Lookup strategies in the use of online bilingualised dictionaries by English-Medium secondary school graduates in Macao: A small-scale think-aloud study

by Chi Hin Lok

British Council's Master's Dissertation Awards 2020

Commendation

www.teachingenglish.org.uk/publications/elt-masters-dissertations

NEWCASTLE UNIVERSITY

**SCHOOL OF EDUCATION,
COMMUNICATION AND LANGUAGE SCIENCES**

MA APPLIED LINGUISTICS AND TESOL

DISSERTATION TITLE:

Lookup Strategies in the Use of Online Bilingualised Dictionaries by English-Medium Secondary School Graduates in Macao: A Small-Scale Think-Aloud Study

NAME OF STUDENT:
CHI HIN LOK

NAME OF SUPERVISOR:
DR. MEI LIN

DATE:
30th August 2019

Declaration

I hereby confirm that this dissertation entitled "Lookup Strategies in the Use of Online Bilingualised Dictionaries by English-Medium Secondary School Graduates in Macao: A Small-Scale Think-Aloud Study" is all my own work.

This work is completed under the supervision of Dr. Mei Lin, and the information derived from other sources has been acknowledged in the list of references.

Name:
CHI HIN LOK

Signature:
(*The signature has been removed in this published version for the purpose of protecting the writer's confidentiality.*)

Date
30th August 2019

Acknowledgements

Throughout this one-year postgraduate programme at Newcastle University, I have been writing all the time. The most impressive feeling I have experienced is that writing is truly an inspirational process not just to others but to oneself. By deconstructing and constructing concepts and ideas from different sources, one can absolutely come up with new notions to view an issue. Henceforth, I would like to thank myself for having the courage and determination to become a postgraduate student so that I can gain the opportunity of walking along this wonderful journey of inspiration.

Regarding the process of writing and completing this dissertation, I would like to thank those people who have been giving me great encouragement. Special credits have to be given to my family and friends who visited me during the time when I was in the UK.

Besides, I am thankful for the useful advice from my supervisor and the companionship of my classmates. They are always my guides who lead me the way towards the destination even when there is darkness.

Last but not least, I would like to show my gratitude to the school that allowed me to conduct the research, as well as those students who willingly devoted their precious time to participating in this study.

Without the enormous support of all these people and parties, I would not have finished this dissertation with a fountain of knowledge and inspiring thoughts.

Abstract

This research aims at figuring out whether it is necessary to teach secondary students in English-medium schools in Macao dictionary skills as required by the new educational policy by investigating if the current high school graduates, who have not received explicit instruction on dictionary use, could have developed necessary dictionary skills and employed lookup strategies when using an online bilingualised dictionary to facilitate their reading in English as a second language. By means of the think-aloud approach as the primary research method, supplemented with observation and stimulated recall interviews, the researcher examined how students conducted their dictionary lookups to comprehend unfamiliar words during a reading task.

The analysis of students' verbal protocols show that they can be adopting seven different lookup strategies, either individually or conjunctly, to determine the meaning of target words, while their lookup results display a high accuracy rate as they mostly successfully perceive accurate word meanings in relation to the reading context. Notwithstanding the overall positive evidence about students' lookup abilities, the comparison between proficient readers and independent readers reveal that proficient readers are more likely to perform context fitting as a lookup strategy and realise the ultimate goal of enhancing reading comprehension, whereas independent readers tend to concentrate on the lookup per se without referring to the reading context.

This suggests that not all secondary students are able to develop necessary abilities to make full use of their dictionary, and teaching dictionary skills is thus necessary so that teachers can fulfil the basic learning requirement established by the education department and guarantee that all their students can be equipped with proper lookup strategies to aid their reading process.

Table of Contents

List of Tables

List of Figures

List of Appendices

Chapter 1 Introduction

Dictionaries have long been regarded as an indispensable resource in second language learning. Apparently, dictionaries can be used to enhance learners' performance in both receptive and productive tasks. For instance, learners can consult dictionaries when they encounter unknown words in the target language so that they can better perceive their meanings. Besides, learners can look for suitable words to express their thoughts or find out appropriate usages of unfamiliar words during writing and speaking activities. In these ways, dictionaries serve as a secondary source that helps learners better perceive or utilise words (Walz, 1990).

1.1 Common Usages of Dictionaries in L2 Learning

Concerning dictionaries as a learning resource for L2 learners, Scholfield (1999) comments that its use is mainly for receptive purposes, and its primary function is to assist learners in perceiving the meanings of unfamiliar items in reading. In this process, incidental vocabulary learning can happen as learners consciously focus on the target words when consulting the dictionary (Hulstijn, 1992). This makes the learning of unknown words a by-product of their reading process. The lookup process thus becomes meaning-focused, and it is not surprising to notice that learners usually look at L2 definitions or L1 equivalents in the entry but not grammatical or collocational features which are more likely to be useful for productive purposes.

These notions have been confirmed in a large-scale survey conducted by Fan (2000). This survey collects data from more than 1000 first-year students from seven tertiary institutions in Hong Kong. The study finds out that students mostly use dictionaries to check the context meaning of unknown words, thus ascertaining that referring to semantic information in the dictionary is the most important function to users. This also demonstrates that learners are more likely to be using dictionaries for receptive purposes instead of productive ones.

1.2 Dictionary Use in Macao for L2 Learning

Conforming to the notion about the essentiality of dictionaries in L2 learning, the Education and Youth Affairs Bureau in Macao has taken into the consideration of dictionary use when devising the basic requirements for the

learning of English as a second language in secondary education. According to the newly implemented regulations, secondary students who are learning English as their target language have to develop the use of dictionaries to enhance their understanding of new vocabulary items as a reading skill (Região Administrativa Especial de Macau, 2017).

This change in the regulations has led to the question of whether there is a need to make any pedagogical adjustments to fulfil this learning goal. This issue is especially crucial in English-medium schools where the English subjects are of utmost importance. In contrast to Chinese-medium schools which tend to prepare students for pursuing further studies at universities in regions, such as Mainland China and Taiwan, English-medium schools are more likely to prepare students for taking public examinations, such as International General Certificate of Secondary Education (IGCSE), which can fulfil the entry requirement of universities in English-speaking countries, such as the United Kingdom and the United States. The language abilities of students from English-medium schools thus become a critical concern of whether they can continue their studies in these English-speaking environments, and perhaps dictionary skills are a necessary ability that can facilitate their tertiary learning.

Having been studying and working as an English teacher in an English-medium secondary school each for five years, I notice that dictionary skills are seldomly taught explicitly to students. Even though students are encouraged to use dictionaries to consult word meanings for unknown words, the relevant lookup skills are rarely discussed in class and are not assessed in any tests or exams. It is thus worthwhile to examine whether students can actually develop such skills under the existing curriculum, or if there is an urgent need to adjust the current teaching approach to develop their abilities in using dictionaries so that students can meet the learning requirement and be better prepared for their learning in the tertiary sector.

1.3 Conclusion: Focus of the Current Study

Concerning the essence of dictionary use in L2 learning and the regulation that the development of dictionary skills is mandatory in the English-medium secondary schools in Macao, it is necessary to understand whether students from

these schools have developed the required abilities in this learning aspect. Hence, the current study aims at examining if graduates from the English-medium secondary schools have adopted any lookup strategies in the consultation, and whether dictionary use can help them understand unfamiliar words during reading activities. The think-aloud approach has been adopted as the primary research method and supplemented with observation and stimulated recall interviews so that participants' dictionary consultation process in relation to their performance can be clearly examined.

Regarding the purpose of this study, the current chapter has briefly explained how dictionary use is related to L2 learning and how it is a critical issue in the English-medium schools in Macao in respect to recent changes of its education policies, which forms the contextual bases of the current study. In the next chapter, the scope of this research will be further sharpened after relevant literature about different types of dictionaries, dictionary lookup strategies, and the reasons for successful and unsuccessful lookups are reviewed. In Chapter 3, we shall discuss how the think-aloud approach is adopted as the primary method in data collection and how the verbal data is transcribed and coded for analysis. Chapter 4 presents the research findings, followed by a discussion about their learning and teaching implication in Chapter 5. The last chapter concludes the paper by summarising the main findings, explaining the limitation of the study, and making suggestions for future studies.

Chapter 2 Literature Review

In Chapter 1, we have understood that dictionary use has long been recommended to L2 learners for assisting all kinds of language learning activities, especially reading and vocabulary learning. This chapter continues to explain its impacts on L2 learning. Firstly, we shall clarify why dictionary use is necessary in L2 learning. Then, we shall compare different types of dictionaries that are classified according to the information involved and their medium. Next, lookup strategies identified in previous studies are reviewed. Afterwards, we shall look at the factors that can impact the successfulness of dictionary lookups and their implications about the employment of lookup strategies. Lastly, the chapter explains how the review of relevant studies defines and narrows the scope of the current study.

2.1 The Controversy of Dictionary Use in L2 Learning

Despite the assumption that dictionaries can be a resource that facilitates L2 learning, their effectiveness has been uncertain as there have been lots of negative comments about their use. For example, Neubach and Cohen (1988) criticise that both teachers and students are treating dictionary use in an overoptimistic manner. Teachers are assuming that students are able to use dictionaries without much difficulty while students are expecting that they can always perceive word meanings when accompanied by dictionary examples. Their scepticism is indeed aroused by the process that dictionary use can involve a series of complicated operations. Learners have to first decide if they can infer the meaning of an unknown word from the context or whether consulting a dictionary is necessary. They then have to keep the context in mind so that they can choose the most appropriate sense when going through different definitions in the entry. They also have to insert the chosen meaning into the reading context to confirm its appropriateness. Since the whole process is not as simple as one may expect, there are great chances that errors can occur, thus negatively impacting the effectiveness of this learning aid.

In fact, previous studies (Neubach and Cohen, 1988; Nesi and Meara, 1991; Nesi, 1994) reveal that dictionary use does not result in any significant impact on reading comprehension. Neubach and Cohen (1988) finds out that

dictionary use does not enhance learners' understanding since both high and low proficiency students can obtain the main ideas of the reading passage even if they fail to understand specific words with the use of dictionaries. They further explain that, when compared to word knowledge, world knowledge can be more critical for comprehending a passage. Likewise, Nesi and Meara (1991) explain that the insignificance of dictionary use is caused by students' failure in identifying words that are essential for reaching the answers to certain questions, so the availability of dictionaries does not necessarily help students to improve their comprehension. Similar findings are also shown in the study of Nesi (1994) in which overseas students in an EAP course fail to derive the real benefit from using a dictionary for the same reason.

The importance of dictionary use is further demoted because of the emergence of communicative approach. Due to its prevalence in language teaching, dictionaries become less recommended to learners as they are encouraged to infer the meanings of unknown words via contextual clues (Wingate, 2001). Proponents believe that this practice can prevent students from getting distracted by their first language during the lookup process so that they can primarily focus on the target language. Besides, communicative language teaching indeed encourages learners to take risk, for example, by guessing unfamiliar words to tackle language problems (Winkler, 2001). Since this view is contradictory to the action of looking for exact information from dictionaries, this thus downgrades their use in L2 learning.

Nonetheless, these findings do not directly reflect that dictionaries are not practical per se for L2 learning. The unfavourable results in previous studies are indeed caused by the fact that learners are not equipped with necessary reading skills to recognise main wordings for consultation as well as dictionary skills to perform their lookups properly. In the learning framework proposed by Hunt and Beglar (2005), they explain that dictionary use can be a useful learning strategy, provided that learners are offered training. For example, learners should be reminded of identifying the word class of the target word and taught how they can seek for contextual clues to find out the most suitable sense in a dictionary entry.

Furthermore, the deterrence of dictionary use is indeed incongruous when compared to the promotion of inferencing strategy for decoding purposes. Even though dictionary use may distract learners from their reading and hinder the development of other reading skills, this does not imply that making inferences is necessarily a more reliable strategy since learners can fail to deduce the correct meanings of unknown words (Walz, 1990). For instance, due to a lack of sufficient context, learners can fail to infer the meanings of unfamiliar words (Bensoussan and Laufer, 1984; Hulstijn, 1992). Research findings (Haynes, 1984; Chan, 2012) show that more than half of learners' guesses can be incorrect if they solely formulate word meanings by referring to contextual clues, while some other studies (Stuart and Richard, 1993; Hulstijn, Hollander, and Greidanus, 1996) indicate that incidental vocabulary learning is more effectively facilitated when a reading task is performed with dictionaries. All these thus justify that simply relying on guessing cannot be a viable learning strategy, and dictionary use is necessary for reading comprehension and vocabulary learning.

After all, dictionary use still plays a significant role in language learning. This issue also becomes crucial when viewing L2 learning as a longitudinal issue. Since dictionaries can provide profound information about words in the target language, they are particularly important in environments where there are insufficient human sources of L1 information (Walz, 1990). In such context, dictionaries are important for the sake of lifelong L2 learning. Fan (2000) agrees with this notion and explains that dictionaries enable learners to consciously examine different aspects of the target language when learners cannot acquire L2 naturally from their surroundings. In these cases, dictionaries can be an important source of input and should be recommended as a learning tool to L2 learners.

2.2 Comparison of Different Types of Dictionaries

Apart from the verification that dictionary use can foster the development of receptive language abilities in L2 learning, it is equally important to notice that learners can be using different types of dictionaries for this purpose. To examine how benefits of dictionary use can be fully obtained, we shall now turn to discuss the comparison of different types of dictionaries.

2.2.1 Monolingual versus Bilingual versus Bilingualised Dictionaries

The review of previous research about dictionary use shows that early studies conducted in 1980s and 1990s have mostly focused on comparing bilingual dictionaries (an exemplary entry is shown in Figure 1) with monolingual ones (an exemplary entry is shown in Figure 2). The former dictionaries provide the reference word in the target language and give their definitions in the users' first language, while the latter ones include the reference words and their definitions in the target language (Aust, Kelley, and Roby, 1993). Nevertheless, which type of dictionaries is more effective has been inconclusive.

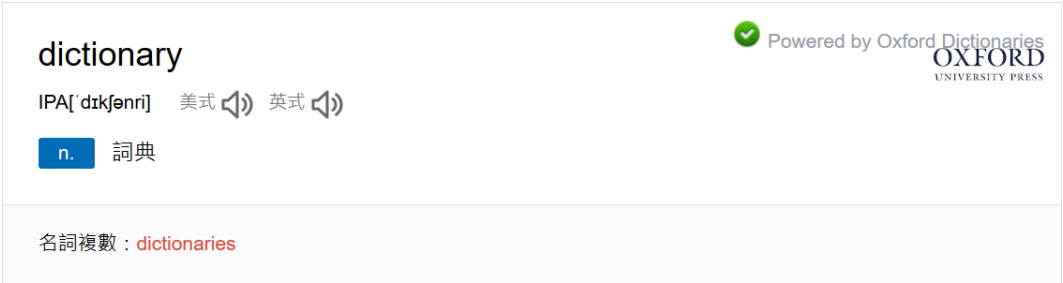
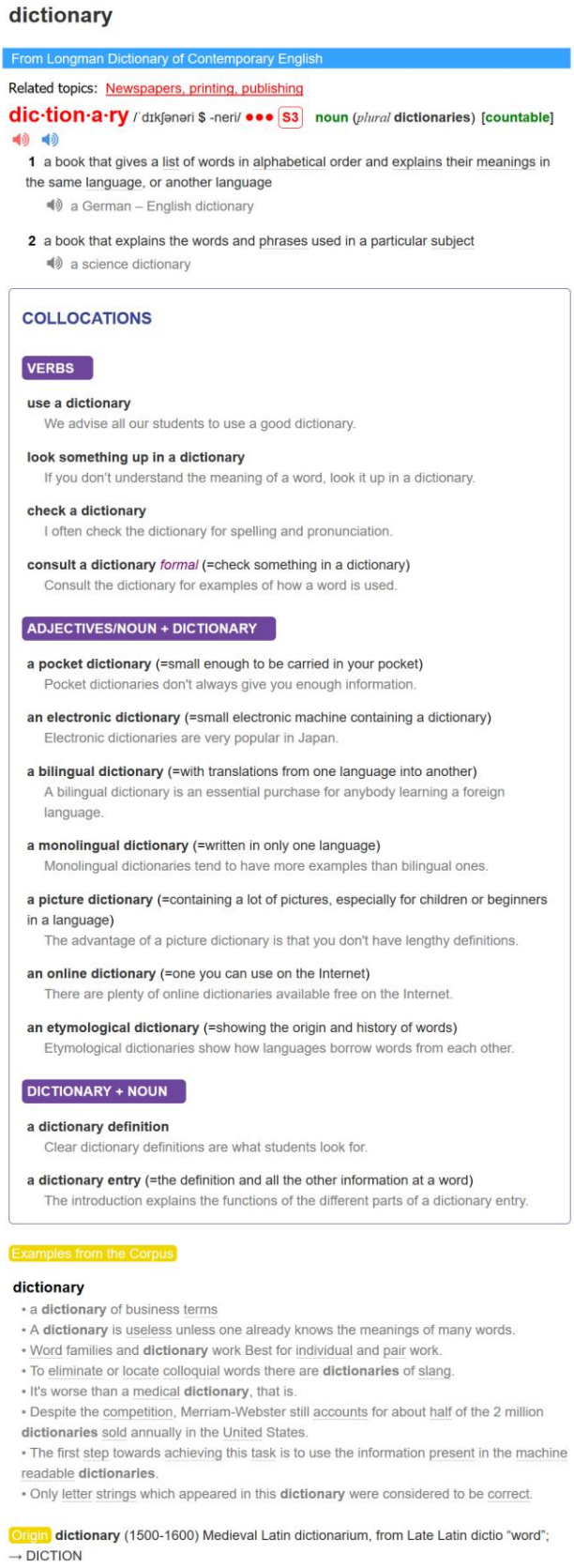


Figure 1: An exemplary entry from a bilingual dictionary (Retrieved from https://hk.dictionary.search.yahoo.com/search;_ylt=AwrtXG22dlxd3U8AXhPDoolQ;_ylc=X1MDMTM1MTE5NzM3OQRfcgMyBGZyAwRncHJpZAMwNE9mR19fM1N3MmNBaTlKOF8xdkRBBG5fcnNsdAMwBG5fc3VnZwMyBG9yaWdpbgNoay5kaWN0aW9uYXJ5LnNlYXJjaC55YWhvby5jb20EcG9zAzAEcHFzdHIDBHBxc3RybAMwBHFzdHJsAzEwBHF1ZXJ5A2RpY3Rpb25hcnkEdF9zdG1wAzE1NjYzNDA3OTc-?p=dictionary&fr=sfp&iscqry=)



dictionary

From Longman Dictionary of Contemporary English

Related topics: Newspapers, printing, publishing

dic·tion·a·ry /ˈdɪkʃənəri $ -neri/ ●●● S3 **noun** (*plural* **dictionaries**) [countable]

1 a book that gives a list of words in alphabetical order and explains their meanings in the same language, or another language

a German – English dictionary

2 a book that explains the words and phrases used in a particular subject

a science dictionary

COLLOCATIONS

VERBS

use a dictionary
We advise all our students to use a good dictionary.

look something up in a dictionary
If you don't understand the meaning of a word, look it up in a dictionary.

check a dictionary
I often check the dictionary for spelling and pronunciation.

consult a dictionary *formal* (=check something in a dictionary)
Consult the dictionary for examples of how a word is used.

ADJECTIVES/NOUN + DICTIONARY

a pocket dictionary (=small enough to be carried in your pocket)
Pocket dictionaries don't always give you enough information.

an electronic dictionary (=small electronic machine containing a dictionary)
Electronic dictionaries are very popular in Japan.

a bilingual dictionary (=with translations from one language into another)
A bilingual dictionary is an essential purchase for anybody learning a foreign language.

a monolingual dictionary (=written in only one language)
Monolingual dictionaries tend to have more examples than bilingual ones.

a picture dictionary (=containing a lot of pictures, especially for children or beginners in a language)
The advantage of a picture dictionary is that you don't have lengthy definitions.

an online dictionary (=one you can use on the Internet)
There are plenty of online dictionaries available free on the Internet.

an etymological dictionary (=showing the origin and history of words)
Etymological dictionaries show how languages borrow words from each other.

DICTIONARY + NOUN

a dictionary definition
Clear dictionary definitions are what students look for.

a dictionary entry (=the definition and all the other information at a word)
The introduction explains the functions of the different parts of a dictionary entry.

Examples from the Corpus

dictionary

- a **dictionary** of business terms
- A **dictionary** is useless unless one already knows the meanings of many words.
- Word families and **dictionary** work Best for individual and pair work.
- To eliminate or locate colloquial words there are **dictionaries** of slang.
- It's worse than a medical **dictionary**, that is.
- Despite the competition, Merriam-Webster still accounts for about half of the 2 million **dictionaries** sold annually in the United States.
- The first step towards achieving this task is to use the information present in the machine readable **dictionaries**.
- Only letter strings which appeared in this **dictionary** were considered to be correct.

Origin **dictionary** (1500-1600) Medieval Latin dictionarium, from Late Latin dictio "word"; → DICTION

Figure 2: An exemplary entry from a monolingual dictionary (Retrieved from https://www.ldoceonline.com/dictionary/dictionary)

Advocates of monolingual dictionaries claim that they provide learners with more detailed information, for example, word collocations, connotations, synonyms, and antonyms, which can assist learners in better perceiving the target words (Ard, 1982). Correspondingly, bilingual dictionaries are excoriated because they fail to exert the same impact. For instance, the equivalent translations in their entries can be indistinctive to learners and lead them to confusion (Lindstrom, 1980). Besides, these equivalent translations can provoke a negative impact known as the naive lexical hypothesis as users may form the false impression that there are always equivalents between L1 and L2 (Bland et al., 1990). Hence, learners become more involved in translating instead of reading in the target language when using bilingual dictionaries, thus hindering their L2 learning.

This prospect has been supported by Bishop (1998) when he conducted a questionnaire-based study to find out how L2 learners are using bilingual dictionaries. The findings show that English learners of French primarily consult bilingual dictionaries for checking spelling and meaning, and a majority of participants consult the dictionary without making any initial guesses of word meanings. In this case, the consultation of bilingual dictionaries promotes the use of literal translation for understanding the target language, and this may not be sufficient for L2 development. Since there are no perfect equivalents between any two languages, students have to learn how to retrieve necessary linguistic information from the context to better understand the unknown words during lookups. This view thus makes monolingual dictionaries, which contain richer information, a more favourable learning tool than bilingual ones.

On the contrary, supporters of bilingual dictionaries state that their operations are less complicated and demanding when compared to monolingual dictionaries. In a survey-based research (Baxter, 1980) in which the subjects are 342 university students in Japan, the results show that most students prefer bilingual dictionaries to monolingual ones because bilingual dictionaries are easier to use, whereas monolingual dictionaries, which present definitions with lots of post-modifiers, can make them incomprehensible since such language structures are rarely used in Japanese. In other words, the problem is especially indisputable when there is a great variation in the language structure between the

learners' first language and their target language. Similar problems can also be caused by circular definitions that explain the target words with the wordings being defined, which then makes it hard for monolingual dictionary users to comprehend the target words (Thompson, 1987).

While there are different reasons for defending the use of monolingual and bilingual dictionaries, Neubach and Cohen (1988) explore the issue from another perspective by associating their use with learners' proficiency. In their introspective study, six students, two each from high, intermediate, and low level EFL classes, verbally reported their searching process and explained why they had chosen certain meanings when using monolingual and bilingual dictionaries. In their conclusion, the researchers comment that monolingual dictionaries which give more precise definitions are more suitable for high proficiency students while bilingual dictionaries are preferred by low proficiency students because there is less that they have to read to understand a word.

Concerning this notion, Laufer and Kimmel (1997) distinguish two evaluative concepts: dictionary usefulness and dictionary usability. The former refers to 'the extent to which a dictionary is helpful in providing the necessary information to its user' while the latter means 'the willingness on the part of the consumer to use the dictionary in question and his/her satisfaction from it' (Laufer and Kimmel, 1997, p.362). When these criteria are applied to the evaluation of monolingual and bilingual dictionaries, it is apparent that monolingual dictionaries are more useful since they provide more information to learners while bilingual dictionaries are more usable as learners primarily prefer using them. Thereupon, the choice between monolingual dictionaries and bilingual dictionaries indeed brings forth the conflict between usefulness and usability.

In order to resolve this conflict, Laufer and Kimmel (1997) turned to examine another type of dictionary: bilingualised dictionaries (an exemplary entry is shown in Figure 3). These dictionaries combine monolingual definitions with the translation in a bilingual entry, so they are presumably the resource that can perform both usefulness and usability. To attest this presumption, these two researchers looked at the language orientation of learners when using bilingualised dictionaries for consulting word meanings. Their study with 70

learners of English from Israel shows that about one-third of students are L1 motivated, another one-third of students are L2 motivated, and only 10 per cent of students are referring to both languages during the lookups. The implication is that bilingualised dictionaries offer the opportunities for learners to be exposed to both L1 and L2 information in the entry, so learners can choose the one they prefer or look at both. Regarding both usefulness and usability, learners thus do not have to make a choice between monolingual and bilingual dictionaries.

