State of the art. *RELC journal*, 24(1), 32-60.
- Matsuoka, W., & Hirsh, D. (2010). Vocabulary learning through reading: Does an ELT course book provide good opportunities? *Reading in a Foreign Language*, 22(1), 56.
- McCarthy, M. (1990). *Vocabulary*: Oxford University Press.
- McCarthy, M. (2001, May) /Interviewer: M. Y. Fan. Cambridge connection, Hong Kong/China.
- McIntyre, N. A. (2016). *Teach at first sight: Expert teacher gaze across two cultural settings* (Doctoral dissertation, University of York).
- McLaughlin, B., Rossman, T., & McLeod, B. (1983). SECOND LANGUAGE LEARNING: AN INFORMATION-PROCESSING PERSPECTIVE1. *Language Learning*, 33(2), 135-158.
- Meara, P. (1996a). The dimensions of lexical competence. In G. Brown, K. Malmkjær, & J. Williams (Eds.), *Performance and competence in second language acquisition* (pp. 35–53). Cambridge: Cambridge university press.
- Meara, P. (1996b). The vocabulary knowledge framework. *Vocabulary Acquisition Research Group Virtual Library*.
- Meara, P. M. (1988). Learning words in an L1 and an L2. *Polyglot* 9 (3), 1-16.
- Melendez, E. J., & Pritchard, R. H. (1985). Applying schema theory to foreign language reading. *Foreign Language Annals*, 18(5), 399-403.
- Melka, F. (1997). Receptive vs. productive aspects of vocabulary. *Vocabulary: Description, acquisition and pedagogy*, 33(2), 84-102.
- Milton, J. (2009). *Measuring second language vocabulary acquisition* (Vol. 45): Multilingual Matters.
- Mondria, J.-A. (2003). The effects of inferring, verifying, and memorizing on the retention of L2 word meanings. *Studies in Second Language Acquisition*, 25(04), 473-499.
- Mondria, J.-A., & Wit-de Boer, M. (1991). The effects of contextual richness on the guessability and the retention of words in a foreign Language1. *Applied linguistics*, 12(3), 249-267.
- Moore, J. C., & Surber, J. R. (1992). Effects of context and keyword methods on second language vocabulary acquisition. *Contemporary Educational Psychology*, 17(3), 286-292.
- Nagy, W. (1997). On the role of context in first- and second-language vocabulary learning. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 64-83). Cambridge, UK: Cambridge University Press.
- Nagy, W. E., Herman, P. A., & Anderson, R. C. (1985). Learning words from context. *Reading research quarterly*, 233-253.
- Nagy, W. E., Scott, J. A., Kamil, M., Mosenthal, P., Pearson, P., & Barr, R. (2000). Vocabulary processes. *Handbook of reading research*, 3(269-284).
- Nakahara, H., Doya, K., & Hikosaka, O. (2001). Parallel cortico-basal ganglia mechanisms for acquisition and execution of visuomotor sequences—a computational approach. *Journal of cognitive neuroscience*, 13(5), 626-647.
- Nation, I. S. (2006). How large a vocabulary is needed for reading and listening? *Canadian Modern Language Review/La revue canadienne des langues vivantes*, 63(1), 59-82.
- Nation, I. S. P. (1990). Teaching and Learning Vocabulary. In Teaching and Learning Vocabulary: Bringing research to practice (pp. 1): Lawrence Erlbaum.
- Nation, P. (1994). Teaching and learning vocabulary: Taylor, Linda. Hemel Hempstead: Prentice-Hall International, 1990. *System*, 22(2), 283-283. doi:10.1016/0346-251X(94)90065-5
- Nation, P. (2001). *Learning vocabulary in another language*: Ernst Klett Sprachen.
- Nation, P. (2007). The four strands. *International Journal of Innovation in Language Learning and Teaching*, 1(1), 2-13.

- Nation, P. (2013). *Learning vocabulary in another language* (2nd edition. ed.): Cambridge University Press.
- Nation, P., & Yamamoto, A. (2012). Applying the four strands to language learning. *International Journal of Innovation in English Language Teaching and Research*, 1(2), 173.
- Nattinger, J. (1988). Some current trends in vocabulary teaching. *Vocabulary and language teaching*, 1, 62-82.
- Nemati, A. (2009). Memory vocabulary learning strategies and long-term retention. *International Journal of Vocational and Technical Education*, 1(2), 014-024.
- Nemati, A. (2013). *Aspects of language learning strategies (LLS) : focus on vocabulary learning strategies (VLS)*. S.I.]: Createspace.
- Nielsen, B. (2006). A review of research into vocabulary learning and acquisition. Retrieved December 10, 2007.
- Novak, J. D., & Cañas, A. J. (2008). The theory underlying concept maps and how to construct and use them.
- O'Malley, J. M., & Chamot, A. U. (1990). *Learning strategies in second language acquisition*: Cambridge University Press.
- O'Malley, J. M., Chamot, A. U., Stewner-Manzanares, G., Kupper, L., & Russo, R. P. (1985). Learning strategies used by beginning and intermediate ESL students. *Language Learning*, 35(1), 21-46.
- Oberauer, K., Schulze, R., Wilhelm, O., & Süß, H.-M. (2005). Working memory and intelligence--their correlation and their relation: comment on Ackerman, Beier, and Boyle (2005).
- Oberauer, K., Süß, H.-M., Wilhelm, O., & Sander, N. (2007). Individual differences in working memory capacity and reasoning ability. *Variation in working memory*, 49-75.
- Ortega, L. (2009). *Understanding Second Language Acquisition*: Hodder Education.
- Oxford, R. (1992). Language learning strategies in a nutshell: update and ESL suggestions. *TESOL Journal*, 1-2, 18-22.
- Oxford, R., & Crookall, D. (1989). Research on language learning strategies: Methods, findings, and instructional issues. *The Modern Language Journal*, 73(4), 404-419.
- Oxford, R., & Crookall, D. (1990). Vocabulary learning: A critical analysis of techniques. *TESL Canada Journal*, 7(2), 09-30.
- Oxford, R. L. (1990). *Language learning strategies : what every teacher should know*. Boston: Heinle & Heinle Publishers.
- Oxford, R. L. (2016). *Teaching and researching language learning strategies: Self-regulation in context*: Taylor & Francis.
- Oxford, R. L., & Burry-Stock, J. A. (1995). Assessing the use of language learning strategies worldwide with the ESL/EFL version of the Strategy Inventory for Language Learning (SILL). *System*, 23(1), 1-23.
- Oxford, R. L., & Scarcella, R. C. (1994). Second language vocabulary learning among adults: State of the art in vocabulary instruction. *System*, 22(2), 231-243.
- Paivio, A. (1990). *Mental representations: A dual coding approach*: Oxford University Press.
- Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian journal of psychology*, 45(3), 255-287.
- Paivio, A. (2006). *Dual coding theory and education*. Paper presented at the Draft paper for the conference on "Pathways to Literacy Achievement for High Poverty Children," The University of Michigan School of Education.
- Paivio, A. (2013). *Imagery and verbal processes*: Psychology Press.
- Papalia, A., & Zampogna, J. (1977). Strategies used by foreign language students in deriving meaning from a written text and in learning vocabulary. *Language Association Bulletin*, 47, 7-8.
- Papathanasiou, E. (2009). How do vocabulary presentation and word properties influence the learning of new English (L2) words by Greek adult beginners. *Selected Papers from the 18th ISTAL*, 321-330.

- Paradis, M. (2004). *A neurolinguistic theory of bilingualism* (Vol. 18): John Benjamins Publishing.
- Paribakht, T. S., & Wesche, M. (1999). READING AND INCIDENTAL L2 VOCABULARY ACQUISITION An Introspective Study of Lexical Inferencing. *Studies in Second Language Acquisition*, 21(2), 195-224.
- Pauwels, P. (2015). How advanced students approach intentional vocabulary study. *The Language Learning Journal*, 1-21. doi:10.1080/09571736.2015.1078398
- Payne, M. E. (1988). *Vocabulary learning strategies used by ESL students and their relationship to perceptual learning style preferences* (Doctoral dissertation, Brigham Young University. Department of Linguistics).
- Pellicer-Sánchez, A. (2016). Incidental L2 vocabulary acquisition from and while reading. *Studies in Second Language Acquisition*, 38(01), 97-130.