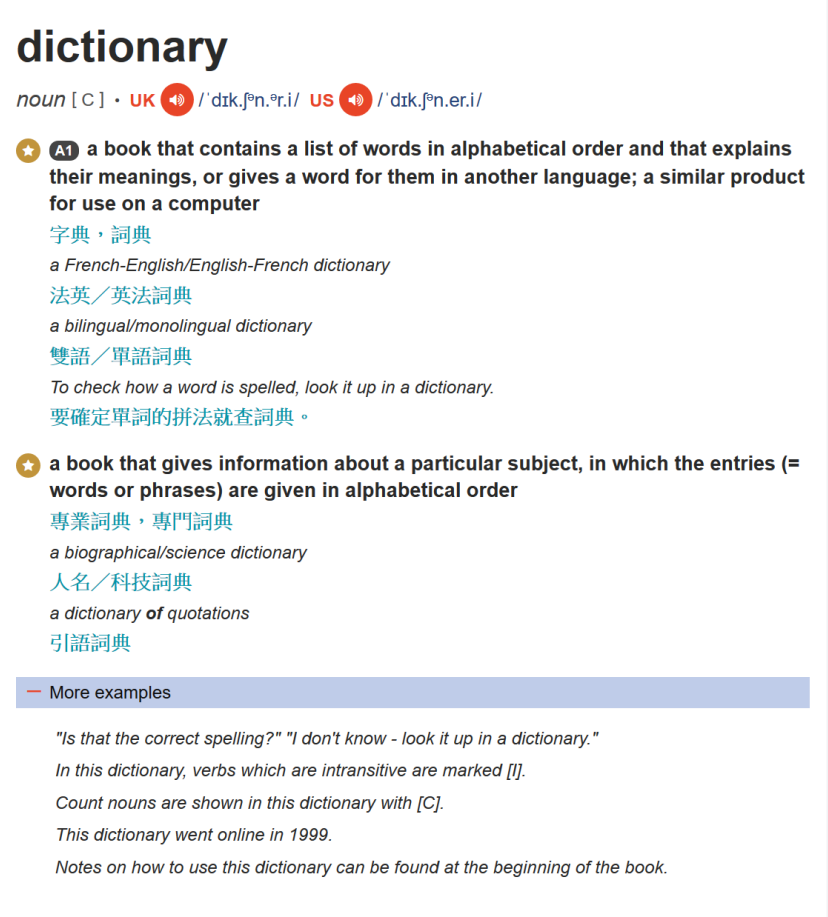


Figure 3: An exemplary entry from a bilingualised dictionary (Retrieved from https://dictionary.cambridge.org/dictionary/english-chinese-traditional/dictionary)

The effectiveness of bilingualised dictionaries over monolingual and bilingual ones is further ascertained in the study of Laufer and Hadar (1997). They compared the effectiveness of these three types of dictionaries in terms of comprehension and production of unknown words. 123 Hebrew learners of English participated in the study and they were divided into two groups, pre-

advanced and advanced groups. They were presented 15 target words and were randomly given five entries from each type of dictionary. Participants finished a multiple-choice exercise in which they referred to the entries and chose the best meanings of the target words and a sentence-making one in which they composed their own sentences after consulting the dictionary entries. The result shows that bilingualised dictionaries are most useful for both comprehension and productive purposes. The researchers conclude that bilingualised dictionaries are practically suitable for learners at all levels. Unskilled dictionary users can focus on the bilingual information; more skilled dictionary users can obtain more information from the monolingual part of the entry; and excellent dictionary users can consolidate their understanding by referring to the translation. In brief, since bilingualised dictionaries present information in both languages, this allows users at different proficiency levels to refer to the language that they prefer or look at both for the sake of reassuring their perception, so bilingualised dictionaries are a more effective learning tool among the three types of dictionaries.

The same findings have also been shown in subsequent studies that focus on English learning in the Chinese context. As Laufer and Hadar's study (1997) was replicated by Chen (2011) in the context of university students of English majors in China, similar results that bilingualised dictionaries are more effective in terms of comprehension and production are reported. Likewise, the replication of Laufer and Kimmel's study (1997) by Chen (2011) was done with 131 students majoring in English in four universities in China. The findings show that the consultation of both languages in a bilingualised entry lead to better results in comprehending the word meaning, and capable students are more likely to use the information of both languages in the entry. All these illustrate how bilingualised dictionaries are more effective than monolingual dictionaries and bilingual ones.

Apart from their effectiveness for comprehension and productive purposes, compelling evidence has also shown that there is a significant correlation between the use of bilingualised dictionaries and vocabulary learning. In the study of Laufer and Hill (2000), 72 ESL students were required to read a passage with 12 target words. As they looked up these words in a computer-assisted dictionary, the computer log files recorded the specific information that they had consulted.

Afterwards, these students completed an unexpected vocabulary test in which they wrote down the meaning of those target words in either L1 or L2. The findings show that dictionary use is beneficial to incidental vocabulary learning. Even though no clear correlation between the lookup patterns and the retention rate is identified, the consultation of both L1 and L2 information yields best retention rate in the study. Hence, this evidence demonstrates that bilingualised dictionaries can lead to better semantic perception, which in turn supports their use.

While the above discussion is built upon the findings from task-based studies, the same issue has also been viewed from the psycholinguistic perspective. Accordingly, our mental lexicon consists of two levels: the word-form level and the conceptual level. There are thus two stages throughout the learning process of L2 words (de Groot and Hoeks, 1995). In the first stage, learners make a strong connection between L2 words and their equivalents in the first language. When learners proceed to the second stage, they directly associate the L2 words with their concepts. This gradually happens when learners make progress in their proficiency.

In this perspective, bilingualised dictionaries are most effective in vocabulary learning when compared to monolingual and bilingual dictionaries (Zhao, 2010). The reason is that bilingualised entries allow users to relate L2 vocabulary items to L1 lexical items, and this facilitates the process of word-form connection. In cases when the L1 equivalents are unable to provide the meanings of the target words concisely, the L2 definitions further explain the meanings so that learners do not have to solely rely on either L1 equivalents or L2 definitions. Since the use of bilingualised dictionaries can help learners construct a clearer conceptual representation of L2 words in their lexicon, this explains and approves their effectiveness in L2 learning.

2.2.2 Paper versus Electronic Dictionaries

Apart from classifying dictionaries according to the languages used in the presentation of information, dictionaries can also be classified by the medium through which the entries are presented. Traditionally, paper dictionaries remain a familiar reference resource that exhibits the significance of the target language, and their solid existence can provide users with the pleasure of handling the book

(de Schryver, 2003). In addition to traditional paper versions, dictionaries are now available in all kinds of electronic forms because of the development of technologies. Examples include handheld dictionaries which learners can access through a palmtop device, CD-ROM dictionaries which require a computer to permit their access, intranet dictionaries stored within an internal network, as well as online dictionaries that are available on the Internet (de Schryver, 2003). The dominant features of electronic dictionaries are that their increasing storage capacity allows more information to be presented, so the entries can be supplemented by audio and visual information (de Schryver, 2003). Due to the emergence of this new phenomenon in dictionary use, studies begin to focus on comparing paper dictionaries with electronic ones, and most of these studies point out that electronic dictionaries are indeed a more favourable learning resource.

To start with, the use of electronic dictionaries can serve as a more motivating factor of L2 learning. When comparing the use of hyper-references and paper dictionaries by undergraduates who are learning Spanish as a second language, the researchers (Bland et al. 1990) find out that electronic dictionaries encourage learners to look up more words because of its convenient access. Such advantage of electronic dictionaries has also been reported in the study of Tang (1997) who investigated the use of pocket electronic dictionaries in the context of Chinese learners of English in Vancouver. Through questionnaires, classroom observations, and interviews, the researcher concludes that electronic dictionaries can grant learners easy access to the target entry, thus enhancing their engagement in L2 learning.

Besides, electronic dictionaries are regarded as a more effective learning aid since they can facilitate the process of reading and vocabulary learning. For instance, Laufer and Hill (2000) finds out that the use of electronic dictionaries leads to smooth reading and enhances the chance of learning unknown words as they can tackle the problems of paper dictionary use which can be time-consuming and disruptive to the reading process. Similar comments have been made by Rezaei and Davendi (2016) who compare the use of paper dictionaries and mobile phone dictionaries. They conclude that electronic dictionaries have a greater impact on vocabulary retention. The possible reason is that using

electronic dictionaries is less time-consuming and does not affect the flow of reading. Moreover, multimodal information, such as visual and audio aids, is presented in electronic dictionaries, which can better word perception. All these thus indicate that electronic dictionaries are a preferable choice as a learning tool since they can better learners' reading and vocabulary learning.

Nevertheless, electronic dictionaries are not a perfect tool since their use can arouse undesirable learning behaviour. Notably, the easy access available for learners can cause the problem of excessive consultation that learners can be looking up words that are not necessarily important in their reading (Bland et al., 1990). Consequently, this act can discourage learners from the development of other reading strategies, such as guessing and predicting, thus negatively affecting learners' progress in improving their proficiency in the target language (Tang, 1997).

Despite the fact that these studies can be discussing different types of electronic dictionaries, their findings about the advantages are generally sharable among different types of electronic dictionaries. Particularly, online dictionaries are recommended since they are mostly available to learners for free and are constantly updated (de Schryver, 2003). Since these advantages are more far-reaching and considerably outweigh those disadvantages, the conclusion can be that electronic dictionaries and especially online dictionaries are a more effective learning tool when compared to paper dictionaries.

2.3 Dictionary Operations and Strategies

After understanding the usefulness and usability of bilingualised and online dictionaries in the receptive domain of L2 learning, it is also important to know how these tools should be used to maximise their benefits for L2 learning. This leads to the investigation of dictionary operations that learners undergo as well as dictionary strategies that they employ.

2.3.1 Findings about Dictionary Operations and Strategies

Scholfield is the very first scholar to explore the operational processes of how L2 learners are using dictionaries for reading purposes. According to his findings (Scholfield, 1982), the lookup process can be divided into seven steps. To start with, learners recognise the unknown words in the context. They then

identify the base form of the target word if it is inflected. Next, they search for the unknown word according to the alphabetic list. If no main entries of the target word can be found, learners may have to refer to nearby entries. When they succeed in locating the correct entry, they have to eliminate any unsuitable meanings to figure out the most appropriate one that fits the reading context. They lastly apply the chosen meaning to the text or adjust the selected definition so that it better explains what the word conveys in the context. They may also have to infer the word meaning if none of the senses in the dictionary fit the context.

Apart from examining the lookup process as a list of lookup operations, latter studies have attempted to sort them into different strategies. For instance, Neubach and Cohen (1988) identifies dictionary strategies according to the temporal stage of the lookup process. For example, strategies during the pre-search phase can involve reading the sentence where the unknown word is recognised for several times, translating the sentence into their first language, recognising other unfamiliar words in the sentence, identifying the part of speech of the target word, and predicting its possible meaning.

Alternatively, by adopting O'Malley and Chamot's classification of learning strategies, Scholfield (1999) further examines the matter from the mental perspective and distinguish the operations between metacognitive and cognitive strategies. The former ones involve the process of managing the lookup operations, for example, identifying the problem, deciding an appropriate strategy, and evaluating the solution. The latter ones refer to the actual lookup procedures of achieving a solution to vocabulary problem during a reading task. These can involve the steps of selecting the most suitable meaning from the entry and justifying its appropriateness in relation to the reading context.

Lookup operations can also be categorised into different strategies according to the technical knowledge involved in the process. In this way, Wingate (2004) classifies three types of strategies that learners have to acquire in order to perform their lookups properly, and they are explained in Figure 4:

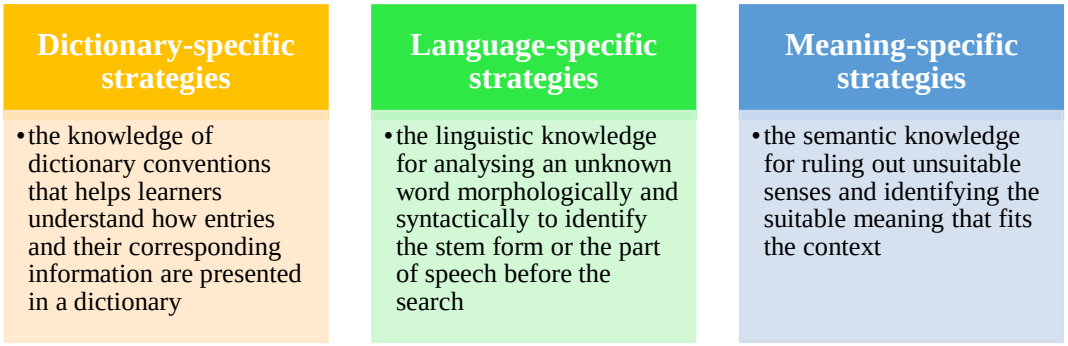


Figure 4 Types of Lookup Strategies as categorised by Wingate (2004)

In particular, Thumb (2004) concentrates on the analysis of meaning-specific strategies, for she defines a lookup strategy as 'a systematic application of certain skills to retrieve the meaning of a word during the process of dictionary consultation' (p. 56). This definition thus points out that the ultimate goal of dictionary lookups is to formulate word meaning and such task is meaning-focused. In her study, she observes the lookup process of university students in Hong Kong through a think-aloud process and classifies seven lookup strategies. A brief explanation of each of these strategies are provided in Figure 5:

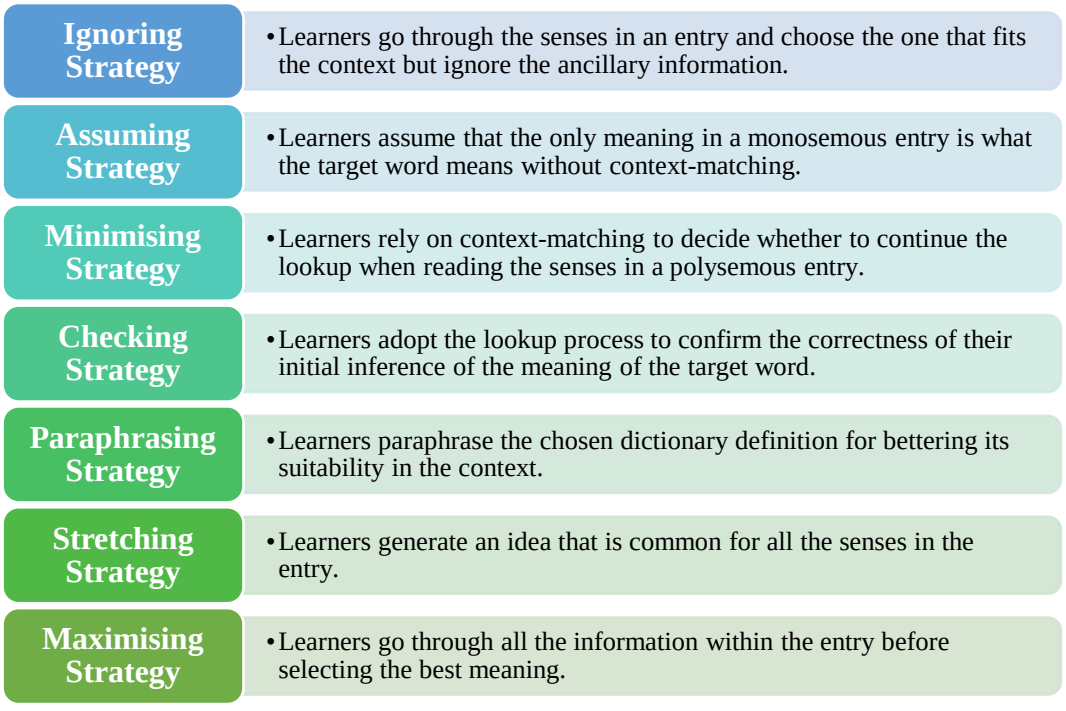


Figure 5 Lookup Strategies identified in the study of Thumb (2004)

In fact, Thumb's strategies seem to involve the problem that there is an inconsistency in terms of the rationale behind the classification. While ignoring, assuming, minimising, and maximising strategies are identified according to the entry information that learners have consulted, checking, paraphrasing, and stretching strategies are characterised by how learners formulate the meaning of the target word.

Nonetheless, when comparing Thumb's strategies with those identified in previous studies, her classification is indeed more meticulous. Unlike previous studies that label each operation in isolation, Thumb takes into account that a lookup strategy 'is comprised of mental operations and decisions made by users in the process of consultation' (2014, p.56). In other words, each operation within the lookup process should not be classified separately but should be treated as part of a series of operations. In this way, Thumb associates different lookup operations and elucidate their relationship under each strategy, thus making her analysis a more comprehensive and in-depth one.

2.3.2 The Investigation of Dictionary Operations and Strategies

As shown in the review about dictionary operations and strategies, most of these studies (Neubach and Cohen, 1988; Wingate, 2004; Thumb, 2004) actually adopt the think-aloud method as the primary way to collect data about the lookup process of participants. Even though researchers could have relied on production data to analyse how learners are performing during the learning process, this practice can be problematic, for there can always be several explanations to elucidate a production process and this makes it hard to reach convincing reasons to explain the situation (Gass and Mackey, 2000). This thus suggests the essentiality of the think-aloud method as it can assist researchers in directly eliciting cognitive data of language learners (Bowles, 2010) and compensate for what production data cannot address (Corder, 1973). In the research about dictionary use, such mental data can then be analysed to clearly explain learners' lookup operations and strategies.

Nonetheless, this method has provoked controversial discussion about its validity (Bowles, 2010). According to the cognitive perspective, verbalisation can accurately reflect one's internal thoughts, thus giving researchers the access to

one's mental processes; this supports the use of think-alouds as a tool for data collection. In contrast, from the sociocultural perspective, inner speech has to be made to manage one's cognitive process; the verbalisation of these speeches can possibly alter one's thinking process. In other words, concurrent reports can probably exert an impact on participants' thoughts; such reactivity can change one's mental processes instead of reflecting one's mind accurately. Hence, such alternation becomes a hindrance to the use of verbal reports since the accuracy of the data collected can be impacted.

To resolve this controversy, Bowles (2010) attempts to reach a conclusion by reviewing several studies (read Leow and Morgan-Short, 2004; Bowles and Leow, 2005; Sachs and Polio, 2007; Rossomondo, 2007) that compare experimental participants who perform tasks in a think-aloud environment with control ones who complete tasks silently. The review shows that both think-aloud and silent groups gain statistically similar scores in task assessments. This implies that thinking aloud does not considerably affect the cognitive process and should be regarded as a valid approach in research studies.

After all, there is still insufficient evidence to demonstrate that the think-aloud method is a fully valid approach. The reactivity discussed by Bowles (2010) is merely based on end products of task performance, but the potential alternation in one's thoughts is still unclear. Notwithstanding the uncertainties about verbal reports, the think-aloud method is still a fundamental and preferable way of data collection in many studies about learning strategies since it is comparatively a salient approach that can establish direct contact with participants' inner thoughts, which is seemingly unachievable by means of other research methods.

2.4 Dictionary Strategies and Lookup Results

As different lookup operations and strategies have been recognised with the use of introspective studies, it is noteworthy that their application does not necessarily guarantee learners' success in their lookup results since this greatly depends on how well learners can be using them. Throughout the investigation of how learners are using dictionaries, scholars have identified several factors that can affect the successfulness of learners' lookups.

Notably, learners' lookups can be affected by their awareness of dictionary-specific strategies. For instance, failures can occur when learners are unable to search for the target word through the alphabetical order (Neubach and Cohen, 1988). Similarly, unsuccessful lookups can happen as learners fail to understand dictionary symbols and abbreviations (Wingate, 2004). In both cases, the unfamiliarity with dictionary conventions is why learners experience problems with their lookups.

Whether language-specific strategies are effectively implemented is also associated with learners' consultation outcomes. For example, some learners can wrongly perceive the word class of the target word, thus locating a wrong entry (Nesi and Haill, 2002). As a result, insufficient linguistic knowledge can become a hindrance to accurate lookups.

The most distinctive factor that determines the success of learners' lookups is whether they can perform meaning-specific strategies properly. Accordingly, the likeliness of successful lookups is enhanced when learners are able to comprehend the definitions. The situation is especially favourable when the definitions consist of familiar wordings that can directly replace the target words in the context (Wingate, 2001). In contrast, when learners encounter unknown words in the definitions, they can become uncertain about their meaning (Neubach and Cohen, 1988). Some learners may also fail to comprehend the entry because the definitions are derivational and explain words by their root forms that are still unintelligible to learners (Wingate, 2001). Besides, problems can occur with meaning-specific strategies when learners only read the very first part of the entry. In this situation, they can only form accurate word meaning when the appropriate sense is shown at the very beginning of the entry, or when the entry consists of only one definition (Wingate, 2001). Even though these learners are able to locate the right entry, their lookups can still be in vain when they choose an unsuitable sense from the correct entry (Tseng, 2009).

In brief, when learners are undertaking different dictionary strategies, their final goals are to achieve proper understanding of the target words. The discussion about learners' successful lookups and their abortive consultations implies that dictionaries per se are a practical learning tool, but their effectiveness greatly

depends on how well learners can be using them with proper lookup skills. This becomes a critical aspect that has to be under investigation to justify whether it is necessary to provide training to learners in the current study or they can already conduct lookups with proper dictionary strategies.

2.5 Conclusion: Scope of the Current Research

This chapter reports major findings from previous studies about dictionary use in L2 learning, the effectiveness of different dictionary types, the categorisation of lookup strategies, and their relationship with learners' lookup success. All these thus lay the groundwork for the current study and sharpen its scope. How this study is based upon these findings is explained as follows:

- Despite the controversies about the ineffectiveness of dictionary use and their negative impacts on the development of learners' reading skills, dictionaries remain an important learning tool since they can reliably facilitate reading comprehension, vocabulary learning, and lifelong learning. Hence, this confirms the importance of the current study which examines learners' performance on the use of dictionaries.
- The evidence that bilingualised dictionaries and online dictionaries are more effective directs the current study to investigate how learners are using online bilingualised dictionaries due to their efficacy in L2 learning.
- Even though previous studies have demonstrated how dictionary strategies can be categorised according to temporal, mental, or knowledge-based aspects, these do not reflect directly how learners are adopting dictionary strategies to understand unknown words. Thereupon, this suggests that the rationale behind the classification of lookup strategies should be based on how learners perceive word meanings during lookups.
- Following how researchers of previous studies about dictionary strategies access participants' mind, this study adopts the think-aloud method so that participants' thoughts can be directly observed during their lookups.
- The close correlation between lookup strategies and their successfulness asserts the importance of examining whether the strategies identified in the current study can assist learners in achieving their lookup goals or if these learners can encounter any problems during the consultation.

In conclusion, the scope of this study is to examine the lookup strategies adopted by graduates from English-medium secondary school in Macao in respect to the use of online bilingualised dictionaries through a think-aloud method. By understanding how these students are consulting the dictionary for reading purposes and the problems that they may have encountered in the process, the study turns to answer the initial questions of whether there is a need to adjust the current teaching approach so that language teachers can comply with the newly implemented regulations that secondary students in English-medium schools in Macao should be equipped with necessary dictionary skills for reading purposes.

Chapter 3 Methodology

After reviewing existing literature that refines the scope of this research, this chapter explains how this introspective study is carried out. Firstly, the chapter addresses the research questions. Next, there is a brief introduction about the participants as well as the sampling method. Afterwards, the procedures of data collection and analysis are explained in detail. Then, the chapter further discusses how validity and reliability is ensured in this study. Lastly, a discussion about its ethical issues is made.

3.1 Research Questions

As explained in the first chapter, the motive of this study is to figure out whether it is necessary to teach students in English-medium secondary schools in Macao dictionary skills as required by the basic learning requirements newly imposed by the government. This study thus aims at examining whether students under the previous school curriculum from this school type have already developed proper dictionary lookup strategies for consulting word meanings. Hence, the following questions are established:

1. Are graduates from English-medium secondary schools in Macao using any lookup strategies for comprehension purpose when consulting online bilingualised dictionaries? What are these strategies if they are using any?
2. How successful are graduates from English-medium secondary schools in Macao when using online bilingualised dictionaries to lookup unfamiliar words for comprehension purpose?
3. To what extent can lookup strategies assist in successful understanding of unfamiliar words in relation to the reading contexts?
4. Are there significant differences between students at different language proficiency levels in terms of their lookup strategies and performance?

The first question addresses the issue of whether students apply lookup strategies as L2 readers. The next question focuses on students' lookup results and examine how far they can succeed in perceiving unfamiliar words via dictionary consultation. The third question clarifies if adopting lookup strategies can lead to successful lookups. The last question considers that participants can vary in terms

of their proficiency, and it is necessary to examine whether great variations exist between the performances of students at different proficiency levels.

3.2 Participants

Purposive sampling is adopted in the research. This involves a non-probability sampling procedure that allows researchers to select a sample that fits the criteria of the study (Riazi, 2016). In line with the research context, the initial criterion is that participants have to be high school graduates from an English-medium secondary school. In addition to this criterion, the selection of participants has to be based on their reading proficiency since this study attempts to compare how students at different proficiency levels consult words for reading.