- Pellicer-Sánchez, A., & Schmitt, N. (2010). Incidental Vocabulary Acquisition from an Authentic Novel: Do " Things Fall Apart"? *Reading in a Foreign Language*, 22(1), 31-55.
- Pigada, M., & Schmitt, N. (2006). Vocabulary acquisition from extensive reading: A case study. *Reading in a Foreign Language*, 18(1), 1.
- Pinheiro, J. C., & Bates, D. M. (2000). Linear mixed-effects models: basic concepts and examples. *Mixed-effects models in S and S-Plus*, 3-56.
- Plastina, A. (1997). MA in Linguistics (TESOL) University of Surrey. *UK Unpublished*.
- Poeppel, D., & Embick, D. (2017). Defining the relation between linguistics and neuroscience. In *Twenty-first century psycholinguistics* (pp. 103-118): Routledge.
- Politzer, R. L., & McGroarty, M. (1985). An exploratory study of learning behaviors and their relationship to gains in linguistic and communicative competence. *TESOL Quarterly*, 19(1), 103-123.
- Pollatsek, A., Reichle, E. D., & Rayner, K. (2006). Tests of the EZ Reader model: Exploring the interface between cognition and eye-movement control. *Cognitive Psychology*, 52(1), 1-56.
- Pressley, M., Levin, J. R., & Miller, G. E. (1982). The keyword method compared to alternative vocabulary-learning strategies. *Contemporary Educational Psychology*, 7(1), 50-60.
- Prince, P. (1996). Second language vocabulary learning: The role of context versus translations as a function of proficiency. *The Modern Language Journal*, 80(4), 478-493.
- Pulido, D. (2004). The relationship between text comprehension and second language incidental vocabulary acquisition: A matter of topic familiarity? *Language Learning*, 54(3), 469-523.
- Pulido, D., & Hambrick, D. Z. (2008). The "Virtuous" Circle: Modeling Individual Differences in L2 Reading and Vocabulary Development.(Author abstract)(Report). *Reading in a Foreign Language*.
- Purpura, J. E. (1997). An analysis of the relationships between test takers' cognitive and metacognitive strategy use and second language test performance. *Language Learning*, 47(2), 289-325.
- Purpura, J. E. (1999). *Learner strategy use and performance on language tests: A structural equation modeling approach* (Vol. 8): Cambridge University Press.
- Quine, W. V. O. (1960). Word and object. *Cambridge, MA: MIT Press*.
- Radach, R., & Kennedy, A. (2004). Theoretical perspectives on eye movements in reading: Past controversies, current issues, and an agenda for future research. *European Journal of Cognitive Psychology*, 16(1-2), 3-26.
- Ramos, R., & Dario, F. (2015). Incidental vocabulary learning in second language acquisition: a literature review. *Profile Issues in Teachers Professional Development*, 17(1), 157-166.
- Rayner, K. (1997). Understanding eye movements in reading. *Scientific Studies of Reading*, 1(4), 317-339.
- Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological bulletin*, 124(3), 372.
- Rayner, K. (2009). Eye movements in reading: Models and data. *Journal of eye movement research*, 2(5), 1.

- Rayner, K., & Frazier, L. (1989). Selection mechanisms in reading lexically ambiguous words. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 15(5), 779.
- Rayner, K., & McConkie, G. W. (1976). What guides a reader's eye movements? *Vision research*, 16(8), 829-837.
- Rayner, K., Sereno, S. C., Morris, R. K., Schmauder, A. R., & Clifton Jr, C. (1989). Eye movements and on-line language comprehension processes. *Language and Cognitive Processes*, 4(3-4), S121-S149.
- Rayner, K., Sereno, S. C., & Raney, G. E. (1996). Eye movement control in reading: a comparison of two types of models. *Journal of Experimental Psychology: Human Perception and Performance*, 22(5), 1188.
- Read, J. (2000). *Assessing vocabulary*: Cambridge university press Cambridge.
- Read, J. (2007). Second language vocabulary assessment: Current practices and new directions. *IJES, International Journal of English Studies*, 7(2), 105-126.
- Reber, A. S. (1993). *Implicit learning and tacit knowledge: An essay on the cognitive unconscious*. New York, NY: Oxford University Press.
- Rebuschat, P. (2015). Introduction: implicit and explicit learning of languages.
- Rebuschat, P., & Williams, J. (2012). *Statistical learning and language acquisition* (Vol. 1): Walter de Gruyter.
- Reid, J. M. (1995). *Learning styles in the ESL/EFL classroom*: ERIC.
- Renkl, A. (1997). Learning from worked-out examples: A study on individual differences. *Cognitive science*, 21(1), 1-29.
- Richards, J. C. (1976). The role of vocabulary teaching. *TESOL Quarterly*, 77-89.
- Rieder, A. (2003). Implicit and explicit learning in incidental vocabulary acquisition. *Views*, 12(2), 24-39.
- Roberts, L., & Meyer, A. (2012). Individual Differences in Second Language Learning: Introduction. *Language Learning*, 62, 1-4. doi:10.1111/j.1467-9922.2012.00703.x
- Robinson, P. (1995). Attention, memory, and the "noticing" hypothesis. *Language Learning*, 45(2), 283-331.
- Robinson, P. (2001). Individual Differences, Cognitive Abilities, Aptitude Complexes and Learning Conditions in Second Language Acquisition. *Second Language Research*, 17(4), 368-392. doi:10.1191/026765801681495877
- Rodrigues, P., & Ćavar, D. (2005). *Learning Arabic morphology using information theory*. Paper presented at the Proceedings from the Annual Meeting of the Chicago Linguistic Society.
- Rodríguez, M., & Sadoski, M. (2000). Effects of rote, context, keyword, and context/keyword methods on retention of vocabulary in EFL classrooms. *Language Learning*, 50(2), 385-412.
- Roediger, H. L., & Gynn, M. J. (1996). Retrieval processes. In E. L. Bjork & R. A. Bjork (Eds.), *Memory* (pp. 197-236). San Diego, CA: Academic Press.
- Rost, M., & Ross, S. (1991). Learner Use of Strategies in Interaction: Typology and Teachability. *Language learning*, 41(2), 235-268.
- Rott, S. (1999). THE EFFECT OF EXPOSURE FREQUENCY ON INTERMEDIATE LANGUAGE LEARNERS' INCIDENTAL VOCABULARY ACQUISITION AND RETENTION THROUGH READING. *Studies in Second Language Acquisition*, 21(4), 589-619.
- Royer, J. M. (1973). Memory effects for test-like-events during acquisition of foreign language vocabulary. *Psychological Reports*, 32(1), 195-198.
- Rubin, J. (1987). Learner strategies: Theoretical assumptions, research history and typology. *Learner strategies in language learning*, 15-30.
- Rushworth, M. F., Krams, M., & Passingham, R. E. (2001). The attentional role of the left parietal cortex: the distinct lateralization and localization of motor attention in the human brain. *Journal of cognitive neuroscience*, 13(5), 698-710.
- Ryding, K. C. (2013). *Teaching and learning Arabic as a foreign language: A guide for teachers*.

- Sadoski, M. (2005). A Dual Coding View of Vocabulary Learning. *Reading and Writing Quarterly: Overcoming Learning Difficulties*, 21(3), 221-238. doi:10.1080/10573560590949359
- Sadoski, M., & Paivio, A. (2004). A dual coding theoretical model of reading. *Theoretical models and processes of reading*, 5, 1329-1362.
- Sadoski, M., & Paivio, A. (2013). *Imagery and text: A dual coding theory of reading and writing*: Routledge.
- Sagarra, N., & Alba, M. (2006). The key is in the keyword: L2 vocabulary learning methods with beginning learners of Spanish. *The Modern Language Journal*, 90(2), 228-243.
- Saiegh-Haddad, E., & Henkin-Roitfarb, R. (2014). The structure of Arabic language and orthography. In *Handbook of Arabic literacy* (pp. 3-28): Springer.
- Saiegh-Haddad, E. (2004). The impact of phonemic and lexical distance on the phonological analysis of words and pseudowords in a diglossic context. *Applied Psycholinguistics*, 25(4), 495-512.
- Saint-Cyr, J. A., Taylor, A. E., & Lang, A. E. (1988). Procedural learning and neostriatal dysfunction in man. *Brain*, 111(4), 941-960.
- Sanaoui, R. (1993). *Vocabulary learning and teaching in French as a second language classrooms*.