Such purposive sampling was achieved by recruiting participants at an English-medium secondary girl school in Macao. The recruitment form, together with a video that explains the purpose of the research in the students' first language, was sent to all high school graduates of the school in the format of a Google Form. 94 out of 99 receivers filled in the form. Their responses show that these students have been studying in an English-medium schools for at least three years, and they are using Cantonese as their first language, so these indicate that these potential participants fit the purpose of the study and are homogenous in terms of their learning and language background.

Moreover, students were asked to provide their public language test scores so that their reading proficiency could be inferred (see Figure 6). 63 students replied that they had taken IELTS in the recent two years, and 54 students clearly reported their reading scores. Accordingly, these students are classified as readers at four different levels as illustrated in Figure 7. While more than half of them are upper-intermediate readers, some students reach the advanced or proficient level. These further allow the division of two learners' groups: independent readers of B1 and B2 levels and proficient readers of C1 and C2 levels. Due to the qualitative nature of this small-scale study, three proficient readers and three independent readers were purposively selected to be the research participants. Participants of the former group were labelled as Student A, B, and C, while the other three participants were called Student D, E, and F. The number of

participants became six in total, accounting for six per cent of the population of graduates from the school.

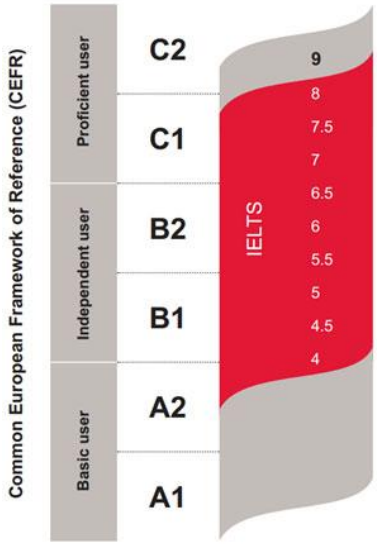


Figure 6: Comparison between Common European Framework of Reference (CEFR) to Scores of International English Language Testing System (IELTS) (retrieved from https://www.ielts.org/ielts-for-organisations/common-european-framework)

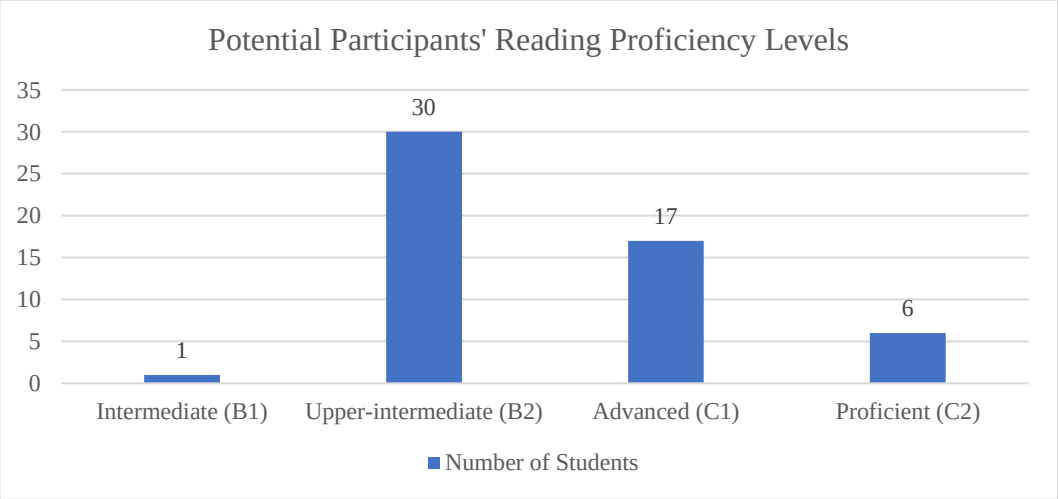


Figure 7: Potential Participants' Reading Proficiency Levels

3.3 Research Procedures for Data Collection

After the selected participants had confirmed their availability, the researcher scheduled two individual research sessions, i.e. a training session and a think-aloud session, with each participant. The procedures are outlined in Figure 8 and each of these steps is further explained in the following sub-sessions.

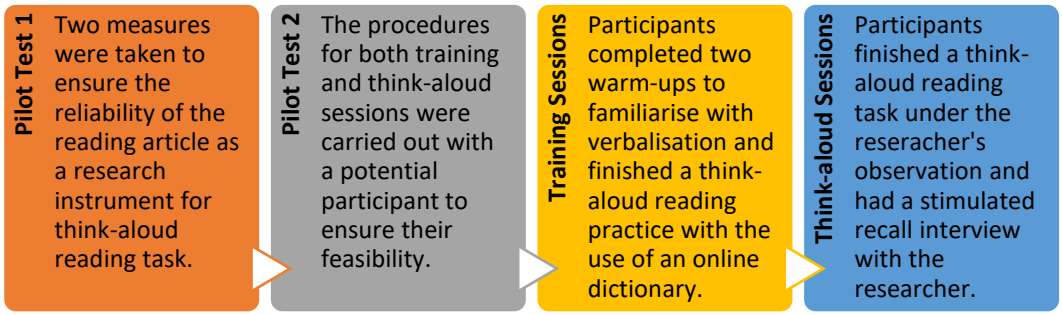


Figure 8: Outline of the Procedures for Data Collection

3.3.1 Pilot Test 1

Since the current study involves the examination of how students look up words for reading comprehension, an article about the study of archaeology (Appendix 1) has been selected as the instrument for the think-aloud reading task. This article is chosen because it presents an academic topic, which is in line with what participants may usually read in school. Besides, the article is selected since the topic is presumably unfamiliar to participants, who are either commerce or science students, so this increases the chance of eliciting their lookup behaviours.

Two measures were taken to ascertain that this reading article includes unknown words to participants. Initially, the text was examined against different vocabulary lists, including K1 words (most frequent 1000 words), K2 words (second most frequent 1000 words), academic words, and off-list words (words that are not shown in the previous three lists). Following Thumb's procedures (2004) in her think-aloud study, the researcher used the Vocab Profilers of LEXTUTOR (see Figure 9), a system that bases on Heatley, Nation, and Coxhead's frequency program (2002), to conduct such examination, and the result is shown in Figure 10. It indicates that 73.57% of the word types are from K1 word list; this shows that the text, with most words relatively common, should be comprehensible to learners. Since 14.47% of the words are off-list words, they tend to be those that are not commonly used in English, thus suggesting that they are potentially unfamiliar to learners and can provoke their lookups.

Figure 9: Screen Shot of Vocab Profilers on the website of LEXTUTOR (Cobb, 2019)

	Families	Types	Tokens	Percent
K1 Words (1-1000):	205	247	671	73.57%
Function:	...	...	(407)	(44.63%)
Content:	...	...	(264)	(28.95%)
> Anglo-Sax	...	...	(128)	(14.04%)
K2 Words (1001-2000):	29	36	57	6.25%
> Anglo-Sax	...	...	(30)	(3.29%)
1k+2k			...	(79.82%)
AWL Words:	35	41	52	5.70%
> Anglo-Sax	...	...	(3)	(0.33%)
Off-List Words:	2	58	132	14.47%
	269+?	382	912	100%

Current profile	
%	Cumul.
73.57	73.57
6.25	79.82
5.70	85.52
14.47	100.00

Words in text (tokens):	912
Different words (types):	382
Type-token ratio:	0.42
Tokens per type:	2.39
Lex density (content words/total)	0.55
Pertaining to onlist only	
Tokens:	780
Types:	324
Families:	269
Tokens per family:	2.90
Types per family:	1.20
Anglo-Sax Index: (A-Sax tokens + functors / onlist tokens)	%
Greco-Lat/Fr-Cognate Index: (Inverse of above)	%

Figure 10: Results generated by Vocab Profilers in the examination of the reading text for the think-aloud session

While the initial measure is objective, a subjective measure was also adopted. 8 independent and 8 proficient readers who filled in the recruitment form took part in a pilot test. They underlined the words that they would consult in the dictionary to enhance their understanding of the text (see Appendix 2 for target words intended to be consulted). The result, shown in Table 3.1, indicates that the average number of words intended to be consulted by these readers is 13.4 words, and independent readers can be consulting slightly a few more words than proficient readers. Therefore, both measures reflect that the reading passage is an instrument that is likely to arouse lookup actions and fits the purpose of the study.

Table 3.1: Results of Pilot Test 1

	Average no. of words intended to be consulted	% of words intended to be consulted against the total no. of words	Standard Deviation
All Readers	13.4	1.5%	5.3
Independent Readers	14.1	1.6%	5.3
Proficient Readers	12.6	1.4%	5.3

P.S. The calculated number is round up to 1 decimal place.

3.3.2 Pilot Test 2

Another pilot test was done to confirm the feasibility of the procedures for the sessions. Some modifications were then made to enhance the clarity of the instructions. For example, participants should be told that they can verbalise in their first language, and they have to be reminded to speak out everything that passes through their mind, including all kinds of information that they are looking at in the dictionary or from the passage. Besides, no corrective feedbacks should be given to participants, which can potentially alter their lookup behaviours and affect the accuracy of the study.

Insights about the technical issues were also gained from the pilot test. In terms of physical setting, more working space, i.e. two desks instead of only one desk, should be reserved for the participant so that she can refer to the printed text and use the laptop to consult the online dictionary at the same time. Besides, simply using a digital camera is not able to clearly record the lookup process, and screen recording is necessary to record the display of the laptop screen.

3.3.3 Training Sessions

Following the advice of Bowles (2010), the researcher offered a training session to each participant so that he could clarify why they have to think aloud, instruct how they should verbalise their thoughts, and offer practices for them to get familiar with thinking aloud. To make the instruction clear to participants, the researcher chose to use Cantonese to communicate with them.

In the training, participants were guided to complete two warm-ups so that they could get familiar with the process of verbalisation (Ericsson and Simon, 1993). They first verbalised a non-verbal operation for solving an arithmetic problem before they completed a more complicated verbal operation. This step is essential for the study since participants' minds can only be validly accessed when they know how to verbalise their inner thoughts.

To familiarize participants with the actual reading task, the researcher assigned participants a reading practice in which an online dictionary was consulted. Participants were first asked to read a given text once, then underlined the words that they would like to consult, verbalised their lookup process in the language they preferred, and wrote down the word meaning after each lookup.

Cambridge Dictionary (Figure 11) is selected to be the learning instrument of this study since this dictionary, to the researcher's knowledge, is the only online bilingualised one that is made freely available to learners by a reputable publisher; other dictionaries, such as Oxford Learners' Dictionaries, Longman Dictionary of Contemporary English Online, and Collins Dictionary, do not provide any bilingualised entries. Besides, this dictionary, which is designed for A2 to C2 learners (Cambridge University Press, 2019) fit the proficiency levels of the participants.

Figure 11: Screen shot of the cover page of Cambridge Dictionary in the English-Chinese version (retrieved from https://dictionary.cambridge.org/dictionary/english-chinese-traditional/)

Concerning that this prior practice should not affect the goal of the study (Bowles, 2010), the researcher assigned readers to read a news article (Appendix 3). This news article is chosen because it presented a widely discussed issue at the time of the research, so participants should find the reading relatively familiar and they could concentrate on practising how to verbalise their thoughts. More importantly, the article is of a different text type from the one in the later think-aloud session, so this minimizes the effect of the training session towards the think-aloud session.

3.3.4 Think-aloud Sessions

As participants became familiar with the process of thinking aloud, they proceeded to complete the actual reading task in the think-aloud session. In this session, the researcher utilised three research methods for data collection.

3.3.4.1 Think-aloud

Participants followed the same procedures of the reading practice in the training session (read Appendix 4 for reminders and instructions of research sessions). As they verbalised the process of consulting an online dictionary, the researcher video recorded this think-aloud process in two different ways. While a digital camera was used to video the participants' physical actions, such as typing and writing, and their interaction with the dictionary and the reading, the built-in recorder of the laptop screen recorded the dictionary consultation. Besides, participants were instructed to write down the word meaning after each lookup. In these ways, the researcher could collect verbal and written data for the analysis of lookup strategies and lookup results.

3.3.4.2 Observation

While participants were completing the think-aloud reading task, the researcher acted as an observer to ensure that participants were properly verbalising their thoughts in this process. Following Thumb's procedures (2004) in her think-aloud study, the researcher also observed the lookup process to identify important questions to be asked during stimulated recall interviews.

3.3.4.3 Stimulated Recall Interview

Lastly, concerning the function that participants can clarify their thoughts about any long pauses during their lookup process (Thumb, 2004) and the warning that prolonged delay can negatively impact the accuracy of the retrospective reports (Gass and Mackey, 2000), the researcher conducted a stimulated recall interview right after the think-aloud lookup task (read Appendix 5 for reminders and instructions of stimulated recall interviews). In this process, the recorded videos of participants' dictionary consultation were used as the prompts so that participants could recall what they were thinking at certain times during their lookups.

Henceforth, this study achieves data triangulation, with the think-aloud approach as the major method for data collection and observation and stimulated recall interviews as the supplementary methods, so that the verbal and written data collected from different methods can be cross-validated to enhance the validity of the study.

3.4 Research Procedures for Data Analysis

The next stage of the study is to analyse the data collected. Verbal data recorded in the videos during the think-aloud sessions and the stimulated recall interviews was first transcribed to make them analysable. Since participants verbalised themselves in both Cantonese and English, the transcription was done in the mixture of both languages. The transcribed data was then translated into English, for the target readers of this study are English readers. Together with the written data from the meanings noted by the participants during the same process, the entire set of data was coded at three levels to address the research questions.

3.4.1 Transcription and Translation

Since the current research only looks at participants' thoughts as reflected in the verbal data and does not concern any affective factors, the researcher produced a word-level transcription and adopted the conventions used by Thumb (2004) for both transcription and translation (see Appendix 6 for a sample of transcribed and translated verbal data and Appendix 7 for notes about transcription and translation).

In the translation, the Cantonese part of the protocols were translated into English, and those words that were originally delivered in English were placed within quotation marks. In particular, Chinese definitions that were said in Cantonese were placed within brackets and were romanised according to the Cantonese phonological information in the Chinese Character Database established on the website of The Chinese University of Hong Kong.

3.4.2 Coding

The researcher divided the transcribed and translated verbal data in accordance to each lookup. For example, the data of the first lookup made by Student A was labelled as A1. Then, the data was further divided into communication units according to natural pauses and linguistic structures, which are often indicators of the boundaries of phrases that can demonstrate an idea or a behavioural action (Ericsson and Simon, 1993). This process is known as segmentation in which the communication units can be used to identify the coding categories that match the focus of a study (Mackey and Gass, 2000). To analyse

the data, the researcher then applied three coding levels to fully disclose the process of each lookup.

The first level was done with the coding scheme developed by Thumb (2004) (see Appendix 8 for the full list of coding schemes adapted from Thumb (2004) as well as those recognised in this study). In this way, the researcher examined each communication unit and distinguished three types of operations in the lookup process. Executive operations refer to participants' physical and verbal actions, cognitive operations reflect their thinking about the content, and metacognitive operations are the mental thoughts that manage the lookup process.

As the first level of coding allowed the researcher to clearly describe the procedures of each lookup, he moved on to the second level about lookup strategies. Following Bowles' guideline (2010) that the researcher should identify a list of strategies from previous studies as a reference, the researcher based on the list of strategies from Thumb (2004) to code the lookups and classified seven types of strategies. Such result thus helps to answer the first research question.

Lastly, during the third level of coding, the researcher turned to examine the lookup results, focusing on the word meanings that participants had written after their lookups. In particular, the researcher considered if partial or precise understanding was developed in each lookup since this could be a domain in one's receptive lexical competence during the vocabulary learning process (Henriken, 1999). The verbal data was also referred at times to confirm that the written notes did reflect participants' thoughts. In these ways, those successful lookups could be distinguished from the unsuccessful ones, and the results could then be associated with the strategies adopted and the proficiency levels of participants to answer the subsequent research questions.

3.5 Validity and Reliability

When designing and conducting the above research procedures, validity and reliability are carefully monitored to ensure that the study is properly carried out. This session briefly explains how validity and reliability are ensured in the current study.

3.5.1 Validity

Validity can be classified as two major types: internal validity and external validity. The former concerns 'the degree to which the effect observed in the dependent variable could be attributed to the changes made in the independent variables and not other potentially confounding variables' (Reiza, 2016, p.152), while the latter refers to whether the findings can be generalised to describe the target populations (Reiza, 2016).

In terms of internal validity, the independent variable is the lookup process carried out by participants, and the dependent variable is their proficiency level. Since the researcher recruited participants by referring to the criteria that fits the purpose of the study, for example, these participants have to be high school graduates from an English-medium high school in Macao and are using Cantonese as the first language, participants' homogeneity regarding their learning and language background thus ensures that the differences in their proficiency levels should account for any variations in their performance, and this makes the outcome of the study internally valid.

Besides, confounding variables that can possibly affect participants' performance are carefully managed to uphold the internal validity. These include the physical environment of the sessions and the instructions given by the researcher during those sessions. Accordingly, all participants completed their sessions in a quiet and air-conditioned classroom and identical instructions were given by the researcher.

In respect to external validity, since most students in the population are found to be either proficient or independent readers, the results of the study should be representative and can be generalised to reflect the target situation as the study involves participants from both levels.

3.5.2 Reliability

When examining a study, one should concern if the findings are reliable (Reiza, 2016). Due to time limitation, intra-rater reliability, which concerns the consistency between ratings by the same rater at different times (Mackey and Gass, 2005), was not feasible. To compensate for this shortcoming, inter-rater reliability was adopted. An English teacher, who has more than eight years of

teaching experience in an English-medium secondary school in Macao, has been invited to code the lookup results and determines the extent of their successfulness. Inter-coder reliability is then calculated by referring to the percentage of agreement between this coder and the researcher in terms of their coding. This involves calculating the total number of identical ratings marked by the raters against the total number of ratings (Bowles, 2010). The result shows that the percentage of agreement is 91.2%, thus confirming that the analysis of verbal data is reliable.

3.6 Research Ethics

The researcher received the approval from the Ethics Committee at Newcastle University before launching the study. Approval of conducting the research was also obtained from the principal and related teachers at the school where the recruitment took place.

Since the study involves students as participants, careful attention was devoted to the ethical issues about human factors. For example, to ensure that target students were well informed of the relevant information about the study, the information was presented to them through the recruitment form and the information sheet (Appendix 9). Hence, students would understand that their participation in the study is voluntary, and withdrawal is permitted anytime without any negative consequences. They would also know that they would have to verbalise their thoughts as a participant, which serves as the data for analysis.

Students' consents were required at different stages of the research. For example, students gave their consent (Appendix 10) to provide their personal information before filling in the recruitment form. Participants of the main study gave written consent of the involvement of audio and video recording in the process. Since all participants are over 16 years old, no consent has to be obtained from their parents.

To maintain participants' identity confidential, they are labelled as A to F in the report and the data collected is password protected in a laptop.

The schedule of the sessions was subject to the available time of students, and they were only arranged and held after participants had finished their final exams in school to avoid provoking any negative impacts on their studies.

3.7 Summary of Methodologies

In brief, this chapter explains the research questions and presents the procedures for both data collection and data analysis, and the relation of these aspects are summarised in Table 3.2.

Table 3.2: Summary of Research Questions, Data Collection, and Data Analysis

Research Questions	Types of Data Collected	Data Analysis
1) Are graduates from English-medium secondary schools in Macao using any lookup strategies for comprehension purpose when consulting online bilingualised dictionaries? What are these strategies if they are using any?	• verbal data from the think-aloud process and the stimulated recall interviews	• labelling lookup procedures through Level 1 Coding • identifying strategies via Level 2 Coding
2) How successful are graduates from English-medium secondary schools in Macao when using online bilingualised dictionaries to lookup unfamiliar words for comprehension purpose?	• written data from word meanings noted by participants	• evaluating lookup results through Level 3 Coding
3) To what extent can lookup strategies assist in successful understanding of unfamiliar words in relation to the reading contexts?	• associating the lookup strategies identified in Level 2 Coding with the successfulness of lookup results evaluated in Level 3 Coding to examine their relationship	
4) Are there significant differences between students at different language proficiency levels in terms of their lookup strategies and performance?	• associating lookup strategies adopted by participants with their lookup results to make between-group and within-group comparisons	

Chapter 4 Research Findings

This chapter presents the results of the analysis in accordance to the four research questions. Firstly, the lookup strategies that were adopted by participants are explained with examples to illustrate how they were implemented. Next, the chapter presents the analysis of the lookup results in respect to their successfulness. Afterwards, particular attention is devoted to how lookup strategies are associated with successful and unsuccessful lookups. Lastly, a comparison is made between the two groups of participants in relation to their use of strategies and lookup performance.

4.1 Lookup Strategies

The analysis of the verbal data shows that the six participants generated 105 lookups in total. However, the search system of the bilingualised dictionary was automatically directed to the monolingual one during three lookups; these lookups cannot be part of the analysis since they cannot reflect how learners were using an online bilingualised dictionary. As a result, only 102 lookups are examined in the analysis.

With the focus on how participants formulated and assured word meanings, seven strategies are identified, and they are contextualising, checking, deriving, explaining, paraphrasing, referring, and substituting strategies. Examples are given below to illustrate how participants determined the meanings of target words with the use of these strategies.

4.1.1 Contextualising Strategy

Contextualising strategy is adopted when a dictionary user refers to the text to construct a context in mind when consulting the dictionary. Hence, the operations of *referring text* and *focusing text* are mandatory in the application of this strategy. Such mental construction acts as the rationale for learners to judge whether the senses consulted are appropriate. In terms of timing, this strategy is mostly used at the very beginning or in between the lookup process.

Table 4.1 shows an example of how contextualising strategy can be adopted at the initial phase and halfway through a lookup process. At the very beginning, Student A referred to the text and focused on the sentences where the target word ‘trace’ was written (CU84), so she could bear the context in mind as

she continued with the rest of the lookup process, especially when she focused on the Chinese meanings in the entry (CU91 and CU96). Meanwhile, contextualising strategy was adopted in between these operations as Student A looked at a short phrase in the reading to refer back to the context (CU94). As a result, she was able to evaluate the suitability of the senses and finally decided the meaning (CU98). Her interview protocol confirmed this practice, and the relevant excerpt reads:

> (R = Research; A = Student A)
> R: Before you looked up 'trace', you had read this sentence once, why did you do so?
> A: To look at what it mentions, actually I normally read as well, but as I read it very quickly, perhaps so quickly that I can only scan a few words. When you review them later, look at what's going on, and then consult the word.

The purpose of adopting contextualising strategy is thus to understand the background circumstance of a target word so that this perception can facilitate the determination of its meaning.

Table 4.1: Use of contextualising strategy to look up 'trace' by Student A

A9: trace Context: It is almost impossible to completely rule out the possibility that a trepanation was carried out for medical reasons, because some brain conditions leave no trace on the skull Information written by Student A: 痕跡 (meaning 'a sign that something has happened or existed')			
Communication Units (CU)	**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
84. 'however convincing evidence is hard to come by it is almost impossible to complete rule out the possibility that a trepanation was carried out for medical reasons because some brain conditions leave no trace'	RT	FT	
85. oh, seem to have seen this in 'account'			UPR
86. (typing 'trace' in the search box)	TT		
87. 'trace'	RH	FH	
88. find (*faat3 jin6*)	RTE	FC	
89. 'no' find	ST	EM	
90. let me see			MO
91. find (*zaau2 dou3*) find out (*caa4 ceot1*) discover (*faat3 jin6*)	RTE	FC	
92. this is a 'verb'	RG	FG	

93.	this is 'no', this is a 'noun' (scrolling down the webpage)	RG	FG	
94.	'no trace'	RT	FT	
95.	'verb'	RG	FG	
96.	trace (*han4 zik1*) trace (*zung1 zik1*)	RTE	FC	
97.	'he attempted to cover up all the traces of his crimes'	RX	FX	
98.	trace (*han4 zik1*) (writing)	W	CD	
99.	How to write? (looking at the words in the entry)		SW	

4.1.2 Checking Strategy

Checking strategy is normally adopted at the beginning of a lookup. This happens when the learner initially infers word meanings through its context or by one's previous knowledge, then the learner consults the dictionary to examine if the presumed meanings are correct. Hence, a crucial operation in such lookup process should consist of *guessing* the word meaning.

Table 4.2 shows how Student C adopted checking strategy when looking up 'burial'. Her first step was making a guess that 'burial sites' should refer to 'places where some people are buried' (CU385). In her interview, she explained:

> Actually, I sometimes know what the word means, but I just want to check it.

Even though it is not clear how the inference was made, her explanation suggests that she could have known the word beforehand, so her guess might be based on her previous knowledge. Next, she consulted the dictionary (CU386) and focused on two Chinese equivalents in the entry (CU387 and CU388). Finally, she chose the one that was similar to her initial inference and determined that sense to be the meaning of the target word (CU389).