- Sanaoui, R. (1995). Adult learners' approaches to learning vocabulary in second languages. *The Modern Language Journal*, 79(1), 15-28.
- Sanz, C. (2012). Multilingualism and metalinguistic awareness. *The Encyclopedia of Applied Linguistics*.
- Schmidt, R. (1990). The Role of Consciousness in Second Language Learning. *Applied Linguistics*, 11, 129-158.
- Schmidt, R. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 3-32). Cambridge: Cambridge University Press.
- Schmidt, R. (2012). Attention, awareness, and individual differences in language learning. *Perspectives on individual characteristics and foreign language education*, 6, 27.
- Schmitt, N. (1997). Vocabulary learning strategies. *Vocabulary: Description, acquisition and pedagogy*, 199-227.
- Schmitt, N. (2000). *Vocabulary in language teaching*: Ernst Klett Sprachen.
- Schmitt, N. (2008a). Review article: Instructed second language vocabulary learning. *Language teaching research*, 12(3), 329-363.
- Schmitt, N. (2008b). *Teaching Vocabulary*: Pearson Education.
- Schmitt, N. (2010a). Key issues in teaching and learning vocabulary. *Insights into non-native vocabulary teaching and learning*, 28-40.
- Schmitt, N. (2010b). Researching Vocabulary: A Vocabulary Research Manual. *Studies in Second Language Acquisition*, 19.
- Schmitt, N. (2010c). *Researching Vocabulary: A Vocabulary Research Manual* (Vol. 19): Palgrave Macmillan.
- Schmitt, N., & McCarthy, M. (1997). *Vocabulary: Description, acquisition and pedagogy* (Vol. 2035): Cambridge university press Cambridge.
- Schmitt, N., & Schmitt, D. R. (1993). Identifying and Assessing Vocabulary Learning Strategies. *Thai TESOL Bulletin*, 5(4), 27-33.
- Scholfield, P. (1999). Dictionary use in reception. *International Journal of Lexicography*, 12(1), 13-34.
- Schwarz, N. (2007). Retrospective and concurrent self-reports: The rationale for real-time data capture. *The science of real-time data capture: Self-reports in health research*, 1126.
- Scurfield, E., & Liyani, S. (2003). *Teach yourself beginner's Mandarin Chinese (TYBL)*.
- Segler, T. M. (2001). PhD Research proposal: Second language vocabulary acquisition and learning strategies in ICALL environments. Retrieved February, 9, 2008.
- Shipstead, Z., Lindsey, D. R. B., Marshall, R. L., & Engle, R. W. (2014). The mechanisms of working memory capacity: Primary memory, secondary memory, and attention control. *Journal of Memory and Language*, 72(1), 116-141. doi:10.1016/j.jml.2014.01.004

- Shuell, T. J. (1986). Cognitive conceptions of learning. *Review of educational research*, 56(4), 411-436.
- Sigelman, C. K., & Rider, E. A. (2014). *Life-span human development*: Cengage Learning.
- Siyanova-Chanturia, A., Conklin, K., & Schmitt, N. (2011). Adding more fuel to the fire: An eye-tracking study of idiom processing by native and non-native speakers. *Second Language Research*, 27(2), 251-272.
- Smith, B. (2012). Eye tracking as a measure of noticing: A study of explicit recasts in SCMC. *Language Learning & Technology*, 16(3), 53-81.
- Smith, B. D., Miller, C., Grossman, F., & Valeri-Gold, M. (1994). Vocabulary retention: Effects of using spatial imaging on hemispheric-preference thinkers. *Journal of Research & Development in Education*.
- Smith, B. D., Stahl, N., & Neil, J. (1987). The effect of imagery instruction on vocabulary development. *Journal of College Reading and Learning*, 20(1), 131-137.
- Sökmen, A. J. (1997). Current trends in teaching second language vocabulary. *Readings in Methodology*, 152.
- Someren, M. v., Barnard, Y. F., & Sandberg, J. A. (1994). *The think aloud method: a practical approach to modelling cognitive processes*: Academic Press.
- Squire, L. R., & Knowlton, B. J. (2000). The medial temporal lobe, the hippocampus, and the memory systems of the brain. *The new cognitive neurosciences*, 2, 756-776.
- Stahl, S. A., Burdge, J. L., Machuga, M. B., & Stecyk, S. (1992). The effects of semantic grouping on learning word meanings. *Reading Psychology: An International Quarterly*, 13(1), 19-35.
- Starr, M. S., & Rayner, K. (2001). Eye movements during reading: Some current controversies. *Trends in Cognitive Sciences*, 5(4), 156-163.
- Steingart, S. K., & Glock, M. D. (1979). Imagery and the recall of connected discourse. *Reading research quarterly*, 66-83.
- Stern, H. H. (1986). *Fundamental Concepts of Language Teaching*. Oxford: Oxford University Press.
- Sternberg, R. J., & Sternberg, K. (2012). *Cognitive Psychology* (J. Perkins Ed. 6 ed.). Belmont, CA 94002-3098
USA: Wadsworth, Cengage Learning.
- Stoffer, I. (1997). University foreign language students' choice of vocabulary learning strategies as related to individual difference variables.
- Strain, E., & Herdman, C. M. (1999). Imageability effects in word naming: an individual differences analysis. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale*, 53(4), 347.
- Summers, D. (2006). *Longman exams dictionary:[your key to exam success]*: Pearson Longman.
- Suzuki, W. L., & Amaral, D. G. (1994). Perirhinal and parahippocampal cortices of the macaque monkey: cortical afferents. *Journal of comparative neurology*, 350(4), 497-533.
- Sweller, J. (1994). Cognitive load theory, learning difficulty, and instructional design. *Learning and instruction*, 4(4), 295-312.
- Taha, H., & Saiegh-Haddad, E. (2016). The role of phonological versus morphological skills in the development of Arabic spelling: An intervention study. *Journal of Psycholinguistic Research*, 45(3), 507-535.
- Takač, V. P. (2008). *Vocabulary Learning Strategies and Foreign Language Acquisition: Multilingual Matters*.
- Tarone, E. (1983). Some thoughts on the notion of communication strategy. In C. Faerch & G. Kasper (Eds.), *Strategies in interlanguage communication* (pp. 61-74). London: Longman.
- Taylor, K. L., & Dionne, J.-P. (2000). Accessing problem-solving strategy knowledge: The complementary use of concurrent verbal protocols and retrospective debriefing. *Journal of Educational Psychology*, 92(3), 413.

- Taylor, K. L., & Jean-Paul, D. (2000). Accessing problem-solving strategy knowledge: The complementary use of concurrent verbal protocols and retrospective debriefing. *Journal of educational psychology*, 92(3), 413-425. doi:10.1037/0022-0663.92.3.413
- Taylor, L. (1990). *Teaching and learning EFL Vocabulary*. Herfordshire: Prentice Hall.
- Tseng, W.-T., Dörnyei, Z., & Schmitt, N. (2006). A new approach to assessing strategic learning: The case of self-regulation in vocabulary acquisition. *Applied linguistics*, 27(1), 78-102.
- Ullman, M. T. (2001a). The declarative/procedural model of lexicon and grammar. *Journal of Psycholinguistic Research*, 30(1), 37-69.
- Ullman, M. T. (2001b). The neural basis of lexicon and grammar in first and second language: The declarative/procedural model. *Bilingualism: Language and Cognition*, 4(2), 105-122.
- Ullman, M. T. (2001c). A neurocognitive perspective on language: The declarative/procedural model. *Nature reviews neuroscience*, 2(10), 717.
- Ullman, M. T. (2005). A cognitive neuroscience perspective on second language acquisition: The declarative/procedural model. *Mind and context in adult second language acquisition*, 141-178.
- Ullman, M. T., Corkin, S., Coppola, M., Hickok, G., Growdon, J. H., Koroshetz, W. J., & Pinker, S. (1997). A neural dissociation within language: Evidence that the mental dictionary is part of declarative memory, and that grammatical rules are processed by the procedural system. *Journal of cognitive neuroscience*, 9(2), 266-276.
- Ullman, M. T., Pancheva, R., Love, T., Yee, E., Swinney, D., & Hickok, G. (2005). Neural correlates of lexicon and grammar: Evidence from the production, reading, and judgment of inflection in aphasia. *Brain and Language*, 93(2), 185-238.