Table 4.2: Use of checking strategy to look up ‘burial’ by Student C

C16: burial Context: Archaeologists were excavating a prehistoric burial site close to the city of Rostov-on-Don in the far south of Russia, near the northern reaches of the Black Sea. Information written by Student C: 埋葬 (meaning ‘the act of putting a dead body in the ground’)			
Communication Units (CU)	**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
385. ‘burial site’ means places where some people are buried, doesn’t it?		G	
386. ‘burial’ (typing ‘burial’ in the search box)	PT + TT	FP	ISP
387. the ceremony connected with the act of putting a dead body into the ground (*zong3 lai5*)	RTE	FC	
388. the act of putting a dead body into the ground (*maai4 zong3*)	RTE	FC	
389. write down the act of putting a dead body into the ground (*maai4 zong3*) (writing)	RTE + W	FC	

4.1.3 Deriving Strategy

While contextual or semantic clues are used to make a prior guess that is later confirmed by reviewing the senses in the entry, dictionary users who employ deriving strategy perform a similar action as they refer to the context for operations, including *defining target words* and *formulating meaning*, but they are doing this to obtain the meaning of the target word because no results of the target word can be found from the dictionary.

Table 4.3 describes the process of how Student F used deriving strategy. Student F initiated the search by focusing on the spelling of the target word (CU902). When she referred to the webpage, she discovered that no results were shown (CU903). She then determined that ‘trepanation’ was a ‘kind of surgery’ (CU904 and CU905). Further explanation of how she formulated such meaning is revealed in her interview excerpt:

> (R = Research; F = Student F)
> R: I want to ask, just now you could not find the first word that you looked up, but you finally wrote down ‘kind of surgery’, so how did you determine this ‘meaning’?
> F: I originally knew that it meant a kind of ‘surgery’, but I wanted to find what its Chinese was so as to understand the word more, but I couldn’t find it.

In fact, Student F initially interpreted the meaning of the target word, probably from the reading context, but she could not further check its exactness by consulting the dictionary, so she assumed that her original thought was correct.

Table 4.3: Use of deriving strategy to look up 'trepanation' by Student F

F1: trepanation Context: Thousands of years ago, people were performing a form of surgery called "trepanation" that involves boring holes through a person's skull. Information written by Student F: kind of surgery			
Communication Units (CU)	**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
902. TREPANATI TREPANATION (typing 'trepanation' in the search box)	RS + TT	FS	ISS
903. any results?.. (scrolling down the webpage)	RDI	FDI	MO
904. should be a 'surgery' (writing)	DT	FM	
905. 'kind of surgery' (writing)	W	RM	

Table 4.4 shows another example of deriving strategy. Student D started the lookup by referring to the reading, thus adopting contextualising strategy (CU626). She then realised that there were no lookup results from the dictionary (CU629). To solve this problem, she probably referred back to the text and surmised the word meaning (CU631). In the interview, she explained:

> Because it already mentions 'or Copper Age', both are meaning the same, so I guessed this could be something difficult to be looked up in a dictionary and should be checked in some other websites, so I directly equated this word with 'Copper Age'.

This case is somehow different from the previous one as the student did not form any preceding perception about the target word. The stimulation that aroused her to adopt deriving strategy was that the unfound result of the dictionary directed her back to the reading to understand the word. In this case, the student successfully derived the meaning from the reading text because there were sufficient contextual clues.

Table 4.4: Use of deriving strategy to look up ‘Chalcolithic’ by Student D

D14: Chalcolithic Context: Based on the style of the burials, the archaeologists knew that they dated to between approximately 5,000 and 3,000 BC, a period known as the Chalcolithic or “Copper Age”. Information written by Student D: Copper Age			
Communication Units (CU)	**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
626. ‘a period known as the.. cor...’	RT	FT	
627. ‘CHALCOLITHIC’ (typing ‘Chalcolithic’ in the search box)	RS + TT	FS	ISS
628. ‘CHAL’	RS	FS	
629. okay cannot find			ET
630. don’t worry			MO
631. ‘Copper Age’ means the same (writing)	DT + W	FM	

4.1.4 Explaining Strategy

Explaining strategy is used when the learner goes through the senses of the entry and utilises the chosen meaning to explain the reading context to confirm its suitability. The core procedures involve *explaining passage* and *constructing text meaning* at the same time. In this way, the strategy is used towards the end of a lookup process as a final assurance of the lookup decision.

The process of how explaining strategy can be used in a lookup process is illustrated in Table 4.5. In this lookup, Student C initiated the search with the use of contextualising strategy as she read the text (CU329). She then focused on the Chinese equivalent in the entry (CU333) and selected that sense as the meaning of the target word (CU335). At the end, she elaborated her understanding towards the reading (CU336), and the purpose of this action is explained in the interview:

> Afterwards, I construct the meaning of the sentence for one more time, to let myself understand what the word means in the passage.

In this way, Student C could finally confirm the word meaning by means of explaining strategy.

Table 4.5: Use of explaining strategy to look up ‘archaeological’ by Student C

C8: archaeological Context: To date, thousands of skulls bearing signs of trepanation have been unearthed at archaeological sites across the world. Information written by Student C: adj. 考古學 (meaning ‘archaeological’ in English)			
Communication Units (CU)	**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
329. ‘at archaeological’	RT	FT	
330. what’s that?			PL
331. ‘ar- archaeological’ (typing ‘archaeo’ in the search box and clicking ‘archaeological’)	PT + TT + RSW	FP + FSW	ISP
332. things related to archaeologists	DT	FM	
333. archaeological (*haau2 gu2 hok6*)	RTE	FC	
334. ‘adjective’ (writing)	RG + W	FG	
335. archaeological (*haau2 gu2 hok6*) (writing)	RTE + W	FC	
336. some archaeological sites ‘around the world’, skulls being discovered by people	EP	CTM	

4.1.5 Substituting Strategy

Another way of evaluating if a chosen meaning is appropriate in the reading context is by means of substituting strategy. The prominent feature of this strategy is the execution of *substituting target word* in the reading sentence or phrase with the formulated meaning. When the substitution is sensible, and so is the word meaning.

Table 4.6 demonstrates how Student D adopted substituting strategy in her lookup process. She firstly initiated the search by focusing on the pronunciation of the word (CU707). She then recognised the Chinese meaning of the target word in the dictionary (CU708). In order to assess its appropriateness in the context, she substituted the target word ‘unprecedented’ in the text with the meaning ‘never having existed’ identified earlier (CU710). In this way, Student D could evaluate whether the chosen meaning could convey a logical idea in the text.

This process is indeed similar to the use of explaining strategy. While users of explaining strategy may focus on a broader context, such as a paragraph or the whole text, users of substituting strategy are more likely to concentrate on the particular sentence or phrase where the target word is written.

Table 4.6: Use of substituting strategy to look up ‘unprecedented’ by Student D

D22: unprecedented Context: This was, and is, unprecedented. Information written by Student D: 史無前例的 (meaning ‘never having existed’)				
Communication Units (CU)		**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
707.	‘unprecedent unprecedented’ (typing ‘unprecedented’ in the search box)	RTW + PT + TT	FTW + FP	ISP
708.	never having existed (*si2 mou4 cin4 lai6 dik1*)	RTE	FC	
709.	let me see			MO
710.	‘clearly finding even one obelion tre- trepanation is remarkable but Batieva Batieva was looking at five all of them buried in the same grave this was’ never having existed (*si2 mou4 cin4 lai6 dik1*) (writing)	RT + ST + W	FT + EM	
711.	okay the next one	ELT		TLT

4.1.6 Paraphrasing Strategy

Paraphrasing strategy is adopted when the dictionary user aims at forming a meaning that can accurately fit the reading context. In this process, the user first goes through the senses in the entry, but he or she may not be satisfied with the senses presented, so the user bases on the chosen sense and paraphrases the meaning in his or her own words to better its suitability in the reading. In accordance, *defining target word* and *formulating meaning* become the requisite operations when paraphrasing strategy is used.

Table 4.7 presents an example of how Student E determined word meaning with paraphrasing strategy. After looking at the English definition (CU803), Student E assumed that the word meaning was ‘to prevent’ (CU804). However, when she referred to the context (CU806), she realised that the meaning did not quite fit the sentence. As a result. she defined the target word and formulated another meaning of her own (CU808). In her interview, she explained why she did not use the dictionary meaning:

> Because ‘possibility’ cannot be ‘prevent[ed]’… you can only eliminate a possibility, so that means ‘wipe out’, I simply think that this meaning is more logically coherent.

Table 4.7: Use of paraphrasing strategy to look up ‘rule out’ by Student E

E5: rule out Context: It is almost impossible to completely rule out the possibility that a trepanation was carried out for medical reasons, because some brain conditions leave no trace on the skull. Information written by Student E: to prevent (or to wipe out…)			
Communication Units (CU)	**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
800. ‘rule out’	SS + RTW	FTW	PL
801. ‘rule out’ (typing ‘rule out’ in the search box)	PT + TT	FP	ISP
802. ‘rule something out’	RH	FH	
803. ‘to prevent something from happening’	RD	FE	
804. ‘that means to prevent something, to prevent something, to rule out something, to prevent something’	DT	FM	
805. ‘this recent wave of terrorism has ruled out any chance of peace talks’	RX	FX	
806. ‘so so back to the paragraph it is only it is almost impossible to completely rule out the possibility blah blah blah’	RT	FT	
807. ‘to prevent.. to prevent’ (writing)	RD + W	FE	
808. ‘but I guess it has the, it also has the meaning of wipe out’	DT	FM	
809. ‘to wipe out something’ (writing)	DT + W	FM	

4.1.7 Referring Strategy

Referring strategy is adopted when the dictionary user refers to another entry in the dictionary to assist in formulating the meaning of the target word. This can happen when the user refers to the meaning of a word that has previously been looked up, mainly because they share similar meanings, or they are within the same word family.

Table 4.8 is an example of how Student E used referring strategy when looking up the word ‘intriguing’. After Student E had located the entry (CU877), she read the English definition in the dictionary (CU878), but then she turned to

consult the verb form of the target word (CU880). At the end, she wrote down the meaning of ‘intrigue’ as a verb (CU887) before she confirmed that the meaning of ‘intriguing’ was ‘interesting’. Her interview protocol confirmed the use of referring strategy and the relevant excerpt reads:

> (R = Researcher; E = Student E)
> R: I want to ask why you first looked up ‘intriguing’ and then ‘intrigue’?
> E: When I first looked at this word, I was thinking what its ending was, I could not think of the word ‘intrigue’. As I had looked up ‘intriguing’, I thought that the original ‘form’ should be ‘intrigue’ with GUE as the ending, so I checked back ‘intrigue’.

Accordingly, the initial thought of Student E is to look up the verb form of the target word to construct the meaning. Thus, this is how referring strategy can be applied to construct word meaning by referring to a closely related entry.

Table 4.8: Use of referring strategy to look up ‘intriguing’ by Student E

E12: intriguing Context: It was an intriguing possibility. Information written by Student E: interesting; to intrigue → make somebody to feel interested			
Communication Units (CU)	**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
877. ‘intriguing’ (pronouncing /ɪnˈtriːgeɪtɪŋ/) (typing ‘intriguing in the search box’)	PT + TT	FP	ISP
878. ‘very interesting’	RD	FE	
879. ‘intrigue’ (pronouncing /ɪnˈtriːgeɪ/)	RG	FG	
880. ‘what is the meaning of intrigue? (pronouncing /ɪnˈtriːgeɪ/) (typing ‘intrigue’ in the search box)	TT		PL
881. ‘intrigue’ oh ‘not intrigue’ (pronouncing /ɪnˈtriːgeɪ/)	RP	FP	
882. ‘intrigue’	PT	FP	
883. ‘intriguing’ oh ‘not intriguing’ (pronouncing /ɪnˈtriːgeɪtɪŋ/)	RP	FP	
884. ‘intriguing’	PT	FP	
885. ‘to interest somebody a lot’	RD	FE	
886. ‘intriguing, to intrigue’		CGF	
887. ‘so it means to make somebody somebody to feel interested’ (writing)	DT + W	FM	
888. ‘so it means interesting’ (writing)	DT + W	FM	

4.1.8 Without Lookup Strategies

While all the above examples are showing how learners can be adopting different strategies to assist the lookup process, the analysis of some lookups indeed reflect that students are not using any strategies to determine the meaning of the consulted word. This happens when a learner simply looks up the target word in the dictionary, reads the information in the entry, and writes down a meaning from the entry.

Table 4.9 shows an example of a lookup process in which no strategies were applied in a lookup process of Student F. She first searched for the target word 'infant' in the dictionary (CU927), then she looked at an English definition and a Chinese meaning in the entry (CU928 and 927), finally she wrote down 'baby' as the perceived meaning. Since this process only involved a copy-and-paste action, no clear strategies could be identified in respect to how the meaning of the target word was perceived by the participant.

Table 4.9: Example of a lookup process without lookup strategies

F6: infant Context: One of the graves contained the skeletons of five adults – two women and three men – together with an infant aged between one and two years, and a girl in her mid-teens. Information written by Student F: 嬰兒 (meaning 'baby')			
Communication Units (CU)	**Executive Operations**	**Cognitive Operations**	**Metacognitive Operations**
927. 'infant' (typing 'infant' in the search box)	PT + TT	FP	ISP
928. 'a newborn baby'	RD	FE	
929. baby (*jing1 ji4*)	RTE	FC	
930. baby (*jing1 ji4*) (writing)	RTE + W	FC	

4.1.9 Frequency of the Use of Lookup Strategies

As illustrated in the above examples, seven strategies have been identified in this study. Figure 4.1 illustrates their frequency of use in these lookups. Among all these strategies, contextualising strategy is the most prevalent strategy and was used in 72 out of 102 lookups. The next most frequently adopted strategy is explaining strategy and was used for 22 times. Substituting, referring, deriving, and checking strategies are similar as they were used for about 10 times. The least frequently used strategy is paraphrasing strategy, which was used for only 7 times.

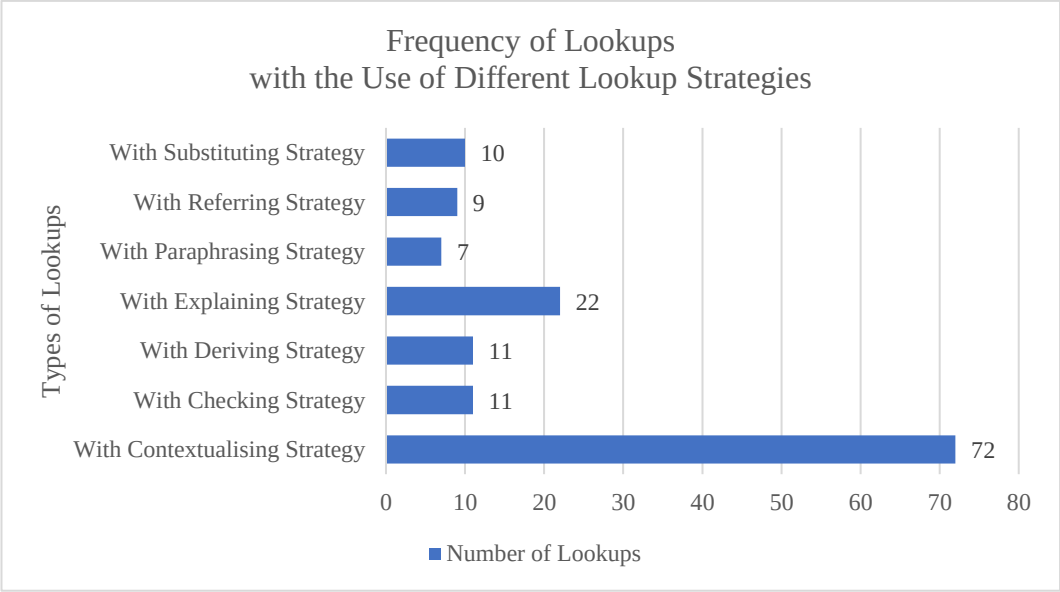


Figure 4.1: Frequency of Lookups with the Use of Different Lookup Strategies

After the classification of lookup strategies, it has been discovered that these strategies are only identified in 91 out of 102 lookups, while no clear strategies are found in the remaining 11 lookups. This results in three different lookup patterns: single strategies, multiple strategies, and no strategies. Figure 4.2 demonstrates their ratio in respect to each of these patterns. While almost half of the lookups were managed with the use of an individual strategy, 40% of lookups were performed with multiple strategies, and only 11% of lookups were completed without any lookup strategies.

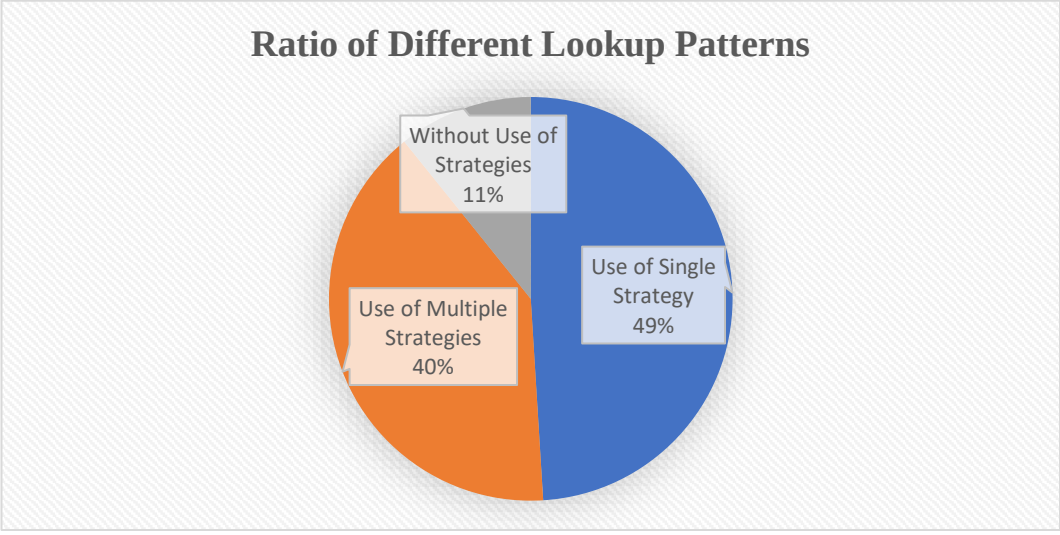


Figure 4.2: Ratio of Different Lookup Patterns

Another way to look at the frequency of these lookup strategies are by reviewing their strategy patterns. Table 4.10 shows a list of 17 strategy patterns that illustrate how strategies were solely or conjunctly adopted by participants. Accordingly, contextualising strategy is the dominant strategy adopted no matter in an individual situation or in combination with other strategies. Contextualising strategy is used as the sole strategy in 30 lookups, and it is used as part of a combination of strategies in all lookups that concern the use of multiple strategies. The most frequent strategy pattern is the use of contextualising strategy with explaining strategy or substituting strategy, which account for 12 and 7 lookups respectively.

Table 4.10 Frequency of Different Strategy Patterns

Strategy Patterns	**Number of Lookups**
contextualising	30
checking	3
deriving	6
explaining	3
paraphrasing	4
referring	3
contextualising + checking	5
contextualising + deriving	5
contextualising + explaining	12
contextualising + paraphrasing	2
contextualising + referring	3
contextualising + substituting	7
contextualising + checking + explaining	2
contextualising + explaining + substituting	2
contextualising + referring + explaining	2
contextualising + referring + substituting	1
contextualising + checking + explaining + paraphrasing	1
no strategies	11
Total Number of Lookups	**102**

4.2 Lookup Results

To examine the extent of successfulness of the lookups, participants' lookup results are classified into four types: successful lookups with accurate understanding (SAU), successful lookups with partial understanding (SPU), unsuccessful lookups with partial understanding (UPU), and unsuccessful lookups with inaccurate understanding (UIU). Examples are given below to illustrate each of these lookup results.

4.2.1 Successful Lookups with Accurate Understanding

Successful lookups are mostly achieved when participants form an accurate understanding of the target word. In other words, the meaning perceived by the participant perfectly fits the context, which makes the lookup a successful one. Table 4.11 shows an example in which Student D constructed an accurate understanding of the target word 'unblemished'. According to the meaning written by the participant during the lookup, her perception was that 'unblemished' means 'not damaged'. This meaning accurately shows how the target word is used in the reading context, which tells that no holes were made on the infant's skull and it was not spoiled. Hence, this lookup is identified as a successful one with accurate understanding.

Table 4.11: An Example of Successful Lookup with Accurate Understanding

Lookup Label	D19
Target word	unblemished
Context	Only the infant's skull was unblemished.
Information written	不被破壞到的 (meaning 'not damaged')

4.2.2 Successful Lookups with Partial Understanding

Successful lookups can also happen when participants only form partial understanding of the target word. Even though learners might not fully understand the exact meaning of the target word, the meaning perceived was sufficient for them to understand the overall meaning of the sentence within the reading context. How this is feasible is shown in the example in Table 4.12. In this lookup, the target word was 'ellipsoidal'. Student C finally wrote that the target

word referred to a shape. Even though this meaning is not fully complete, still the student managed to understand the semantic field of the target word, and this could considerably help her understand the word meaning as well as the reading.

Table 4.12: An Example of Successful Lookup with Partial Understanding

Lookup Label	C19
Target word	ellipsoidal
Context	Each of their skulls contained a single hole, several centimetres wide and roughly ellipsoidal in shape, with signs of scraping around the edges.
Information written	圖形 (meaning 'shape')

4.2.3 Unsuccessful Lookups with Partial Understanding

Nonetheless, partial understanding can also be identified as unsuccessful lookups in cases when such incomplete perception fails to assist learners in enhancing their semantic understanding of target words. Table 4.13 shows an example of unsuccessful lookup of this type. In this lookup, the only information about the target word that Student C gained was that 'trepanation' was 'a noun'. Undeniably, Student C did further her understanding of the word by identifying its part of speech. However, there was no evidence showing that she perceived the word semantically. In other words, this could not help Student C with perceiving what the target word conveyed in the reading. Thereupon, the lookup became unsuccessful as the student failed to construct any word meaning that could facilitate her comprehending the text.

Table 4.13: An Example of Unsuccessful Lookup with Partial Understanding

Lookup Label	C2
Target word	trepanation
Context	Thousands of years ago, people were performing a form of surgery called "trepanation" that involves boring holes through a person's skull.
Information written	a noun

4.2.4 Unsuccessful Lookups with Inaccurate Understanding

Unsuccessful lookups happen when learners form a word meaning that is totally different from the correct one. Table 4.14 is an example of unsuccessful lookup because of inaccurate understanding of the target word. In this example, Student A regarded ‘proceeding’ as the meaning of ‘initiation’. However, the target word should be perceived as a religious event in which a person becomes an official member of a group. As a result, the perceived meaning did not match with what the original text conveyed. This made the lookup an unsuccessful one.

Table 4.14: An Example of Unsuccessful Lookups with Inaccurate Understanding

Lookup Label	A7
Target word	initiation
Context	Since the very first scientific studies on trepanation were published in the 19th century, scholars have continued to argue that ancient humans sometimes performed trepanation to allow the passage of spirits into or out the body, or as part of an initiation rite.
Information written	程序 (meaning ‘proceeding’)

4.2.5 Summary of Lookup Results

In respect to whether participants formed accurate, partial, and inaccurate understanding of target words, lookup results have been classified as the above four types. Figure 4.3 shows the number of each type of lookup results. Most lookups, i.e. 77 out of 102 lookups, are classified as successful lookups with accurate understanding of target words. The number of successful lookups with partial understanding is shown in 13 lookups. There are 12 unsuccessful lookups; six are related to partial understanding, and six involve inaccurate understanding.

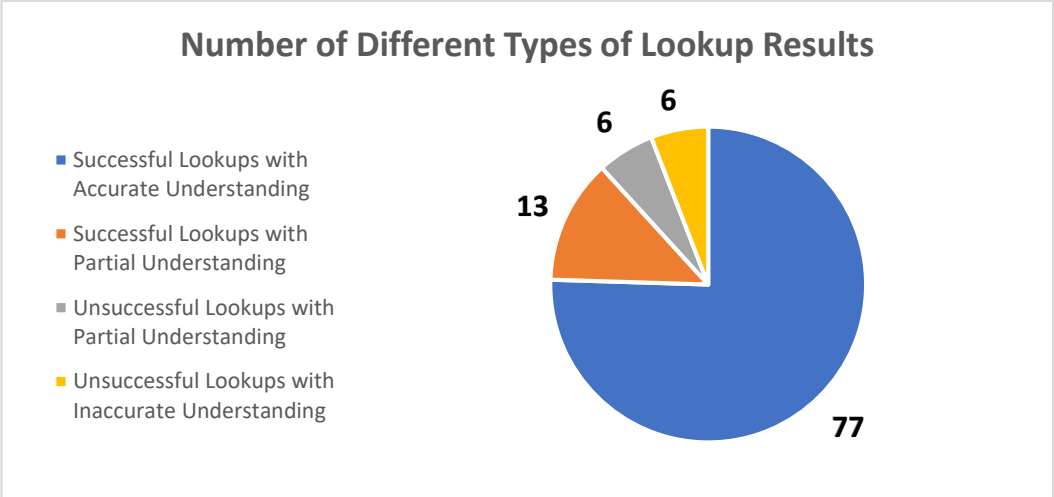


Figure 4.3: Number of Different Types of Lookup Results

4.3 Lookup Strategies and Lookup Results

After identifying seven types of lookup strategies and categorising the lookup results in four different types to demonstrate the extent of successfulness, we shall look at the relationship between these two aspects. Figure 4.4 shows the number of successful lookups against that of unsuccessful ones in the application of each lookup strategy. In general, the application of different lookup strategies is positively associated with successful lookup results. Paraphrasing and checking strategies are most likely to be leading to successful lookups since no unsuccessful results are found because of their implementation. In respect to the ratio of successful lookups to unsuccessful ones, referring strategy and deriving strategy are most likely to be in relation to problematic lookups, while the adoption of substituting, explaining, and contextualising strategies can exert a slightly adverse effect on the lookup results.

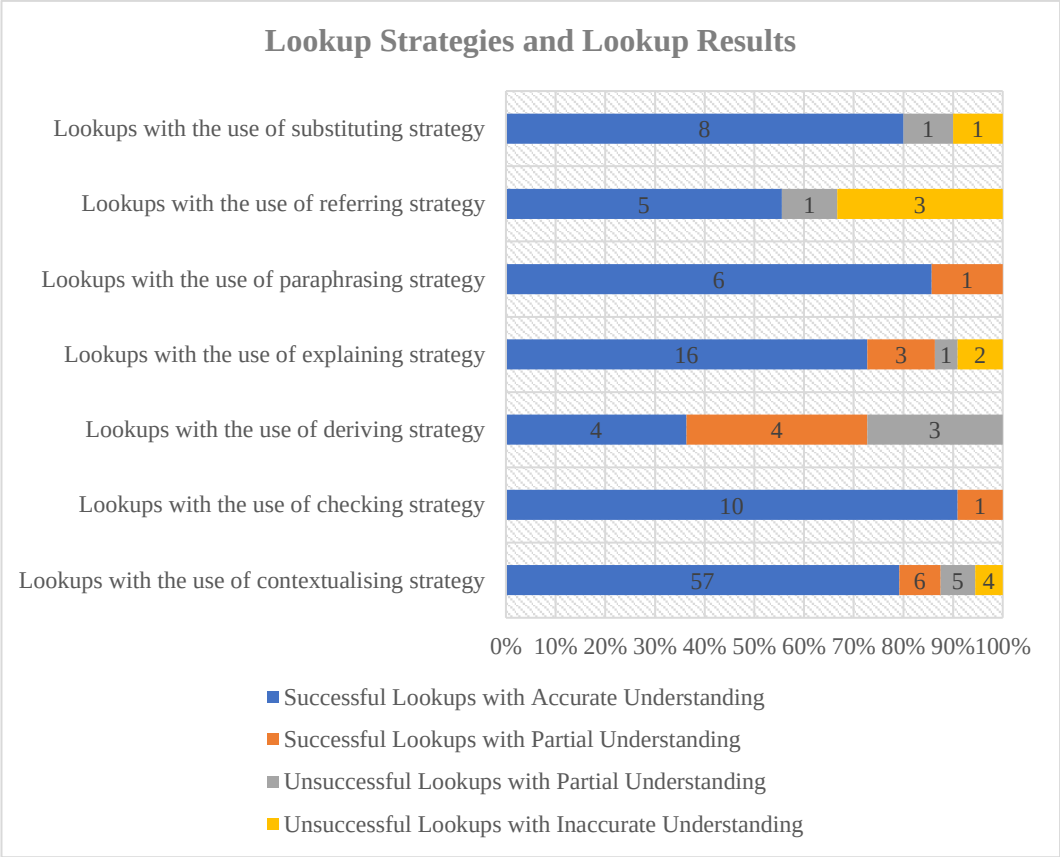


Figure 4.4: Lookup Strategies and Lookup Results

Concerning the practice that participants can be using a single strategy at times or adopt strategies together in a lookup, we could obtain a clearer picture by looking at the use of each strategy pattern in relation to their lookup results, and this is shown in Table 4.16. On the whole, most strategy patterns are accompanied by a comparatively large number of successful lookups, especially those with accurate understanding. Nevertheless, the table illustrates that there are several situations when the success rate is exceptionally lower, and these are related to the use of deriving, explaining and referring strategies.

Table 4.15 Strategy Patterns and Lookup Results

Strategy Patterns	No. of Lookups	SAU	SPU	UPU	UIU	Success Rate
contextualising	30	25	3	1	1	93%
checking	3	3				100%
deriving	6	3	2	1		83%
explaining	3		3			100%
paraphrasing	4	3	1			100%
referring	3	2			1	67%
contextualising + checking	5	4	1			100%
contextualising + deriving	5	1	2	2		60%
contextualising + explaining	12	12				100%
contextualising + paraphrasing	2	2				100%
contextualising + referring	3	2		1		67%
contextualising + substituting	7	6			1	86%
contextualising + checking + explaining	2	2				100%
contextualising + explaining + substituting	2	1		1		50%
contextualising + referring + explaining	2				2	0%
contextualising + referring + substituting	1	1				100%
contextualising + checking + explaining + paraphrasing	1	1				100%
no strategies	11	9	1		1	91%
Total	**102**	**77**	**13**	**6**	**6**	88%

The examination of these unsuccessful lookups further indicates that their failure was fundamentally related to the misuse of these strategies. For example, the use of deriving strategy can result in an unsuccessful lookup when the user fails to extract sufficient information from the context to formulate word meaning. Explaining strategy can sometimes confuse the user who may initially select a correct meaning from the entry but alter its meaning in a wrong direction in the explaining process. Referring strategy can be improperly adopted when a user refers to the result of an unsuccessful lookup, or when a user refers to a correct entry but neglect the information there.

4.4 Comparison between Proficient and Independent Readers

The previous session presents the findings about the use of lookup strategies in relation to participants' overall lookup results. However, there could be differences between the two groups of readers. Figure 4.5 compares proficient readers to independent readers in terms of their performances. Superficially, there are slight differences in terms of the number of words consulted and the success rate. Proficient readers made 57 lookups in total, and 48 lookups were successful, reaching a success rate of about 84%. Independent readers conducted 45 lookups in total and 42 lookups were successful, resulting in a success rate of about 93%.

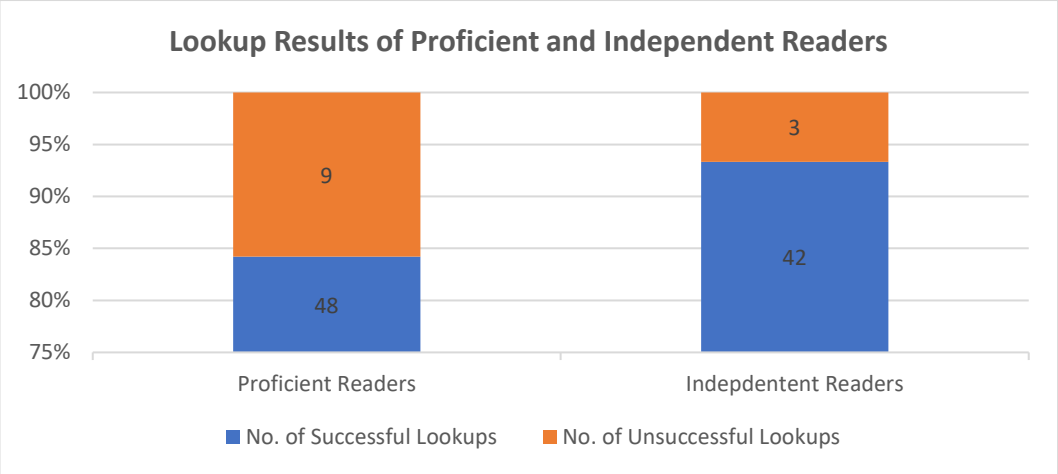


Figure 4.5: Lookup Results of Proficient and Independent Readers

It is indeed remarkable that independent readers could outperform proficient readers. To further explain the situation, the study then takes into account of individual differences and analyses the strategy patterns that each participant used and the corresponding number of successes; these are summarised in Table 4.16. In fact, the information reveals that these six students were displaying quite different lookup behaviours.

Student A mostly used contextualising strategy singly or implement it with other strategies. Although she is a proficient reader, her performance is with a comparatively low success rate. Specifically, this can be caused by her problematic use of referring strategy. A close examination of those unsuccessful lookups shows that she indeed succeeded in referring to an appropriate entry but misinterpreted the information, thus failing to construct a correct word meaning.

The most frequently used strategy of Student B is contextualising strategy since all her lookups involve the use of this strategy. She predominantly used contextualising strategy to comprehend the context where the target word is used. Then, she might adopt some other strategies as a supplementary approach.

Like the previous two students, Student C adopted contextualising strategy as the initial approach. Special attention is turned to her great number of lookups among readers. In fact, eight lookups involve the use of checking strategy, and they are all successful lookups. This reveals that Student C was somehow familiar with the consulted words, and her lookups were to confirm her initial knowledge.

Even though Student D is an independent reader, her use of strategies follows the pattern of proficient readers as she adopted contextualising strategy as her chief approach. Like Student C, she also consulted a lot of words, but checking strategy was rarely used; this suggests that she did not know the consulted words in advanced and her receptive knowledge could be less profound than the proficient readers.

The lookups of Student E demonstrate a very different pattern from all other readers. In most cases, she adopted only one strategy for a single lookup. This happened in eight of her lookups when she had 13 target words in total. Most importantly, while previous students were primarily using contextualising strategies, Student E only used this strategy once. Among all strategies, she used paraphrasing strategies most often.

Student F is the only participant who did not use any lookup strategies at all. When reviewing her lookup process, she simply consulted the dictionary, read the sense(s), and wrote down a word meaning. Nonetheless, all her lookups are successful that she could formulate accurate understanding of most target words. This can be explained by the fact that most of her lookups involve monosemous entry, so she could simply look at the only sense and accept the meaning.

Thereupon, the successfulness of lookups indeed depends on how well readers are implementing lookup strategies to determine word meanings and the types of entries they are consulting. While proficient readers commonly adopt contextualising strategies as the primary approach, independent readers can be performing very differently, which makes their behaviour indeterminate.

Table 4.16 Look Results of Each Participant in Relation to Strategy Patterns

	Student A		Student B		Student C		Student D		Student E		Student F	
Strategy Patterns	No. of Successes	No. of Lookups	No. of Successes	No. of Lookups	No. of Successes	No. of Lookups	No. of Successes	No. of Lookups	No. of Successes	No. of Lookups	No. of Successes	No. of Lookups
contextualising	4	5	5	5	6	7	12	12				
checking					2	2			1	1		
deriving	1	1					0	1	3	3	1	1
explaining					2	2			1	1		
paraphrasing									4	4		
referring					0	1			2	2		
contextualising + checking	1	1			3	3	1	1				
contextualising + deriving			1	1	2	3	1	1				
contextualising + explaining	1	1	1	1	7	7	3	3				
contextualising + paraphrasing			1	1					1	1		
contextualising + referring	0	1			1	1	1	1				
contextualising + substituting	2	3			2	2	3	3				
contextualising + checking + explaining					2	2						
contextualising + explaining + substituting					1	1	0	1				
contextualising + referring + explaining	0	2										
contextualising + referring + substituting	1	1										
contextualising + checking + explaining + paraphrasing					1	1						
no strategies	2	2					1	2	1	1		
Total	12	17	8	8	29	32	22	25	13	13	7	7
Success Rate	70.6%		100.0%		90.6%		88.0%		100.0%		100.0%	

4.5 Summary of Research Findings

To summarise, this chapter has reported the research findings. On the one hand, the qualitative analysis of verbal and written data shows that participants can be utilising seven different lookup strategies when they are perceiving word meanings for reading purposes, and their lookup results are mostly successful and accurate. On the other hand, the quantitative analysis indicates the positive association between lookup strategies and lookup results and reveals that proficient readers' lookups are more tactical than those of independent readers.

Chapter 5 Discussion

Based on the findings shown in Chapter 4, this chapter is going to present answers to the research questions. To deepen the discussion, the chapter also compares the findings with those from previous studies. The discussion is finally concluded by reviewing the initial question of this research to discuss if it is necessary to equip secondary students with lookup strategies so that they can fulfil the basic learning requirement of the local education system.

5.1 Classification of Lookup Strategies

In response to the first research question of whether graduates from English-medium secondary schools in Macao are using any lookup strategies for comprehension purpose when consulting online bilingualised dictionaries, this study confirms that most participants are able to implement lookup strategies, and seven different lookup strategies are identified in the analysis. As explained in Chapter 2, the current study has taken a different perspective when classifying lookup strategies. How these strategies in the current study and those in previous studies are related and deviated are shown in Figure 12.

Accordingly, the lookup strategies of Neubach and Cohen (1988), Scholfield (1999), and Wingate (2004) are comparable as they are developed from the lookup operations of Scholfield (1982). In these studies, the scholars categorise each lookup operation into groups of strategies according to temporal, mental, and knowledge-based criteria. However, this neglects the process that learners are performing a series of operations instead of a single one. To illustrate how operations are sequentially carried out, Thumb (2004) particularly focuses on meaning-specific strategies and identifies lookup strategies in terms of how learners obtain word meanings through the information that they have consulted in the dictionary in relation to whether the entry is polysemous or monosemous. This direction thus overcomes the initial shortcoming in the field and paves the way for the current study.

Nevertheless, one limitation of Thumb's classification is that some of her strategies only recount how learners consult the information in the dictionary but do not reflect how they determine word meanings, which is indeed the ultimate goal of a lookup. To further ameliorate the categorisation of lookup strategies, this

study has focused on how dictionary users formulate and assure the meanings of target words. This becomes the rationale behind the classification of lookup strategies in the analysis.

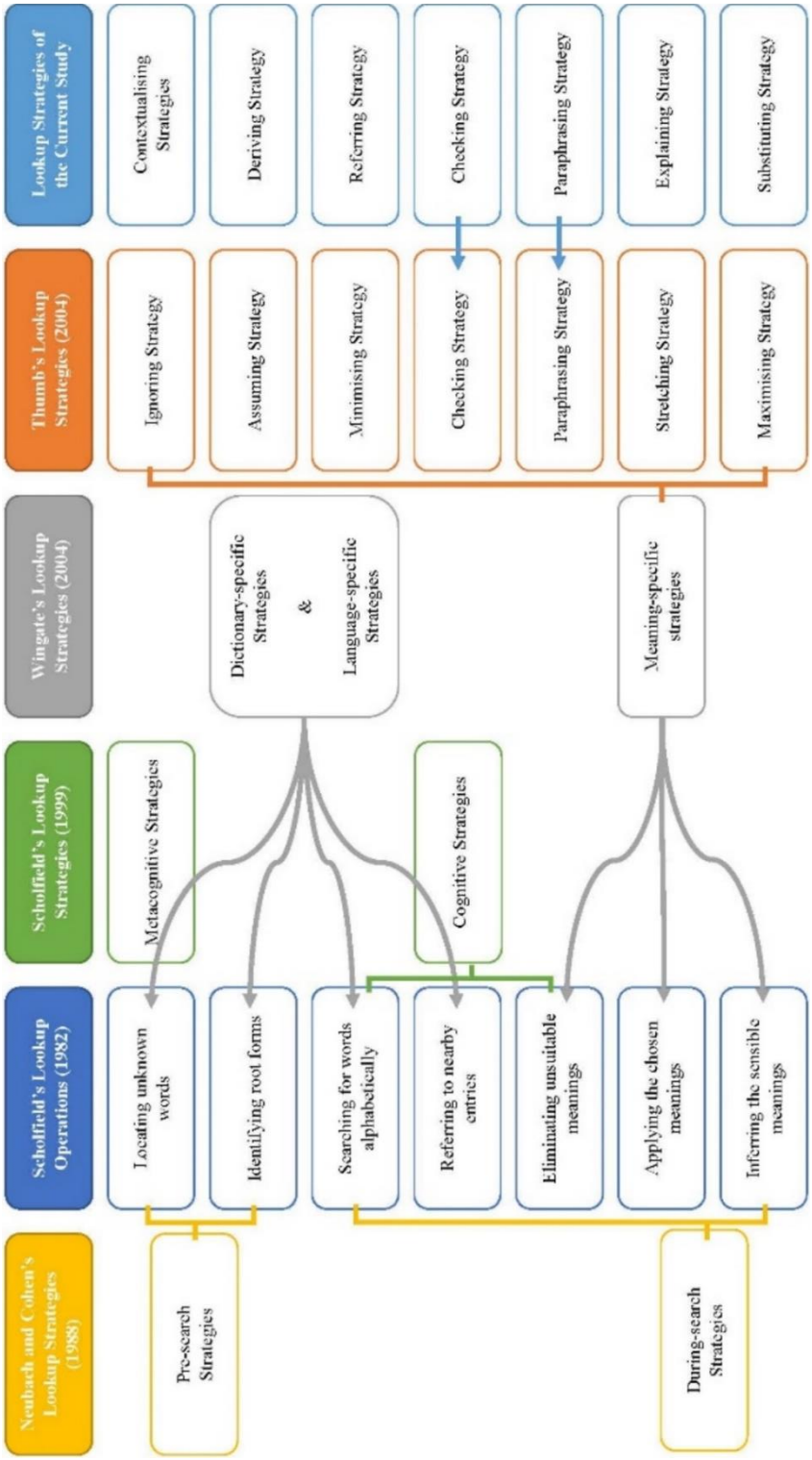


Figure 12 Comparison of lookup strategies from different studies

In this way, the seven strategies identified in the current study explain how learners achieve lexical understanding when looking up words in dictionary entries as a meaning-focused task. At the outset, contextualising strategy can form the cornerstone for learners' judgement during the lookup process. Substituting, explaining, and paraphrasing strategies can help learners to reach a more concise and accurate understanding of the target word. Checking, deriving, and referring strategies can be implemented when learners have to depend on external factors to determine word meanings.

Equally importantly, as these strategies are devised by viewing lookups as a problem-solving task, i.e. tackling reading obstacles caused by unfamiliar words through dictionary consultation, this enhances their practical applicability to learners and can potentially be adopted for pedagogical purposes to expand students' learning inventory.

5.2 Outcomes of Dictionary Consultation

In terms of the second research question about the successfulness of dictionary lookups for comprehension purpose, the findings of this study show that most lookups have been completed with success. Specifically, learners are mostly able to construct accurate understanding of target words by means of dictionary consultation.

This finding conforms to the results of many previous studies which investigate the use of dictionaries by learners of similar proficiency levels and language backgrounds. For instance, in the study of Nesi and Haill (2002), university students are found not to have experienced much problem in figuring out the meanings of unknown words with the use of dictionaries. Likewise, advanced university learners in Hong Kong in the study of Chan (2012) also achieve a high accuracy rate when looking up unknown words in a dictionary. Another study which examines 1180 lookups generated by English learners in a Taiwanese high school also shows a relatively high success rate as 80% of lookups are correct in terms of their meanings constructed (Tseng, 2009).

The findings of the current research thus tie well with previous studies and reassure that dictionary consultation can constitute notable achievement during the learning process of both proficient and independent readers.

5.3 Relationship between Lookup Strategies and Lookup Results

The third research question looks at whether learners' lookup strategies can lead them to successful understanding of unfamiliar words in reading. Findings from the study show that these two aspects, lookup strategies and lookup results, are indeed positively associated. The implication is that the proper use of lookup strategies can substantially lead learners to successful consultation. When compared with how learners behave in previous studies, the participants in the current research are indeed comparatively more strategic dictionary users since they are able to avoid conventional lookup problems.

For instance, one prevalent consultation problem is that learners could have adopted the kidrule strategy and only chosen the familiar parts in an entry to replace the unknown words in the reading regardless of their suitability (Wingate, 2004). Conversely, this problem is not viewed in the current study even when participants were using the substituting strategy. Their implementation was so tactical that they avoided the problem by adopting the substituting strategy with contextualising strategy and were aware of the importance of context fitting.

In respect to the use of online dictionaries, one notable pitfall throughout the lookup process can be the over-reliance on the convenience of the system which allows users to locate a target word without removing its inflection (Tseng, 2009). This convenience may not be preferred as it can lead to problematic search at times when learners are directed to an entry of a wrong grammatical class. In this study, participants were capable of identifying the base form of their target words that they would remove the inflection when typing the word in the search box. Hence, their ability in language-specific strategies explains why they could search for correct entries and succeed in most lookups.

Even though these findings are supporting that the students in English-medium schools in Macao could look up words strategically to enhance their reading comprehension, this does not necessarily suggest that they are all capable readers. Surprisingly, the successful lookups with the use of lookup strategies can sometimes be the evidence of immature readers.

For example, the frequent use of checking strategy indeed suggests that the user may not be selective about the consultation process. Student C is a typical

example of this circumstance. Among all the participants, she was the one with the greatest number of lookups, and she also adopted checking strategy the most. This implies that she probably understood the words consulted beforehand, and her lookups might be unnecessary. Hence, Student C could probably be experiencing the problem of excessive lookups, which reflects her inability in choosing essential words for consultation during the prior reading process. This problem is especially apparent when learners are overly using an online dictionary due to its easy access (Laufer and Hill, 2000; Tabata, 2016).

Similarly, the problem of being unselective is also shown by the successful use of deriving strategy since this suggests that students' lookups are indeed unwarranted. When participants are using deriving strategy, they normally refer back to the context to understand the word meaning since no lookup results are displayed. In this study, participants could mostly infer the word meaning with the use of deriving strategies. Their success could be explained by the fact that most of these lookups actually involve technical terms, such as "trepanation", "obelion", and "Chalcolithic", that were well explained in the reading text. In other words, these participants could initially have extracted the meanings of these unfamiliar words beforehand but not during the lookups if they were capable and strategic readers.

Despite the positive relationship between lookup strategies and lookup results, learners' consultation success by means of lookup strategies can basically reflect that they are capable dictionary users, but whether they are strategic readers remains doubtful.

5.4 Types of Dictionary Users

When comparing proficient readers with independent ones to address the last research question, the study shows that both groups are performing fairly well and are able to reach accurate understanding in most of their lookups. What makes them significantly different is perhaps how they employ lookup strategies. While proficient readers are primarily adopting contextualising strategy, independent readers can be behaving very differently. Their dissimilarity thus suggests that

three types of dictionary users can possibly be found in English-medium secondary schools in Macao, and the main characteristics of these users are described as follows:

- Users of the first type are those carrying out the lookups like Student A, B, C and D, and they adopt contextualising strategy as the primary approach. This practice is comparatively favourable because the frequent use of contextualising strategy suggests that these users are conscious of their reading. Even though their current goal is to perceive word meanings by consulting the dictionary, they still realise that the final goal is to understand the reading. In other words, these users regard the consultation of dictionary as an approach to facilitate their reading process.
- Users of the second type are looking up words like Student E and they basically adopt only one strategy in each lookup, without using any contextualising strategies. The lack of contextualising strategy suggests that these users focuses primarily on their lookups instead of the reading.
- Users of the last type consult the dictionary like Student F. These users are not using any strategies to determine the meaning of the consulted words. They simply look at the dictionary entry and accept the meaning there. In this case, whether the consulted meaning can fit the reading context becomes dubious.

In brief, the first type of users can be regarded as what Gu (1994) defines as good learners since they view dictionary use as a learning approach to be in line with text comprehension strategies and vocabulary learning strategies, whereas the other two types of users are indeed less capable, and their consultation practice can be problematic since text comprehension can be hardly achieved without proper context fitting. Such categorisation of dictionary users thus distinguishes proficient readers from independent readers. While all proficient readers are dictionary users as described in the first type, all the three types of dictionary users can be found among independent readers.

5.5 Conclusion: Is teaching lookup strategies necessary?

In short, this study aims at figuring out if it is necessary to equip students in English-medium secondary schools in Macao with lookup strategies so that they can fulfil the basic learning requirement and are able to consult dictionary to enhance their reading comprehension. To reach an answer to this question, the study examines participants' ability in conducting lookups and evaluates whether they could succeed in this process by adopting proper lookup strategies.

Superficially, the study reveals that teaching lookup strategies is seemingly unnecessary since participants mostly succeed in forming accurate understanding of target words during their lookups. The same notion is further supported by the findings that these learners can be implementing seven different lookup strategies that are all positively associated with lookup results.

Appropriate strategies adopted by students and their high accuracy rate in using dictionary as an aid to assist reading suggest that students who are studying in an English-medium school can generally develop a distinct level of English proficiency which enables them to use dictionaries in a relatively effective manner. This can be attributed by the fact that they have to use dictionaries in many other subject areas apart from the English subjects. This allows them to have sufficient practice in using dictionaries and understand how to make use of the information to formulate their understanding of target reading. The nurture from such environment thus becomes the factor that leads them to successful use of dictionaries.

Nevertheless, not all participants are benefiting from such preferable situation. When individual differences of participants are taken into consideration, the study actually discovers that students can be consulting unfamiliar words without using any strategies and are neglecting the reading context. This thus indicates that it is indeed necessary to teach lookup strategies so that all students can recognise the importance of context fitting, or it can be doubtful whether students' successes in lookups are achieved by chance. In other words, all students should receive instructions on how they should adopt lookup strategies so that they can determine word meaning by relating the entry information with the reading context, and in turn make dictionary use beneficial to L2 reading.