- Van Gog, T., Paas, F., Van Merriënboer, J. J., & Witte, P. (2005). Uncovering the problem-solving process: Cued retrospective reporting versus concurrent and retrospective reporting. *Journal of Experimental Psychology: Applied*, 11(4), 237.
- Van Hell, J. G., & Mahn, A. C. (1997). Keyword mnemonics versus rote rehearsal: Learning concrete and abstract foreign words by experienced and inexperienced learners. *Language Learning*, 47(3), 507-546.
- van Parreren, C. S. (1992). Individual differences in vocabulary acquisition: A qualitative experiment in the first phase of secondary education. In *Vocabulary and applied linguistics* (pp. 94-101): Springer.
- Vann, R. J., & Abraham, R. G. (1990). Strategies of unsuccessful language learners. *TESOL Quarterly*, 24(2), 177-198.
- Vidal, K. (2011). A comparison of the effects of reading and listening on incidental vocabulary acquisition. *Language Learning*, 61(1), 219-258.
- Wang, A. Y., & Thomas, M. H. (1995). Effects of keyword on long-term retention: Help or hindrance? *Journal of Educational Psychology*, 87(3), 468.
- Wang, A. Y., & Thomas, M. H. (1999). In defence of keyword experiments: A reply to Gruneberg's commentary. *Applied Cognitive Psychology*, 13(3), 283-287.
- Waring, R. (2002). Basic principles and practice in vocabulary instruction. *LANGUAGE TEACHER-KYOTO-JALT-*, 26(7), 11-12.
- Waring, R., & Takaki, M. (2003). At what rate do learners learn and retain new vocabulary from reading a graded reader. *Reading in a Foreign Language*, 15(2), 130-163.
- Webb, S. (2007). Learning word pairs and glossed sentences: The effects of a single context on vocabulary knowledge. *Language teaching research*, 11(1), 63-81.
- Webb, S. (2008). The Effects of Context on Incidental Vocabulary Learning. *Reading in a Foreign Language*, 20(2), 232-245.
- Webb, S. (2009). The effects of receptive and productive learning of word pairs on vocabulary knowledge. *RELC journal*, 40(3), 360-376.
- Webb, S. (2013). Depth of vocabulary knowledge. *The Encyclopedia of Applied Linguistics*.

- Weinstein, C. E., & Mayer, R. E. (1986). The teaching of learning strategies. *Handbook of research on teaching*, 3, 315-327.
- Wenden, A. (1987). Conceptual background and utility. In A. Wenden & J. Rubin (Eds.), *Learner strategies in language learning*. New York: Prentice Hall.
- White, T. G., Power, M. A., & White, S. (1989). Morphological analysis: Implications for teaching and understanding vocabulary growth. *Reading research quarterly*, 283-304.
- Wilkins, D. A. (1972). *Linguistics in Language Teaching*. London: Edward Arnold.
- Williams, M., & Burden, R. L. (2004). *Psychology for language teachers*: Ernst Klett Sprachen.
- Williams, R., & Morris, R. (2004). Eye movements, word familiarity, and vocabulary acquisition. *European Journal of Cognitive Psychology*, 16(1-2), 312-339.
- Willing, K. (1988). *Learning styles in adult migrant education*. Adelaide, South Australia: National Curriculum Research Council.
- Wittrock, M. C. (1979). The cognitive movement in instruction. *Educational Researcher*, 5-11.
- Wolverton, G. S., & Zola, D. (1983). The temporal characteristics of visual information extraction during reading. *Eye movements in reading: Perceptual and language processes*, 41-51.
- Xiang-hong, L. (2005). Vocabulary Learning Strategies. *Journal of Shenyang College of Education*, 3, 030.
- Yang, Y. (2017). *Vocabulary learning strategies used by L1 English speakers learning Chinese as a foreign language* (Doctoral dissertation, King's College London).
- Younes, M. A. (1995). *Elementary Arabic: Integrated Approach: Student Workbook*: Yale University Press.
- Young, M. Y. C. (1996). *Listening comprehension strategies used by university level Chinese students learning English as a second language* (Doctoral dissertation, University of Essex).
- Zahar, R., Cobb, T., & Spada, N. (2001). Acquiring vocabulary through reading: Effects of frequency and contextual richness. *Canadian modern language review*, 57(4), 541-572.