Chapter 6 Conclusion

To summarise, the current study measures the dictionary consultation performance of students from English-medium secondary schools in Macao in terms of how they implement lookup strategies to determine the meanings of unfamiliar words for reading. The purpose of this investigation is to justify whether it is necessary to teach these students lookup strategies so that they can learn how to consult words properly from dictionaries to assist their L2 learning, and if there is a need to modify the current teaching curriculum to comply with the basic learning requirement imposed by the education bureau.

Through a think-aloud approach, supplemented by observation and stimulated recall interviews, the researcher observes the mental process of participants as they are performing lookups for reading purposes. Concerning that learners are using dictionaries for consulting the meaning of target words, the researcher examines the lookup operations to identify lookup strategies by focusing on how learners determine word meaning. The findings show that these participants can be adopting seven different lookup strategies, namely contextualising, checking, deriving, explaining, paraphrasing, referring, and substituting strategies, during the lookup process. Such classification of lookup strategies thus sheds light upon the pedagogical implication as their usage is in line with the goal of the consultation task.

Despite the fact that these students have mostly employed lookup strategies and successfully looked up most of the words, the researcher suggests that teaching them lookup strategies is still necessary since some students are found to have neglected the reading context and completed their lookups without any strategies. This thus implies that students who are studying in an English-medium school could have possibly developed the necessary lookup skills because of the educational environment. However, not all students are able to benefit from this situation and they may fail to look up words through an appropriate approach. Hence, to ensure that all students can fully derive the benefits of dictionary use, it is then necessary to adjust the school curriculum and make dictionary strategies an explicit part of the lessons.

6.1 Limitation

However, due to the limited space in this paper, this study does bear several limitations in regard to the investigation. The initial limitation is that the study only investigates dictionary lookup strategies and their impacts within the scope of achieving lexical comprehension. However, whether the formation of such vocabulary understanding can enhance learners' reading comprehension of the text as a whole may need to be further examined. This may include the investigation of whether students are selective in their consultation and whether they are looking up words that are crucial for understanding the reading. Only by then, a clearer picture can be formed in terms of how learners can apply lookup strategies together with reading strategies.

Another limitation concerns the possible factors that can affect the successfulness of the lookups. In this study, lookup successes are primarily associated with the implementation of lookup strategies. Yet, there can also be other factors that can affect students' performance during the lookups; these include the nature of the entries, the types of words that are being consulted, the types of definitions presented in the dictionary, the language proficiency of learners in both L1 and L2, and their language preference. Thereupon, these aspects may require further examination to establish clearer correlation among these factors and explain how they may impact the lookup process.

In respect to the design of the research, a limitation is that the extent of authenticity of the reading task may have to be enhanced since there is no time restriction when participants read the passage and consult the words from the dictionary. Such design is initially made when concerning the risk that time restriction can potentially affect students' verbalisation and in turn the validity of the study. However, in this way, this study can only reflect students' reading and consultation behaviour when they have sufficient time to read in detail. In reality, this may not be often the case. For instance, when facing heavy workload, students may only have limited time to read through a text, so their consultation behaviour in such situation can considerably be different and should also be investigated.

6.2 Future Research Recommendation

This research only examines the lookup strategies that high-school graduates adopt when consulting an online bilingualised dictionary to assist their comprehending a text. Although seven lookup strategies have been identified in the study, their applicability is yet to be investigated, especially when concerning their pedagogical implication. It is indeed intriguing to look at whether students can develop better lookup performances when these strategies are taught to them.

Besides, it is noteworthy that the current list of lookup strategies does not fully depict students' behaviour in all different learning domains with the use of dictionaries. For instance, students could have adopted dictionaries as a learning tool for assisting writing. In this case, the information that the learners consult can be very different from that for reading. For example, students may need to focus more on the example sentences and linguistic features of the target words. Whether any lookup strategies in writing situations can be identified for both learning and teaching implication can be done in future studies.

Last but not least, it may also be interesting to look at how dictionaries are used as a learning aid in compliance with other sources. Due to the advancement of technologies, many students can now gain access to several different dictionaries or sources to look up the meaning of a single word. Hence, how students can integrate the use of multiple sources, what combinations of use can maximise the learning benefits, and in what situations learners should depend on different learning sources, are yet to be investigated in future research.

References

Ard, J. (1982). "The Use of Bilingual Dictionaries by ESL Students while Writing", *International Journal of Applied Linguistics*, 58, pp. 1-27.

Aust, R., Kelley, M. J., and Roby, W. (1993). "The Use of Hyper-Reference and Conventional Dictionaries", Educational Technology Research and Development, 41(4), pp. 63-74.

Baxter, J. (1980). "The Dictionary and Vocabulary Behavior: A Single World or a Handful", TESOL Quarterly, 14(3), pp. 325-336.

Bensoussan, M., and Laufer, B. (1984). "Lexical guessing in context in EFL reading comprehension", *Journal of Research in Reading,* 7(1), pp. 15-31.

Bishop, G. (1998). "Research into the use being made of bilingual dictionaries by language learners", Language Learning Journal, 18(1), pp. 3-8.

Bland, S. K., Noblitt, J. S., Armington, S. and Gay, G. (1990). "The naïve lexical hypothesis: Evidence from computer-assisted language learning", Modern Language Journal, 74(4), pp. 440-450.

Bowles, M. A. (2010). The Think-Aloud Controversy in Second Language *Research*. New York: Routledge.

Bowles, M., & Leow, R. P. (2005). "Reactivity and type of verbal report in SLA research methodology: Expanding the scope of investigation", Studies in Second Language Acquisition, 27(3), pp. 415-440

Cambridge University Press (2019). Cambridge Dictionary. English Dictionary, Translations, and Thesaurus. Available at: https://dictionary.cambridge.org/ (Accessed: 2 June 2019)

Chan, A. Y. W. (2012). "The Use of a Monolingual Dictionary for Meaning Determination by Advanced Cantonese ESL Learners in Hong Kong", Applied Linguistics, 33(2), pp. 115-140.

Chen, Y. (2011). "STUDIES ON BILINGUALIZED DICTIONARIES: THE USER PERSPECTIVES", International Journal of Lexicography, 24(2), pp. 161-197.

Cobb, T. (2019) Web Vocabprofile. Available at: http://www.lextutor.ca/vp/ (Accessed: 2 June 2019).

Corder, S. P. (1973). “The elicitation of interlanguage”, in Svartik, J. (ed.) Errata: Papers in error analysis. Lund: CKW Geerup, pp. 36-48.

de Groot, A. M. B. and Hoeks, J. C. J. (1995). “The Development of Bilingual Memory Evidence from Word Translation by Trilinguals”, Language Learning, 45(4), pp. 683-724.

de Schryver, G. (2003). “Lexicographers’ Dreams in the Electronic-dictionary Age”, International Journal of Lexicography, 16(2), pp. 143-199.

Ericsson K. A. and Smith H. A. (1999). Protocol Analysis. Verbal Reports as Data. Revised Edition. London: MIT Press.

Ericsson, K. A., and Simon, H. A. (1993). Protocol analysis: Verbal reports as data. Cambridge: The MIT Press.

Fan, M. Y. (2000). “The Dictionary Look-Up Behavior of Hong Kong Students: A Large-Scale Survey”, Education Journal, 28(1), pp. 123-138.

Gass, S. M. and Mackey, A. (2000). Stimulated Recall Methodology in Second Language Research. Mahwah: Lawrence Erlbaum Associates, Inc.

Gu, Y. (1994). “Vocabulary Learning Strategies of Good and Poor Chinese EFL Learners”, Paper presented at the Annual Meeting of the Teachers of English Speakers of Other Languages.

Hayne, M. (1984). “Patterns and Perils of Guessing in Second Language Reading”, on TESOL, 83, pp. 163-176.

Heatley, A., Nation, I. S. P. and Coxhead, A. (2002). RANGE and FREQUENCY programs. Available at: http://www.victoria.ac.nz/lals/staff/paul-nation.aspx.

Henriken, B. (1999). “Three Dimensions of Vocabulary Development”, Studies in Second Language Acquisition, 21(2), pp. 303-317.

Hulstijn, J. H. (1992), “Retention of inferred and given word meanings: experiments in incidental learning”, in Arnaud, P. J. L. and Bejoint, H. (eds.), Vocabulary and applied linguistics. Basingstoke: Macmillan, pp. 113-125.

Hulstijn, J. H., Hollander, M., Greidanus, T. (1984). “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), pp. 327-339.

Hunt, A. and Beglar, D. (2005). “A framework for developing EFL reading vocabulary”, Reading in a Foreign Language, 17(1), pp. 23-59.

Laufer, B. and Hadar, L. (1997). “Assessing the Effectivenss of Monolingual, Bilingual, and “Bilingualised” Dictionaries in the Comprehension and Production of New Words”, The Modern Language Journal, 81(2), pp. 189-196.

Laufer, B. and Hill, M. (2000). “What Lexical Information Do L2 Learners Select in a CALL Dictionary and How Does It Affect Word Retention?”, Language Learning & Technology, 13(2), pp. 58-76.

Laufer, B. and Kimmel, M. (1997). “BILINGUALISED DICTIONARIES: HOW LEARNERS REALLY USE THEM”, System, 25(3), pp. 361-369.

Leow, R. P., & Morgan-Short, K. (2004). “To think aloud or not to think aloud: The issue of reactivity in SLA research methodology”, Studies in Second Language Acquisition, 26(1), pp. 35-57.

Lindstrom, N. O. (1980). “Making the Bilingual Dictionary Safer for Students”, Hispania, 63(4), pp. 718-723.

Mackey, A. and Gass, S. M. (2005) Second Language Research: Methodology and Design. Mahwah: Lawrence Erlbaum Associates, Inc., Publishers.

Mackey, A. and Gass, S. M. (2005). Second Language Research. Methodology and Design. London: Lawrence Erlbaum Associates, Inc.

Nesi, H. (1994). “The Use and Abuse of EFL Dictionaries: how learners of English as a foreign language read and interpret dictionary entries (doctoral thesis)”, Wales: Swansea University.

Nesi, H. and Haill, R. (2002). “A STUDY OF IDCTIONARY USE BY INTERNATIONAL STUDENTS AT A BRITISH UNIVERSITY”, International Journal of Lexicography, 15(4), pp. 277-305.

Nesi, H. and Meara, P. (1991). “How using dictionaries affects performance in multiple-choice EFL tests”, Reading in a Foreign Language, 8(1), pp. 631-643.

Neubach, A. and Cohen, A. D. (1988) “Processing Strategies and Problems Encountered in the Use of Dictionaries”, Journal of the Dictionary Society of North America, 10, pp. 1-19.

O’Malley, J. M., & Chamot, A. U. (1990). Learning strategies in second language acquisition. Cambridge, UK: Cambridge University Press.

Região Administrativa Especial de Macau (2017). “Anexo VI. Exigências das competências académicas básicas da Língua Inglesa no ensino secundário complementar (segunda língua)”, Boletim Oficial da Região Administrativa Especial de Macau — I Série — Suplemento, 26, pp. 681-682.

Rezaei, M. and Davoudi, M. (2016). “The Influence of Electronic Dictionaries on Vocabulary Knowledge Extension”, Journal of Education and Learning, 5(3), pp. 139-148.

Riazi, A. M. (2016). The Routledge Encyclopedia of Research Methods in Applied Linguistics. Quantitative, qualitative, and mixed-methods research. New York: Routledge.

Rossomondo, A. E. (2007). “The role of lexical temporal indicators and text interaction format in the incidental acquisition of the Spanish future tense”, Studies in Second Language Acquisition, 29(1), pp. 39-66.

Sachs, R., & Polio, C. (2007). “Learners’ uses of two types of written feedback on an L2 writing revision task”, Studies in Second Language Acquisition, 29(1), pp. 67-100.

Sanz, C., Lin, H., Lado, B., Bowden, H. W., and Stafford, C. A. (2009). “Concurrent Verbalizations, Pedagogical Conditions, and Reactivity: Two CALL Studies”, Language Learning, 59(1), pp. 33-71.

Scholfield, P. (1982). “Using the English dictionary for comprehension”, TESOL Quarterly, 16(2), pp. 185-194.

Scholfield, P. (1999). “DICTIONARY USE IN RECEPTION”, International Journal of Lexicography, 12(1), pp. 13-34.

Stuart, L. and Richard, R. D. (1993). “Reading, Dictionaries, and Vocabulary Learning”, Language Learning, 43(2), pp. 263-279.

Tabata-Sandom, M. (2016). “How do Learners of Japanese Read Texts When They Use Online Pop-up Dictionaries?”, The Reading Matrix: An International Online Journal, 16(2), pp. 98-109.

Tang, G. M. (1997). “Pocket Electronic Dictionaries for Second Language Learning: Help or Hindrance?”, TESL Canada Journal, 15(1), pp. 39-57.

Thompson, G. (1987). “Using Bilingual Dictionaries”, ELT Journal, 41(4), pp. 282-286.

Thumb, J. (2004). Dictionary Look-up Strategies and the Bilingualised Learner’s Dictionary. A Think-aloud Study. Berlin, Boston: De Gruyter.

Tseng, F. (2009). “EFL Students’ Yahoo! Online Bilingual Dictionary Use Behavior”, English Language Teaching, 2(3), pp. 98-108.

Walz, J. (1990). “The Dictionary as a Secondary Source in Language Learning”, The French Review, 64(1), pp. 79-94.

Wingate, U. (2001). “An investigation into the effectiveness of different dictionary types for intermediate learners of German”, PhD thesis. Hong Kong: University of Hong Kong.

Wingate, U. (2001). An investigation into the effectiveness of different dictionary types for intermediate learners of German. University of Hong Kong (doctoral thesis). Hong Kong: University of Hong Kong.

Wingate, U. (2004). “Dictionary use - The need to teach strategies”, Language Learning Journal, 29(1), pp. 5-11.

Winkler, B. (2001). “Students’ working with an English learners’ dictionary on CD-ROM”, paper presented at the ITMELT 2001 Conference.

Zhao, C. (2010). “The Effectiveness of the Bilingualized Dictionary: A Psycholinguistic Point of View”, Chinese Journal of Applied Linguistics, 33(5), pp. 3-14.

Appendixes

Appendix 1: Reading Passage for Think-aloud Sessions

Title: Why our ancestors drilled holes in each other's skulls?
Thousands of years ago, people were performing a form of surgery called "trepanation" that involves boring holes through a person's skull.

For a large part of human prehistory, people around the world practised trepanation: a crude surgical procedure that involves forming a hole in the skull of a living person by either drilling, cutting or scraping away layers of bone with a sharp implement.

To date, thousands of skulls bearing signs of trepanation have been unearthed at archaeological sites across the world.

But despite its apparent importance, scientists are still not completely agreed on why our ancestors performed trepanation.

Anthropological accounts of 20th-century trepanations in Africa and Polynesia suggest that, in these cases at least, trepanation was performed to treat pain – for instance, the pain caused by skull trauma or neurological disease.

Trepanation may also have had a similar purpose in prehistory. Many trepanned skulls show signs of cranial injuries or neurological diseases, often in the same region of the skull where the trepanation hole was made.

But as well as being used to treat medical conditions, researchers have long suspected that ancient humans performed trepanation for a quite different reason: ritual.

The earliest clear evidence of trepanation dates to approximately 7,000 years ago. It was practised in places as diverse as Ancient Greece, North and South America, Africa, Polynesia and the Far East. People probably developed the practice independently in several locations.

Trepanation had been abandoned by most cultures by the end of the Middle Ages, but the practice was still being carried out in a few isolated parts of Africa and Polynesia until the early 1900s.

Since the very first scientific studies on trepanation were published in the 19th century, scholars have continued to argue that ancient humans sometimes performed trepanation to allow the passage of spirits into or out of the body, or as part of an initiation rite.

However, convincing evidence is hard to come by. It is almost impossible to completely rule out the possibility that a trepanation was carried out for medical reasons, because some brain conditions leave no trace on the skull.

However, in a small corner of Russia archaeologists have turned up some of the best evidence for ritual trepanation ever discovered.

The story begins in 1997. Archaeologists were excavating a prehistoric burial site close to the city of Rostov-on-Don in the far south of Russia, near the northern reaches of the Black Sea.

The site contained the skeletal remains of 35 humans, distributed among 20 separate graves. Based on the style of the burials, the archaeologists knew that they dated to between approximately 5,000 and 3,000 BC, a period known as the Chalcolithic or "Copper Age".

One of the graves contained the skeletons of five adults – two women and three men – together with an infant aged between one and two years, and a girl in her mid-teens.

Finding multiple skeletons in the same prehistoric grave is not particularly unusual. But what had been done to their skulls was: the two women, two of the men and the teenage girl had all been trepanned.

Each of their skulls contained a single hole, several centimetres wide and roughly ellipsoidal in shape, with signs of scraping around the edges. The skull of the third man contained a depression which also showed evidence of having been carved, but not an actual hole. Only the infant's skull was unblemished.

The job of analysing the contents of the grave fell to Elena Batieva, an anthropologist now at the Southern Federal University in Rostov-on-Don, Russia. She immediately recognised the holes as trepanations, and she soon realised that these trepanations were unusual.

They had all been made in almost exactly the same location: a point on the skull called the "obelion". The obelion is on the top of the skull and towards the rear, roughly where a high ponytail might be gathered.

Less than 1% of all recorded trepanations are located above the obelion point. What's more, Batieva knew that such trepanations were even less common in ancient Russia. As far as she was aware at the time, there was just one other recorded case of an obelion trepanation: a skull unearthed in 1974 at an archaeological site remarkably close to the one she was excavating.

Clearly, finding even one obelion trepanation is remarkable. But Batieva was looking at five, all of them buried in the same grave. This was, and is, unprecedented.

There is a good reason why obelion trepanation is uncommon: it is very dangerous.

The obelion point is located directly above the superior sagittal sinus, where blood from the brain collects before flowing into the brain's main outgoing veins. Opening the skull in this location would have risked major haemorrhage and death.

This suggests the Copper Age inhabitants of Russia must have had good reason to perform such trepanation procedures. Yet none of the skulls showed any signs of having suffered any injury or illness, before or after the trepanation had been performed.

In other words, it appeared as if all of these people were trepanned while they were completely healthy. Was their trepanation evidence of some sort of ritual?

It was an intriguing possibility. However, Batieva had to give up the trail. She had many more skeletons to analyse from all over southern Russia, and could not afford to get sidetracked by just a few skulls, however enigmatic.

Source: http://www.bbc.com/earth/story/20160826-why-our-ancestors-drilled-holes-in-each-others-skulls

Appendix 2: Target Words

Target words intended to be consulted by pilot test participants

- anthropologist
- anthropological
- apparent
- archaeological
- archaeological
- archaeologists
- boring
- burial (adj.)
- burial (noun)
- carved
- Chalcolithic
- cranial
- crude
- drilled
- drilling
- ellipsoidal
- enigmatic
- excavating
- grave
- haemorrhage
- implement
- infant
- inhabitants
- initiation
- intriguing
- neurological
- obelion
- ponytail
- prehistoric
- prehistory
- rear
- rite
- ritual
- sagittal
- scholars
- scraping
- sidetracked
- sinus
- skeletal
- skeletons
- skull
- skulls
- trace
- trace
- trauma
- trepanation
- trepanned
- unblemished
- unearthed
- unprecedented

Appendix 3: Reading Passage for Training Sessions

Title: Hong Kong Police Face Criticism Over Force Used at Protests

HONG KONG — Hong Kong's security forces faced widespread criticism on Thursday over the tear gas and rubber bullets that local police used a day earlier to suppress tens of thousands of people demonstrating against an unpopular bill that would allow extraditions to mainland China.

Criticism of the security force's measures came swiftly, and raised the political cost for Carrie Lam, chief executive of Hong Kong, who firmly supports the bill. Debate on the legislation, which had been postponed from Wednesday to Thursday, was again postponed for at least two more days.

Videos of the protests in which officers appear to be using excessive force circulated widely across social media, and the police action was condemned by pro-democracy activists, human rights groups and opposition lawmakers.

Footage of unarmed protesters fleeing like ants from clouds of tear gas or facing off with riot police officers pointing batons at them was broadcast around the world, an unfamiliar sight in the wealthy Asian financial hub famed for its glitzy skyscrapers.

Even a number of former senior officials joined in criticizing the police actions, as well as the bill. Joseph Wong, a former civil service secretary, told a local broadcaster that Mrs. Lam's decision to push ahead with the measure despite such strong opposition was "nothing short of a dictator's act," and called for an independent review of the police's use of force.

The Hong Kong police chief defended his officers, saying they were mostly restrained but had to respond with force when some protesters tried to storm the Legislative Council.

Instead of pushing back the small group of demonstrators, however, officers appeared determined to use tear gas and rubber bullets over the vast majority of protesters in order to clear the roads around the building that they had occupied.

On Thursday, tensions had eased, though the police physically prevented a group of pro-democracy lawmakers from completing a symbolic protest march toward Mrs. Lam's residence. Some of the lawmakers lamented that their hometown, normally a peaceful haven for bankers, lawyers and traders, had begun to feel like a police state.

Further protests are planned for Sunday.

Tempers are running high across Hong Kong in part because some see the fight against the bill as a last stand of sorts against a significant erosion of the civil liberties that set this territory apart from the rest of China.

"The survival of the city is at stake," Lee Cheuk-yan, a veteran activist and former lawmaker who helped to organize the march last weekend, said on Thursday. He also called on schools, shops and workers to go on strike on Monday, after Sunday's protests, in another effort to stop the bill from passing.

On Wednesday, the founder of a smartphone messaging app, Telegram, said his service had been attacked during the protests, likely by China's government. The report of the hack came a day after the Hong Kong police arrested a 22-year-old protest organizer who was the administrator for a group being used to coordinate thousands of demonstrators.

The extradition bill would allow Hong Kong to detain and transfer people wanted in countries and territories with which it has no formal extradition agreements, including the Chinese mainland. The bill is widely expected to eventually pass because a pro-Beijing political faction controls the Legislative Council.

Lawyers' associations, rights organizations, opposition lawmakers and even foreign governments have said they worry that the bill would break down a firewall between Hong Kong's legal system and the courts in mainland China, which are answerable to the ruling Communist Party.

They say it would also further diminish the "high degree of autonomy" that was promised under the "one country, two systems" arrangement that was established when the British handed over Hong Kong to China in 1997.

In pushing the extradition bill, Mrs. Lam has tried to distance herself from Beijing, saying the law would address a legal loophole urgently needed to ensure that a Hong Kong man accused of killing his girlfriend in Taiwan last year does not go free.

Anger over the extradition bill has been brewing for months. In May, pandemonium broke out in the Legislative Council when opposition and pro-Beijing lawmakers clashed over it. Discussions became so heated that one lawmaker was carried out of the chamber on a stretcher.

The outpouring of opposition by ordinary Hong Kongers began in earnest last weekend, when as many as one million people marched against the bill and China's growing influence in the territory.

On Wednesday, tens of thousands of demonstrators opposed to the bill surrounded the Legislative Council building and prevented lawmakers from meeting as scheduled to move the bill toward a vote next week. When some protesters charged the police as they tried to enter the building, riot control officers opened fire with rubber bullets and tear gas, casting a smoky pall over downtown.

The government later said 81 people had been injured.

Mrs. Lam, who was selected by China's leaders to govern Hong Kong two years ago, stood firm on Wednesday against what she called an "organized riot."

But her comments only further inflamed her critics. One of them, the pro-democracy lawmaker Charles Mok, said on Thursday that by having police officers clear the protesters with such force, Mrs. Lam had effectively used them to solve a political problem.

Source: https://www.nytimes.com/2019/06/13/world/asia/hong-kong-extradition.html

Appendix 4: Reminders and Instructions for Research Sessions

Reminders for Warm-up Tasks

- start the training with non-verbal think-aloud, such as an arithmetic problem, which is relatively simpler to participants
  - What is the result of multiplying 24 x 36?
  - 請問二十四乘以三十六等於多少？
- move on to verbal think-aloud which is relatively more complex
  - How many windows are there in your house?
  - 你家中有多少扇窗？
- conduct the operational task which is similar to the actual task in the study
  - read a sample passage and consult a dictionary for any unfamiliar words

These procedures are suggested by Ericsson and Smith (1999).

Reminders for Think-Aloud Reading Tasks

- ensure that the instruction is clear and does not affect the goal of the study
- include the following in the instruction
  - a description of the meaning of think-aloud
  - the language(s) that the participants can use to think aloud
  - the extent of details in the think-aloud.
- remind the participant that there is no time restriction

These reminders are mentioned in Bowles (2010).

- in order not to disturb the think-aloud process and ensure its naturality, the researcher should:
  - sit behind the subject and become not visible to the subject
  - minimize the social interaction with the subject, for example, reminding the subject to keep talking instead of requesting the subject to tell the researcher what he or she is thinking
  - remind the subject that the primary focus is on completing the task and he/she should go thought the same sequence of thoughts as what is done silently.

These reminders are mentioned in Ericsson and Smith (1999).

English Instruction

- Read the following passage and start from the title
- Underline the vocabulary items that you would like to look up in a bilingualised dictionary to enhance your understanding of the passage.
- Say out loud everything that you would speak to yourself silently when you are thinking as you consult the dictionary. You can act like you were alone in the room and speak to yourself. You are reminded not to explain your thoughts. In this process, you can speak in Cantonese, English or both languages.
- After consulting the dictionary, write down the word meaning next to each underlined word.

Chinese Instruction

- 請從標題開始閱讀以下文章。
- 在你認為需要在雙語字典中查詢的詞語下面劃線，因而在查詢後能加深你對文章的理解。
- 在查閱字典時，請大聲對自己說出你在查字典時[靜默工作時]心中所想的一切。你可以想像是獨自在房內跟自己說話，但切記無需解釋你的想法。在這過程中，你能使用粵語、英語或雙語。
- 查字典後，在每個底下有劃線的詞語旁寫下其中文或英文意思。

The instruction is adapted from Sanz et al. (2009).

Appendix 5: Reminders and Instructions for Stimulated Recall Interview

Reminders for Stimulated Recall Interviews

- After reading the instructions to the participant, stop the video and ask a question as a model. For instance, choose a segment, stop the video, and ask a question. If the participant stops the video, listen to what they say. If you stop the video, ask something general like:
  - What were you thinking here/ at this point/ right then?
  - 你在這個時候是怎樣想的？
  - Can you tell me what you were thinking at that point?
  - 你能告訴我你在這個時候是怎樣想的？
- If the participant says, "I don't remember", accept the comment and continue the video. Forcibly eliciting recall comments from participants may enhance the chance that their comments are based on their thinking during the recalls, thus resulting in biased or flawed recollection.
- Try not to focus or direct participants' answers beyond what they were thinking then. It is useful to direct participants' attention to their original production.
- Researchers should not give concrete responses and should give non-responses, such as "I see" or "okay" to avoid offering feedback or input that can potentially alter the participant's thoughts.

These reminders are adapted from Gass and Mackey (2000).

English Instruction

- What we're going to do now is to watch the video that shows the consultation process that you have just done. We are interested in what you were thinking at the time you were consulting the dictionaries. In fact, you have already verbalised your thoughts throughout the process, but we don't know what you were thinking at times of pauses. So, what I'd like you to do is to tell me what you were thinking what was in your mind at the time while you did not verbalise your thoughts during the consultation.
- We are going to play the video by using the computer. You can pause the video any time that you want if you want to tell me something about your thoughts. If I have a question about what you were thinking at times of pauses, then I will push pause and ask you to talk about that part of the video.

Chinese Instruction

- 我們現在會重播剛剛你查詢字典的過程。我們有興趣知道你在查詢字典時腦海中的想法。雖然你已經一邊查字典一邊把你的想法告訴了我，但我未能完全清楚你在沒有說話時候的想法。因此，我希望你可以把你在剛剛查詢字典時沒有說話時候的想法告訴我。
- 我們會用電腦重播剛剛你查詢字典的過程。如果你有任何關於你剛剛查詢字典時的想法要補充的，你可以隨時把影片停下來。若我有什麼關於你在沒有說話時候的想法，我會把影片停下來，並希望你能告訴你剛剛是怎樣想的。

The instruction is adapted from Gass and Mackey (2000).

Appendix 6: A Sample of Processed Verbal Data

A1: trepanation

Context: Thousands of years ago, people were performing a form of surgery called "trepanation" that involves boring holes through a person's skull.

Meaning/ information written by student: no meaning was written down

Communication Units/ Segments	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
people were performing a form of surgery called trepanation..	1. 'people were performing a form of surgery called trepanation'..	RT	FT		UIU
TREPANATION (typing 'trepanation' in the search box)	2. 'TREPANATION' (typing 'trepanation' in the search box)	RS + TT	FS	ISS	
無呢個字嘅...	3. there is no such word…	RDI	FDI	ET	
試下查下.. 睇下有無 verb (typing 'trepanate' in the search box)	4. try to check.. see if there is the 'verb' (typing 'trepanate' in the search box)	RG + TVT	FG	PL	
吓.. 查唔到啊.. (scrolling down the webpage)	5. oh.. can't check.. (scrolling down the webpage)	RDI	FDI	ET	
查 查住第二個先	6. check check another word first			PMS	
The lookup process is continued during the lookup process of A4.					
many trepanned	'many trepanned'	RT	FT		Contextualising Strategy Referring Strategy Explaining Strategy
搵唔到	cannot find	RDI	FDI	ET	
係唔係可以 make a guess？	Can I 'make a guess'?			PL	
呢個好難 make a guess 喎 (typing 'trepann' in the search box)	this is hard to 'make a guess' (typing 'trepann' in the search box)	TT		ET	
有無啲近啲㗎？ (deleting the letters being typed in the search box)	Are there any closer words? (deleting the letters being typed in the search box)	D		PL	
呢個估下啦	make a guess at this then			PL	
呢個佢嘅 verb	this is its 'verb'	RG	FG		
個 noun 搵唔到	the 'noun' cannot be found	RG	FG		
唔係 個 adjective 都搵唔到	no, its 'adjective' cannot be found as well	RG	FG		
people were performing a surgery called trepanation	'people were performing a surgery called trepanation'	RT	FT		
咦 that involves boring holes through a person's skull	oh, 'that involves boring holes through a person's skull'	RT	FT		
(typing 'boring' in the search box)	(typing 'boring' in the search box)	TT			

佢係 verb (scrolling the webpage)	this is a 'verb' (scrolling the webpage)	RG	FG		
有無 verb form？ (scrolling the webpage)	Is there a 'verb form'? (scrolling the webpage)	RG	FG		
bore 呢個字 (typing 'bore' in the search box)	this word 'bore' (typing 'bore' in the search box)	TVT			
哦 一定唔係解呢個	okay, must not be meaning this	RD/RTE	R		
啊 有啦 (scrolling down the webpage)	oh, here it is (scrolling down the webpage)	REN	FEN	ET	
use a drill to bore a hole	'use a drill to bore a hole'	RD	FE		
同呢個一樣	the same as this one		RSM		
咁即係呢個係都係掘啦	so that means this also means excavating (*gwat6*)	DT	RSM		
呢兩個都係掘嗰個動作	both of them mean the action of excavating (*gwat6*)	DT	RSM		
掘咗出呢嘅 skulls	the 'skulls' being excavated	EP	CTM		
嗯 差唔多	alright, more or less like this	ELT		TLT	

A2: crude

Context: For a large part of human prehistory, people around the world practised trepanation: a crude surgical procedure that involves forming a hole in the skull of a living person by either drilling, cutting or scraping away layers of bones with a sharp implement.

Meaning/ information written by student: 無禮的 (meaning 'rude' in English)

Communication Units	**Translation**	**Executive**	**Cognitive**	**Metacognitive**	**Supplementary Notes**
people around the world practise trepanation a crude surgical procedure	7. 'people around the world practise trepanation a crude surgical procedure'	RT	FT		UIU Contextualising Strategy Substituting Strategy
crude.. (typing 'crude' in the search box)	8. 'crude'..	PT + TT	FP	ISP	
簡陋的	9. simple (*gaan2 lau6 dik1*)	RTE	FC		
simple and not skillfully done or made	10. 'simple and not skillfully done or made'	RD	FE		
簡陋的 surgery procedure	11. simple 'surgery procedure'	ST	EM		
睇下有無其他 (scrolling down the webpage)	12. see if there are others (scrolling down the webpage)	REN	FEN		
無禮的	13. rude (*mou4 lai5 dik1*)	R	FC		
無禮的好似似啲 (writing)	14. rude (*mou4 lai5 dik1*) seems to be more suitable (writing)	W	CD		

A3: trauma

Context: Anthropological accounts of 20th-century trepanations in Africa and Polynesia suggest that, in these cases at least, trepanation was performed to treat pain – for instance, the pain caused by skull trauma or neurological disease.

Meaning/ information written by student: 損傷 (meaning 'injury' in English)

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
for instance the pain caused by	15. 'for instance the pain caused by'	RT	FT		SAU
點讀呢？	16. How to pronounce?		SP		Contextualising Strategy
(typing 'skull' in the search box)	17. (typing 'skull' in the search box)	TT			
想知佢點讀㗎咋 (clicking to play the pronunciation of 'skull')	18. simply want to know how to pronounce this word (clicking to play the pronunciation of 'skull')	RP	FP	PL	
skull skull	19. 'skull skull'	PT	FP		
TRAUMA (typing 'trauma' in the search box)	20. TRAUMA (typing 'trauma' in the search box)	RS + TT	FS	ISS	
精神創傷	21. emotional shock (*zing1 san4 cong1 soeng1*)	RTE	FC		
心理創傷	22. psychological shock (*sam1 lei5 cong1 soeng1*)	RTE	FC		
severe emotional shock and pain	23. 'severe emotional shock and pain'	RD	FE		
skull	24. 'skull'	RT	FT		
點讀呢？ (clicking to play the pronunciation of 'trauma')	25. How to pronounce? (clicking to play the pronunciation of 'trauma')	RP	SP + FP		
trauma..	26. 'trauma'..	PT	FP		
the trauma of marriage breakdown 吓 (scrolling down the webpage)	27. 'the trauma of marriage breakdown', oh (scrolling down the webpage)	RX	FX		
損傷..	28. injury.. (*syun2 soeng1*)..	RTE	FC		
應該係損傷或者外傷 (writing)	29. should be injury (*syun2 soeng1*) or external injury (*ngoi6 soeng1*) (writing)	W	CD		

A4: trepanned

Context: Many trepanned skulls show signs of cranial injuries or neurological diseases, often in the same region of the skull where the trepanation hole was made.

Meaning/ information written by student: no meaning was written down

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
many trepanned	30. 'many trepanned'	RT	FT		UIU

點讀啊？	31. How to pronounce?		SP		
TREPANNED (typing 'trepanned' in the search box)	32. TREPANNED (typing 'trepanned' in the search box)	RS + TT	FS	ISS	
唉… 依個又無.. (scrolling the webpage)	33. oh... this cannot be found as well.. (scrolling the webpage)	RDI	FDI	ET	
查住第二個先 (typing 'tr' and deleting 'tr' in the search box)	34. check another word first (typing 'tr' and deleting 'tr' in the search box)	TT + D		PMS	
The lookup process is continued after the lookup process of A5.					
many trepanned	35. 'many trepanned'	RT	FT		Contextualising Strategy
搵唔到	36. cannot find	RDI	FDI	ET	
係唔係可以 make a guess？	37. Can I 'make a guess'?			PL	Referring Strategy
呢個好難 make a guess 喎 (typing 'trepann' in the search box)	38. this is hard to 'make a guess' (typing 'trepann' in the search box)	TT		ET	Explaining Strategy
有無啲近啲㗎？ (deleting the letters being typed in the search box)	39. Are there any closer words? (deleting the letters being typed in the search box)	D		PL	
呢個估下啦	40. make a guess at this then			PL	
呢個佢嘅 verb	41. this is its 'verb'	RG	FG		
個 noun 搵唔到	42. the 'noun' cannot be found	RG	FG		
唔係 個 adjective 都搵唔到	43. no, its 'adjective' cannot be found as well	RG	FG		
people were performing a surgery called trepanation	44. 'people were performing a surgery called trepanation'	RT	FT		
咦 that involves boring holes through a person's skull	45. oh, 'that involves boring holes through a person's skull'	RT	FT		
(typing 'boring' in the search box)	46. (typing 'boring' in the search box)	TT			
佢係 verb (scrolling the webpage)	47. this is a 'verb' (scrolling the webpage)	RG	FG		
有無 verb form？ (scrolling the webpage)	48. Is there a 'verb form'? (scrolling the webpage)	RG	FG		

bore 呢個字 (typing 'bore' in the search box)	49. this word 'bore' (typing 'bore' in the search box)	TVT			
哦 一定唔係解呢個	50. okay, must not be meaning this	RD/RTE	R		
啊 有啦 (scrolling down the webpage)	51. oh, here it is (scrolling down the webpage)	REN	FEN	ET	
use a drill to bore a hole	52. 'use a drill to bore a hole'	RD	FE		
同呢個一樣	53. the same as this one		RSM		
咁即係呢個係都係掘啦	54. so that means this also means excavating (*gwat6*)	DT	RSM		
呢兩個都係掘嗰個動作	55. both of them mean the action of excavating (*gwat6*)	DT	RSM		
掘咗出呢嘅 skulls	56. the 'skulls' being excavated	EP	CTM		
嗯 差唔多	57. alright, more or less like this	ELT		TLT	

A5: cranial

Context: Many trepanned skulls show signs of <u>cranial</u> injuries or neurological diseases, often in the same region of the skull where the trepanation hole was made.

Meaning/ information written by student: 頭蓋骨的 (meaning 'of the skull')

Communication Units	**Translation**	**Executive**	**Cognitive**	**Metacognitive**	**Supplementary Notes**
show signs of cranial	58. 'show signs of cranial'	RT	FT		SAU
CRANIAL (typing 'cranial' in the search box)	59. CRANIAL (typing 'cranial' in the search box)	RS + TT	FS	ISS	Substituting Strategy
咩頭蓋骨的	60. what of the skull (*tau4 goi3 gwat1 dik1*)	RTE	FC		
頭蓋骨的 injuries	61. 'injuries' of the skull	ST	EM		
差唔多 (writing)	62. more or less like this (writing)	ELT + W		TLT	

A6: ritual

Context: But as well as being used to treat medical conditions, researchers have long suspected that ancient humans performed trepanation for a quite different reason: ritual.

Meaning/ information written by student: 儀式 (meaning 'ceremony' in English)

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
ancient humans performed trepanation for a quite for a quite different reason	63. 'ancient humans performed trepanation for a quite for a quite different reason'	RT	FT		SAU Contextualising Strategy
ritual (pronouncing /ˈrɪtʃuəl/) ritual (pronouncing /ˈraɪtʃuəl/) 點讀	64. 'ritual' (pronouncing /ˈrɪtʃuəl/) 'ritual' (pronouncing /ˈraɪtʃuəl/) how to pronounce	PT	SP		
(typing 'ritual' in the search box)	65. (typing 'ritual' in the search box)	TT			
(clicking to play the pronunciation of 'ritual')	66. (clicking to play the pronunciation of 'ritual')	RP	FP		
ritual	67. 'ritual'	PT	FP		
di- different reason	68. 'di- different reason'	RT	FT		
儀式 應該係儀式 (writing)	69. ceremony (*ji4 sik1*), should be ceremony (*ji4 sik1*) (writing)	RTE + W	FC + A		
a quite different reason	70. 'a quite different reason'	RT	FT		
呢度呢度應該無問題	71. there should be no problem here	ELT		TLT	

A7: initiation rite

Context: Since the very first scientific studies on trepanation were published in the 19th century, scholars have continued to argue that ancient humans sometimes performed trepanation to allow the passage of spirits into or out the body, or as part of an initiation rite.

Meaning/ information written by student: 程序 (meaning 'proceeding' in English)

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
allow to allow the passage of spirits into or out of the body or as part of an initiation rite	72. 'allow to allow the passage of spirits into or out of the body or as part of an initiation rite'	RT	FT		UIU Contextualising Strategy
ini- in- INI INITIATION (typing 'initiation' in the search box)	73. ini- in- INI INITIATION (typing 'initiation' in the search box)	PT + RS + TT	FP + FS	ISP + ISS	
ceremony	74. ceremony	RSW	FSW		
an occasion when something starts..	75. 'an occasion when something starts'..	RD	FE		
lawyers for the couple have announced the	76. 'lawyers for the couple have announced the'	RX	FX		
聽下點讀 (clicking to play the	77. listen to how to pronounce	RP	FP		

pronunciation of 'initiation')	(clicking to play the pronunciation of 'initiation')				
initiation of divorce proceedings	78. 'initiation of divorce proceedings'	RX	FX		
雙方的律師已聲明進入離婚訴訟程序	79. lawyers for the couple have announced the initiation of divorce proceedings	RX	FX		
程序吧	80. proceeding (*cing4 zeoi6*)	DT	FM		

A8: rite

Context: Since the very first scientific studies on trepanation were published in the 19th century, scholars have continued to argue that ancient humans sometimes performed trepanation to allow the passage of spirits into or out the body, or as part of an initiation rite.

Meaning/ information written by student: 禮節 (meaning 'etiquette' in English)

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
查下一個 (typing 'rite' in the search box)	81. check the next one (typing 'rite' in the search box)	TT		MO	SPU No Strategies
宗教儀式 禮節	82. religious ceremony (*zung1 gaau3 ji4 sik1*) ceremony (*lai5 zit3*)	RTE	FC		
應該加埋係禮節吧 (writing)	83. should altogether be ceremony (*lai5 zit3*) (writing)	W	FM		

A9: trace

Context: It is almost impossible to completely rule out the possibility that a trepanation was carried out for medical reasons, because some brain conditions leave no trace on the skull

Meaning/ information written by student: 痕跡 (meaning 'a sign that something has happened or existed')

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
however convincing evidence is hard to come by it is almost impossible to complete rule out the possibility that a trepanation was carried out for medical reasons because some brain conditions leave no trace	84. 'however convincing evidence is hard to come by it is almost impossible to complete rule out the possibility that a trepanation was carried out for medical reasons because some brain conditions leave no trace'	RT	FT		SAU Contextualising Strategy

咦 account 好似見過	85. oh, seem to have seen this in 'account'			UPR	
(typing 'trace' in the search box)	86. (typing 'trace' in the search box)	TT			
trace	87. 'trace'	RH	FH		
發現	88. find (*faat3 jin6*)	RTE	FC		
no 發現	89. 'no' find	ST	EM		
睇下先	90. let me see			MO	
找到 查出 發現	91. find (*zaau2 dou3*) find out (*caa4 ceot1*) discover (*faat3 jin6*)	RTE	FC		
呢個係 a verb	92. this is a 'verb'	RG	FG		
呢個 no 呢個 noun 喎 (scrolling down the webpage)	93. this is 'no', this is a 'noun' (scrolling down the webpage)	RG	FG		
no trace	94. 'no trace'	RT	FT		
verb	95. 'verb'	RG	FG		
痕跡 蹤跡	96. trace (*han4 zik1*) trace (*zung1 zik1*)	RTE	FC		
he attempted to cover up all the traces of his crime	97. 'he attempted to cover up all the traces of his crimes'	RX	FX		
痕跡 (writing)	98. trace (*han4 zik1*) (writing)	W	CD		
點寫？ (looking at the words in the entry)	99. How to write? (looking at the words in the entry)		SW		

A10: excavating

Context: Archaeologists were excavating a prehistoric burial site close to the city of Rostov-on-Don in the far south of Russia, near the northern reaches of the Black Sea.

Meaning/ information written by student: 挖出 (meaning 'to dig' in English)

Communication Units	**Translation**	**Executive**	**Cognitive**	**Metacognitive**	**Supplementary Notes**
in a small corner of Russia archaeologists have turned up some of the best evidence for ritual trepanation ever discovered	100. 'in a small corner of Russia archaeologists have turned up some of the best evidence for ritual trepanation ever discovered'	RT	FT		SAU Contextualising Strategy Referring Strategy Substituting Strategy
the story begins	101. 'the story begins'	RT	FT		
archaeologists were excavating	102. 'archaeologists were excavating'	RT	FT		
ex- EX EXCAVATIN 應該打 E (typing 'excavate' in the search box)	103. ex- EX EXCAVATIN should type E (typing 'excavate' in the search box)	PT + RS + RSW + TVT	FP + FS	ISP + ISS	
係唔係呢？	104. Is that right?			MO	
都係掘出	105. also mean	RTE	FC + RSM		

	digging (*gwat6 ceot1*)				
咁多個掘出	106. so many digging		RSM		
掘出呢個 close to the city	107. digging this 'close to the city'	ST	EM		
挖出 (writing)	108. digging (*waat3 ceot1*) (writing)	W	A		
near the north	109. 'near the north'	RT	FT		
呢個無問題	110. no problem here	ELT		TLT	

A11: unblemished

Context: Only the infant's skull was unblemished.

Meaning/ information written by student: 無瑕疵的 (meaning 'having no faults' in English)

Communication Units	**Translation**	**Executive**	**Cognitive**	**Metacognitive**	**Supplementary Notes**
each of their skulls contained a single hole several centimetres	111. 'each of their skulls contained a single hole several centimetres'	RT	FT		SAU Contextualising Strategy
the skull of the third man contained a depression which also showed evidence of having'	112. 'the skull of the third man contained a depression which also showed evidence of having'	RT	FT		Explaining Strategy
carve (pronouncing /kɑːv/) carve (pronouncing /keɪv/)	113. 'carve' (pronouncing /kɑːv/) 'carve' (pronouncing /keɪv/)	PT	SP		
點讀？	114. How to pronounce?		SP		
but not an actual hole only the infant's skull was unblemished (pronouncing /ʌnˈbleɪmɪʃt/)	115. 'but not an actual hole only the infant's skull was unblemished' (pronouncing /ʌnˈbleɪmɪʃt/)	RT	FT		
unblemished (pronouncing /ʌnˈbleɪmɪʃt/) (typing 'unblemished' in the search box)	116. 'unblemished' (pronouncing /ʌnˈbleɪmɪʃt/) (typing 'unblemished' in the search box)	PT + TT	FP	ISP	
聽下先 (clicking to play the pronunciation of 'unblemished')	117. let me listen (clicking to play the pronunciation of 'unblemished')	RP	FP		
unblemished	118. 'unblemished'	PT	FP		
無瑕疵的	119. having no faults (*mou4 haa4 ci1 dik1*)	RTE	FC		
his his champion record was unblemished	120. 'his his champion record was unblemished'	RX	FX		
嗰啲骨係無瑕疵的 (writing)	121. the bones are having no faults (writing)	EP + W	CTM		

A12: obelion

Context: They had all been made in almost exactly the same location: a point on the skull called the "obelion".
Meaning/ information written by student: no meaning was written down

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
they had all been made in almost exactly the same location a point on the skull called the obelion	122. 'they had all been made in almost exactly the same location a point on the skull called the obelion'	RT	FT		SPU Contextualising Strategy Deriving Strategy
吓 咩嚟㗎？ (typing 'obelion' in the search box)	123. oh, what's this? (typing 'obelion' in the search box)	TT		PL	
又無	124. no again	RDI	FDI		
a point on the	125. 'a point on the'	RT	FT		
係啲骨上面嘅一個位置	126. being a location on the bone	EP	CTM		
is is on the top	127. 'is is on the top'	RT	FT		
哦 is on the top of the skull and towards the rear roughly where a high ponytail might be gathered	128. okay 'is on the top of the skull and towards the rear roughly where a high ponytail might be gathered'	RT	FT		
哦 即係個位啫	129. okay that simply is a location	DT	FM		

A13: sagittal

Context: The obelion point is located directly above the superior sagittal sinus, where blood from the brain collects before flowing into the brain's main outgoing veins.
Meaning/ information written by student: like an arrow

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
睇下先	130. let me see	BLT		MO	SPU
there is a good reason why obelion transpanation trepanation is uncommon it is very dangerous	131. 'there is a good reason why obelion transpanation trepanation is uncommon it is very dangerous'	RT	FT		Contextualising Strategy Checking Strategy
it is located directly above the superior	132. 'it is located directly above the superior'	RT	FT		
應該又係一個位置	133. should be a location again	DT	FM		
會唔會查唔到？	134. Will it be not searchable?			MO	
sa-gi- 點讀呢？ TTAL (typing	135. sa-gi- How to pronounce?	PT + RS + TT	FP + FS	ISP + ISS	

'sagitt' in the search box)	TTAL (typing 'sagitt' in the search box)				
有喎 (clicking 'sagittal' in the suggested result of the search box when typing)	136. here it is (clicking 'sagittal' in the suggested result of the search box when typing)	RSW	FSW	ET	
矢狀縫	137. relating to a line between the bones of the skull (*ci2 zong6 fung6*)	RTE	FC		
relate relating to a line between the bones between the bones	138. 'relate relating to a line between the bones between the bones'	RD	FE		
查埋	139. let me finish looking up	ELT		PL	
寫住先	140. writing first			PL	
line relating to the central plane of the body	141. 'line relating to the central plane of the body'	RD	FE		
like an arrow..	142. 'like an arrow'..	RD	FE		
like an arrow (writing)	143. 'like an arrow' (writing)	W	CD		

A14: sinus

Context: The obelion point is located directly above the superior sagittal sinus, where blood from the brain collects before flowing into the brain's main outgoing veins.

Meaning/ information written by student: 鼻竇 (meaning 'any of the spaces inside the head that are connected to the back')

Communication Units	**Translation**	**Executive**	**Cognitive**	**Metacognitive**	**Supplementary Notes**
SINUS (typing 'sinus' in the search box)	144. SINUS (typing 'sinus' in the search box)	RS + TT	FS	ISS	SAU No Strategies
咩嚟㗎？ (scrolling down the webpage)	145. What's this? (scrolling down the webpage)	RDI	FDI	PL	
any of the spaces inside the head that are connected to the back	146. 'any of the spaces inside the head that are connected to the back'	RD	FE		
哦 connect	147. okay 'connect'	RD	FE		
鼻竇 (writing)	148. any of the spaces inside the head that are connected to the back (*bei6 dau6*) (writing)	RTE + W	FC		

A15: haemorrhage

Context: Opening the skull in this location would have risked major haemorrhage and death.

Meaning/ information written by student: 大出血 (meaning 'a large flow of blood' in English)

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
where blood from the brain collects before flowing into the brain's main outgoing veins	149. 'where blood from the brain collects before flowing into the brain's main outgoing veins'	RT	FT		SAU Contextualising Strategy
opening the skull in this location would have risked major	150. 'opening the skulls in this location would have risked major'	RT	FT		
點讀？	151. How to pronounce?		SP		
haemorrhage (pronouncing /heˈmərɪdʒ/)	152. 'haemorrhage' (pronouncing /heˈmərɪdʒ/)	PT	FP		
silent h	153. silent h	RP	FP		
係唔係？	154. Is that right?			MO	
查下	155. let me check			PL	
MORRAHAGE (typing 'haemorrhage' in the search box)	156. MORRAHAGE (typing 'haemorrhage' in the search box)	RS + TT	FS	ISS	
大出血	157. a large flow of blood (*daai6 ceot1 hyut3*)	RTE	FC		
腦溢 (pronouncing /jat6/) 定溢 (pronouncing /jik1/)	158. haemorrhage (*nou5 jat6*) or haemorrhage (*nou5 jik1*)	RTE	FC		
點讀？	159. How to pronounce?		SP		
a large flow of blood from a damaged blood vessel tube carrying blood	160. 'a large flow of blood from a damaged blood vessel tube carrying blood'	RD	FE		
吓 tube carrying blood	161. oh, 'tube carrying blood'	RD	FE		
大出血 (writing)	162. a large flow of blood (*daai6 ceot1 hyut3*) (writing)	W	CD		
serious	163. 'serious'	RD	FE		
聽下先 (clicking to play the pronunciation of 'heamorrhage')	164. let me listen (clicking to play the pronunciation of 'heamorrhage')	RP	FP		
haemorrhage	165. 'haemorrhage'	PT	FP		
haemorrhage may occur at any time throughout pregnancy	166. 'haemorrhage may occur at any time throughout pregnancy'	RX	FX		
啱㗎啦	167. should be correct	ELT		ET + TLT	

A16: intriguing

Context: It was an intriguing possibility.

Meaning/ information written by student: 神秘的 (meaning 'mysterious' in English)

Communication Units	Translation	Executive	Cognitive	Metacognitive	Supplementary Notes
it was an intriguing (pronouncing /ɪntriːˈgɪŋ/)	168. 'it was an intriguing' (pronouncing /ɪntriːˈgɪŋ/)	RT	FT		UPU Contextualising Strategy Referring Strategy
IN tri- TRTRIGUI (typing 'intrigu' in the search box)	169. IN tri- TRTRIGUI (typing 'intrigu' in the search box)	RS + PT + TT	FS + FP	ISS + ISP	
有啦 (clicking 'intriguing' in the suggested result of the search box when typing)	170. here it is (clicking 'intriguing' in the suggested result of the search box when typing)	RSW	FSW	ET	
非 非常有趣的	171. ve- very interesting (*fei1 soeng4 jau5 ceoi3 dik1*)	RTE	FC		
可能性	172. possibility	RX	FX		
極極具吸引力的可能性	173. an intriguing possibility	RX	FX		
神秘的	174. mysterious (*san4 bei3 dik1*)	RTE	FC		
哦	175. okay			ET	
very interesting because of being unusual and mysterious	176. 'very interesting because of being unusual and mysterious'	RD	FE		
it was an intriguing (pronouncing /ɪntriːˈgɪŋ/) possibility	177. 'it was an intriguing' (pronouncing /ɪntriːˈgɪŋ/) 'possibility'	RT	FT		
um… 引人入勝的	178. 'um'… attractive (*jan5 jan4 jap6 sing3 dik1*)	RTE	FC		
吓 神秘的	179. oh, mysterious (*san4 bei3 dik1*)	RTE	FC		
應該是但一個	180. should be either one		CD		
神秘的	181. mysterious (*san4 bei3 dik1*)	RTE	FC		
神秘的 possibility… (writing)	182. mysterious 'possibility' (writing)	ST + W	EM		
極具吸引力的	183. intriguing (*gik6 geoi6 kap1 jan5 lik6 dik1*)	RTE	FC		
個性極具魅力	184. a really intriguing personality	RX	FX		
無囉喎 (scrolling down the webpage)	185. no more (scrolling down the webpage)	REN	FEN		
查下呢個先 (clicking 'intrigue'	186. let me check this one (clicking 'intrigue' in the	RSW + SS	FSW	PL	

in the list of suggested words)	list of suggested words)				
呢個一定唔係添	187. must not be this one	RTE/RD	R		
people have been	188. 'people have been'	RX	FX		
聽下先 (clicking to play the pronunciation of 'intrigue')	189. let me listen (clicking to play the pronunciation of 'intrigue')	RP	FP		
intrigue	190. 'intrigue'	PT	FP		
原來係咁讀㗎	191. actually pronounce in this way	RP	FP		
intrigued by the question	192. 'intrigued by the question'	RX	FX		
吸引	193. attract	RX	FX		
吸引着	194. attracting	RX	FX		
是但啦	195. whatever	ELT		TLT	

A17: enigmatic

Context: She had many more skeletons to analyse from all over southern Ruissa, and could not afford to get sidetracked by just a few skulls, however enigmatic.

Meaning/ information written by student: mysterious

Communication Units	**Translation**	**Executive**	**Cognitive**	**Metacognitive**	**Supplementary Notes**
however give up the trail (mispronouncing /ˈtraɪəl/) she had many many more skeletons to analyse and could not afford to get sidetracked by just a few skulls however	196. 'however give up the trail' (mispronouncing /ˈtraɪəl/) 'she had many many more skeletons to analyse and could not afford to get sidetracked by just a few skulls however'	RT	FT		SAU Contextualising Strategy
EN however ENIGMATIC (typing 'enigmatic' in the search box)	197. EN 'however' ENIGMATIC (typing 'enigmatic' in the search box)	RS + TT	FS	ISS	
enigmatic	198. 'enigmatic'	RH	FH		
however could not afford to get sidetracked by just a few skulls however	199. 'however could not afford to get sidetracked by just a few skulls however'	RT	FT		
難以捉摸	200. mysterious (*naan4 ji5 zuk1 mo2*)	RTE	FC		
費解的	201. impossible to understand (*fai3 gaai2 dik1*)	RTE	FC		
mysterious	202. 'mysterious'	RD	FE		
係啦 mysterious (writing)	203. yep, 'mysterious' (writing)	W	CD		

A2: trace

R: 點解你會，其實你覺得「無禮的」定「簡陋的」係即係嗰個 meaning，你係點樣抉擇？
A: 哦，我有啲求其，即係睇完之係好似覺得唔係好對，或者睇下下面，跟住好似覺得順眼啲囉。啱啱係覺得順眼啲嘅，但係你後尾問返我又覺得「簡陋的」係好似啱，但係睇下下面佢有個儀式，我覺得又好似好無禮咁，即係都有機會，但係應該係「簡陋的」

R: Why do you, you actually think rude (*mou4 lai5 dik1*) or simple (*gaan2 lau6 dik1*) is the meaning, how do you make the choice?
A: oh, I am a bit sloppy, that means after reading I think that it is not quite right, or when I read further, it seems that it is much more agreeable. Just now I think it is agreeable, but when you ask me later on, I think simple (*gaan2 lau6 dik1*) also seems to be correct, but when I look further that it is about ritual, I actually think that should be rude, that means there is also a possibility, but it should be simple (*gaan2 lau6 dik1*).

A3: trauma

R: 我想問呢你查 trauma 呢個字嘅時候，你未聽咗佢個讀法，呢個係唔係你平時都會咁做？
A: 平時都會咁做

R: I want to ask when you are checking the word 'trauma', you have listened to its pronunciation, is that something you do as usual?
A: I normally do this as well

A1 & A4: trepanation & trepanned

R: 我想問呢兩個字你都查唔到，但係你知道佢地係有關聯，你平時有無遇過呢啲狀況都係查唔到個字？
A: 成日都查唔到
R: 咁如果係咁你會點樣去解決嗰個問題？
A: 有時就唔理佢，即係有時就算因為好麻煩，跟住但係如果有啲一定要知，就會揀第二個網再查下
R: 例如係啲咩網？
A: 打上 Google 會有好多，即係平時唔會特登去開一個 dictionary 出嚟
R: 咁你平時係點樣？
A: 就咁係 Google 到打隻字，跟住就會彈哂好多例子，跟住求其撳一個，佢已經，即係唔使撳，佢已經有細細行嘅寫咗，咁我跟住就當係

R: I want to ask these two words that you cannot look up, but you know they are related, do you normally encounter this situation when you cannot look up a word?
A: I can look up a word all the time.
R: so if this is the case, how would you solve this problem?
A: sometimes I just neglect it since it can be troublesome, but if it is something I have to know, I would choose to check it on some other websites.
R: for example?
A: typing it in 'Google' can lead to a lot of results, that means I don't normally open a dictionary
R: so what do you usually do?
A: I would simply type the word in Google, then it will pop up a lot of examples, then simply click on one, or it already, that means without clicking, there are already some small lines written there, then I simply refer to those

A9: trace

R: 你查 trace 之前呢，你就將呢句成句讀咗一次，點解你會咁樣做嘅？
A: 睇下佢講乜囉，其實呢平時都會我都會睇，但係因為我好快速咁睇，可能快到睇咗幾隻字。你再 review 返佢，睇下佢做緊乜，跟住再查咁樣。

R: Before you looked up 'trace', you had read this sentence once, why did you do so?
A: To look at what it mentions, actually I normally read as well, but as I read it very quickly, perhaps so quickly that I can only scan a few words. When you review them later, look at what's going on, and then consult the word.

A10: excavating

R: 你頭先查 excavating 最後未打咗 E 嘅，你係基於啲乜嘢會打 E？
A: 因為佢而家係 continuous tense，有時你打嗰個佢都會彈去呢個，或者係查唔到，跟住所以就直接打呢個，因為咁啱又見到啊嘛，可能就快啲。

R: When you consult ‘excavating’, you finally type in ‘E’ what makes you type in ‘E’?
A: because this is now ‘continuous tense’, sometimes when you type this form, the dictionary is still directed to the base form or no results can be found, so I directly type in this one, and also I see it, perhaps this can be faster.

A17: enigmatic

R: 你可唔可以解釋多次點解最後你會揀咗「神秘的」？
A: 咁「引人入勝的」possibility 我覺得好奇怪，跟住下面「吸引力」我覺得好似唔係，跟住後尾本身係求其揀嘅，跟住後尾見到 mysterious，應該都係講啲差唔多嘅，跟住就所以無再翻查。

R: Can you explain once again why you finally choose mysterious (*san4 bei3 dik1*)?
A: I think that attractive (*jan5 jan4 jap5 sing3 dik1*) ‘possibility’ is weird, an then I don’t think it is attractiveness (*kap1 jan5 lik6*), then I actually want to randomly choose one, then I see ‘mysterious’, should be telling something similar, then I stop checking the word again.

Other Questions

R: 我見你好多時都係先睇中文 meaning 再睇英文，呢個係咪你平時常做？
A: 係啊，除非我係想攞另外一隻英文字代替佢，即係譬如好似 EFB 測驗嗰啲唔可以寫中文，有時直接就會查英文，如果呢啲為咗理解我會睇中文先。

R: I see that for most of the time you check the Chinese ‘meaning’ first before the English one, do you normally do this?
A: yes, unless I want to use another English word to replace it, for example, I can’t write Chinese in the EFB test, sometimes I directly consult the English part, if it is for comprehending purpose, I will look at the Chinese first.

*EFB stands for English for Business and is a subject in the Commerce class.

Appendix 7: Notes about Transcription and Translation

Transcription Notes adapted from Thumb (2004)

Transcription Signs	Descriptions
..	Short pause
…	Long pause
( )	Physical action performed at the time of verbalisation
CAPITALISATION	Words that were spelt by the participant
hyphenated words	Part of a polysyllabic word is stammered or pronounced
XX	Inaudible words in the verbal protocols

Translation Notes adapted from Thumb (2004)

Translation Signs	Descriptions
‘ ’	Utterances originally in English are placed within quotation marks.
( )	Definitions originally in Chinese are romanised and placed within brackets next to a communication unit.

Appendix 8: Coding Scheme for Lookup Operations

Executive operations adapted from Thumb (2004)

(BLT)	*Beginning Look-up Task:* signalling the beginning of look-up task.
(SS)	*Starting Search*: signalling the beginning of the search for the target word.
(RH)	*Referring Headword:* referring to target headword or referring to a headword similar to target headword in dictionary.
(REN)	*Referring Entry:* referring to the entry of target headword or its related headword.
(RS)	*Referring Spelling:* referring to the spelling of target word/headword in reading text/dictionary
(RG)	*Referring Grammar:* referring grammatical information (such as adjectives, countable and uncountable nouns, phrasal verbs, inflections, derivatives, compound nouns, syntactic structures, variant forms) derived from clues in reading text or found in dictionary.
(RP)	*Referring Pronunciation*: referring to pronunciation of target word in reading text or referring to pronunciation/phonetic symbols/audio aids of target headword in dictionary.
(RD)	*Referring Definition:* referring to English definition(s) of target headword or its related headword.
(RT)	*Referring Text:* referring to target word in reading text or referring to contextual clue(s) in particular or referring to reading text as a whole.
(RX)	*Referring Example:* referring to examples (in LI and/or L2) which are in the form of a sentence, clause or phrase and which are related to target headword in dictionary.
(RF)	*Referring Features:* referring to mechanical features such as italics or bold face related to target word/headword in dictionary.
(RDI)	*Referring Dictionary:* referring to the dictionary in general.
(W)	*Writing:* writing down LI translation equivalent(s), L2 definition(s), or/and additional information for target word in reading text
(ELT)	*Ending Look-up Task:* signalling the end of look-up task.

Executive operations observed in the current research

(TT)	*Typing Target Word*: typing the target word in the search box.
(TVT)	*Typing Variant Target Word*: typing the variant form of the target word, for example, by removing the derivatives from the target word or by transforming the target word into a word of another part of speech.
(D)	*Deleting*: deleting the letter(s) having been typed in the search box.
(RTE)	*Referring to Translation Equivalent(s)*: referring to the translation equivalent(s) shown in one's first language in the dictionary.
(ST)	*Substituting Target Word*: replacing the target word with the meaning found in the dictionary or constructed by the dictionary user to evaluate the suitability of the meaning.

(PT)	*Pronouncing Target Word*: pronouncing the target word or its related word or part of it.
(RSW)	Referring to Suggested Word(s): looking at the suggested list of words shown when typing in the search box or on the page of a dictionary entry.
(DT)	*Defining Target Word*: defining the target word according to the learners' understanding after reading the text or the dictionary or both.
(EP)	*Explaining Passage*: explaining the passage by translating part of it into the first language or by summarising the main idea.
(C)	*Closing Webpage*: closing a webpage, usually a pop-up one.
(TD)	*Translating Definition(s)*: translating the English definition(s) into Chinese one(s) to better perceive them.
(TTE)	*Translating Translation Equivalent(s)*: translating the translation equivalent(s) into English one(s) to better perceive them.
(RTW)	*Referring to Target Word*: looking at the target word during the lookup process.
(RVT)	*Referring to Variant Form of Target Word*: looking at the variant form of the target word during the lookup process.

Cognitive operations adapted from Thumb (2004)

(FS)	*Focusing Spelling:* focusing on the spelling of target headword or any related words, usually when typing the word in the search box.
(FEN)	*Focusing Entry:* focusing on the entry of target headword or its related headword.
(FG)	*Focusing Grammar:* focusing on grammatical information, such as the word class, of target headword to formulate meaning or to identify the variant form of the target word.
(CGF)	*Comparing Grammatical Form:* comparing grammatical forms of some target headwords to formulate meaning.
(FC)	*Focusing Chinese:* focusing on Chinese (LI) translation equivalent(s) of target headword.
(FE)	*Focusing English:* focusing on English (L2) definition(s) of target headword.
(A)	*Accepting:* accepting LI translation equivalent and/or L2 definition in the dictionary.
(FX)	*Focusing Example:* focusing illustrative examples (in LI and/or L2) of the target headword to formulate meaning.
(FM)	*Formulating Meaning:* formulating meaning/definition/semantic feature of the target word after reading dictionary/contextual clues or basing on one's inferences.
(FP)	*Focusing Pronunciation:* concentrating on pronunciation of target word or concentrating on different pronunciations/phonetic symbols/ audio tracks of target headword.
(FF)	*Focusing Features:* Focusing on features such as italics or bold face related to target word/headword in reading/dictionary.

(RSM)	*Realizing Shared Meaning:* realizing some target words share the same or similar meaning after looking them up.
(CD)	*Choosing Definition:* choosing LI translation equivalent and/or L2 definition which is/are considered to fit the reading text best.
(RM)	*Refining Meaning:* fine-tuning meaning after formulating word meaning from contextual clues or fine-tuning dictionary definition(s).

Cognitive operations observed in the current research

(SP)	Struggling with Pronunciation: struggling with the pronunciation of any words in L1 or in L2.
(SW)	Struggling with Writing: struggling with how to write certain words in L1 (Chinese) or how to spell certain words in L2 (English).
(FT)	Focusing Text: focusing on the reading text to comprehend the context where the target word is presented.
(R)	Rejecting: rejecting LI translation equivalent and/or L2 definition in the dictionary.
(EM)	*Examining Meaning*: Examining the likeliness of the checked meaning by inserting it into the reading text to decide its sensibleness
(FSW)	Focusing Suggested Word(s): focusing on the suggested list of words shown when typing in the search box or on the page of a dictionary entry.
(FH)	Focusing Headword: focusing on the target headword shown in the dictionary entry.
(FDI)	*Focusing Dictionary:* focusing on the dictionary in general.
G	*Guessing Meaning:* guessing the meaning of any word(s) from prior knowledge or contextual clues, usually before word search
CTM	*Constructing Text Meaning*: constructing text meaning to better comprehend the reading text, usually after looking up the meaning of the target word in dictionary
FTW	*Focusing Target Word*: focusing on the target word during the lookup process.
FVT	*Focusing Variant Form of Target Word*: focusing on the variant form of the target word during the lookup process.

Metacognitive Operations adapted from Thumb (2004)

(PL)	*Planning:* Making plans during the look-up task on how to tackle the task or setting look-up task goals or task demands.
(UPR)	*Using Prior Knowledge:* drawing on prior linguistic or semantic knowledge of target word to decide whether to start, continue or discontinue looking it up or form initial guesses about the meaning of the target word.
(ISS)	*Initiating Search Strategy by Spelling:* starting the spelling-driven word search by spelling out the whole or part of the target word.
(ISP)	*Initiating Search Strategy by Pronouncing:* starting the spelling-driven word search by pronouncing the whole or part of target word.

(MO)	*Monitoring:* monitoring the progress or process of the look-up task.
(PMS)	*Postponing* Meaning Search: postponing search for meaning of target headword after dictionary user expresses doubts or have queries about the given dictionary definitions
(ET)	*Evaluating Task*: making general comment(s) on look-up task.
(TLT)	*Terminating Look-up Task*: ending look-up task after dictionary user decides that s/he has looked up all the words s/he intends to look up.

P.S. The same look-up word is termed 'target word' in the reading text or 'target headword' in the dictionary.

Appendix 9: Information Sheet

Information Sheet (for students)

1. You are invited to take part in a research study entitled "Lookup Strategies in the Use of Online Bilingualised Dictionaries by English-Medium High School Graduates in Macao: A Small-Scale Think-Aloud Study".
2. Please read this document carefully and ask any questions you may have before agreeing to take part in the study.
3. The study is conducted by Chi Hin Lok as part of his postgraduate studies at Newcastle University.
4. This research project is supervised by Dr. Mei Lin from the School of Education, Communication & Language Sciences at Newcastle University.
5. The purpose of this study is to research how high school graduates from English-medium schools in Macao look up unknown words when using online bilingualised dictionaries.
6. You have been invited to take part in this study because you are a graduate from an English-medium high school fit the purpose of this study.
7. If you agree to take part in this study, you will be asked to attend a training session about how to verbalise your thoughts, perform a reading task with the use of dictionary while being audio and video recorded, and complete a short interview and reflection form at school.
8. Your participation in this study will take approximately two mornings or afternoons.
9. Your personal data, including your name and your email address will be collected for contacting purpose during this research. Besides, your proficiency level in reading English will be collected as well so that your performance during the language task can be analysed in relation to your proficiency level.
10. You will be notified of the main findings of this research via email.
11. You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.
12. All responses you give, or other data collected will be kept anonymous and confidential. The records of this study will be kept secure and private in my laptop. All files containing any information you give will be password protected in my laptop. In any research report that may be published, no information will be included that will make it possible to identify you individually. There will be no way to connect your name to your responses at any time during or after the study.
13. If you have any questions, requests or concerns regarding this research, please contact me via email or by telephone.

This study has been reviewed and approved by the School of Education, Communication & Language Sciences Ethics Committee at Newcastle University.

Information Sheet (for teachers)

1. Your students are invited to take part in a research study entitled "Lookup Strategies in the Use of Online Bilingualised Dictionaries by English-Medium High School Graduates in Macao: A Small-Scale Think-Aloud Study".
2. Please read this document carefully and ask any questions you may have before agreeing your student to take part in the study.
3. The study is conducted by Chi Hin Lok as part of his postgraduate studies at Newcastle University.
4. This research project is supervised by Dr. Mei Lin from the School of Education, Communication & Language Sciences at Newcastle University.
5. The purpose of this study is to research how high school graduates from English-medium schools in Macao look up unknown words when using online bilingualised dictionaries.
6. Your students have been invited to take part in this study because they are graduates from an English-medium high school and this fits the purpose of this study.
7. If they agree to take part in this study, they will be asked to attend a training session about how to verbalise their thoughts, perform a reading task with the use of dictionary while being audio and video recorded, and complete a short interview and reflection form at school.
8. Their participation in this study will take approximately two mornings or afternoons.
9. Their personal data, including their name and email address will be collected for contacting purpose during this research. Besides, their proficiency level in reading English will be collected as well so that her performance during the language task can be analysed in relation to their proficiency level.
10. Your student will be notified of the main findings of this research via email.
11. Your student is free to decide whether or not to participate. They are free to withdraw at any time without any negative consequences.
12. All responses your students give, or other data collected will be kept anonymous and confidential. The records of this study will be kept secure and private in my laptop. All files containing any information your students give will be password protected in my laptop. In any research report that may be published, no information will be included that will make it possible to identify your students individually. There will be no way to connect their name to their responses at any time during or after the study.
13. If you have any questions, requests or concerns regarding this research, please contact me via email or by telephone.

This study has been reviewed and approved by the School of Education, Communication & Language Sciences Ethics Committee at Newcastle University.

**Information regarding the writer's email and phone number has been removed from the original information sheets for the purpose of protecting his confidentiality.*

Appendix 10: Declaration of Informed Consent

Declaration of Informed Consent (for students)

- I agree to participate in this study, the purpose of which is to research how high school graduates from English-medium schools in Macao look up unknown words when using online bilingualised dictionaries.
- I have read the participant information sheet and understand the information provided.
- I have been informed that I may decline to answer any questions or withdraw from the study at any point without penalty of any kind.
- I have been informed about the types of data, including personal data that the researcher will elicit from me and for which purposes these data will be used. The lawful basis for processing my personal data is consent.
- I have been informed that data collection will involve the use of recording devices.
- I have been informed that all of my responses will be kept confidential and secure, and that I will not be identified in any report or other publication resulting from this research.
- I have been informed that the investigator will answer any questions regarding the study and its procedures. And he can be contacted via email.
- I will be provided with a copy of this form for my records.

Any concerns about this study should be addressed to the School of Education, Communication & Language Sciences Ethics Committee, Newcastle University via email to ecls.researchteam@newcastle.ac.uk

_____	_____	_____
Date	Participant Name	Participant Signature

I certify that I have presented the above information to the participant and secured his or her consent.

_____	_____
Date	Signature of Investigator

Declaration of Informed Consent (for teachers)

- I agree to allow my student to participate in this study, the purpose of which is to research how high school graduates from English-medium schools in Macao look up unknown words when using online bilingualised dictionaries.
- I have read the participant information sheet and understand the information that my student has to provide.
- I have been informed that my student may decline to answer any questions or withdraw from the study at any point without penalty of any kind.
- I have been informed about the types of data, including personal data that the researcher will elicit from my student and for which purposes these data will be used. The lawful basis for processing her personal data is consent.
- I have been informed that data collection will involve the use of recording devices.
- I have been informed that all of my student's responses will be kept confidential and secure, and that she will not be identified in any report or other publication resulting from this research.
- I have been informed that the investigator will answer any questions regarding the study and its procedures. And he can be contacted via email.
- I will be provided with a copy of this form for my records.

Any concerns about this study should be addressed to the School of Education, Communication & Language Sciences Ethics Committee, Newcastle University via email to ecls.researchteam@newcastle.ac.uk

_____	_____	_____
Date	Participant Name	Participant Signature

I certify that I have presented the above information to the participant and secured his or her consent.

_____	_____
Date	Signature of Investigator

**Information regarding the writer's email and phone number has been removed from the original declarations of informed consent for the purpose of protecting his confidentiality.*