

Exploring the effectiveness of incidental vocabulary acquisition through writing and reading: A thought experiment replicating and extending Pichette et al. (2012)

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Abstract

This paper investigates the effectiveness of incidental vocabulary acquisition through writing and reading tasks, replicating and extending the study conducted by Pichette et al. (2012). Based on the Involvement Load Hypothesis and recent literature on cognitive and lexical processing, the paper proposes an improved methodology of a study which could investigate whether writing sentences promotes greater vocabulary retention than reading, and whether concrete nouns are more successfully acquired and retained than abstract ones. The methodology builds closely on the original study maintaining the within-subject design but introduces refined item selection, culturally negotiated translations, and additional controls to ensure ecological validity and reduce the influence of intentional learning. The proposed methodology also takes into account the impact of connotation, word length, learner proficiency, and word decay curve.

Keywords incidental vocabulary learning, emotional load, domain bias, experiment design

1. Introduction

Vocabulary knowledge is one of the core components of language acquisition (Zou, 2017). A critical threshold of second language (L2) vocabulary enabling communication is estimated at 2000 high-frequency words, whereas to be able to comprehend academic texts one is expected to know 10,000 word families (Averianova, 2015). Complete word knowledge entails being familiar with its form, meaning and use (Nation, 2022). Word knowledge can also be partial (Hamada, 2021), for example when recognizable form is only vaguely connected with a meaning, or when only receptive knowledge of the word is available.

Building a rich word set is time consuming, and even in languages which are related to one's first language (L1), it is highly unlikely to take place purely through direct classroom instruction (Nation, 2005). It is also an incremental process, in which breadth (number of known words) is gained through increased exposure (Nation, 2022). Words can be also learned incidentally, alongside other tasks, while trying to achieve other learning goals (Hamada, 2021).

This essay discusses the factors mediating the effectiveness of incidental learning. First, a brief context summarising the current state of knowledge is presented. Then, an empirical study of Pichette, et al. (2012), who investigated how reading and writing sentences impacts incidental vocabulary learning, and explored the role of the

nature of the word in this process, is summarised and critically evaluated. Subsequently, a replication study is proposed. Finally, conclusions are drawn.

2. Context

Incidental learning occurs when the learners are focused on the meaning of the input they are receiving, or during other word-focused tasks (Laufer, 2020), rather than on intentionally committing the words to memory. Instead, they remain unaware of an upcoming test (Nation, 2022). In incidental learning, word acquisition can be considered a by-product of either reading or listening comprehension (Gass, 1999), assuming that the students pay close conscious attention to the content and notice the unfamiliar word items (Laufer, 2020).

Reading is a task particularly closely related to incidental vocabulary development, as it gives students an opportunity to infer words' meanings from the context (Hamada, 2021). Effectiveness of said inferring depends on how densely the unknown words occur, length of the text, frequency and proximity of repetitions, and explicitness of relevant clues (Nation, 2022). Depending on task conditions, readers can also search the words in dictionaries and glosses, or negotiate words' meanings with their peers. Integrated, content-oriented reading-writing tasks can also promote incidental vocabulary learning (Joe, 1998). Barcroft (2004) argues that in initial stages of language learning sentence writing can inhibit the vocabulary learning process, however results of

Pichette, et al. (2012) suggest that writing is more effective than reading.

Among the factors moderating retention of incidentally learned vocabulary, increased depth of processing of word-focused follow-up tasks seems most prevalent (Hamada, 2021). The Involvement Load Hypothesis (ILH) posits that the sum of motivational aspect of the task (*need*) and its cognitive aspects (*search* and *evaluation*, involving respectively finding the form or meaning of the word, and selecting those best fitting the context) correlates positively with word retention (Laufer & Hulstijn, 2001). Other relevant factors impacting vocabulary retention are summarised in Table 1.

Table 1. Factors affecting word retention

Word-oriented factors	Learner-oriented factors
emotional load ¹ (Gotoh, 2012)	L2 proficiency (Nation, 2022)
phonotactic regularity (Hashimoto & Egbert, 2019)	learners' pre-existing associative connections (Zareva, 2011)
polysemy (Nation, 2022)	working memory (WM) capacity (Dornyei & Skehan, 2003)
word class (Zareva, 2011)	
existence of L1 synonym of the L2 word (Nation, 2022)	

3. Pichette, de Serres and Lafontaine (2012) – critical evaluation

3.1. Summary of the study

Participants of this study were 203 Canadian, French-speaking intermediate and advanced level students of English. Although the participants' mean age was 24.2, the age ranged between 18 and 53. Prior to the study, five PhD holding "*native speakers of English*" (Pichette, et al., 2012, p. 80) chose sixteen three-syllable-long nouns (eight concrete and eight abstract, no cognates) which they considered "*very rare*" (Pichette, et al., 2012, p. 70). During the intervention, participants were asked to read three sentences containing target words in different syntactic functions, or write three sentences with a minimum of ten words each. For each participant, words were randomly assigned to conditions. Participants received L1 definitions corresponding to target L2 words. There was no time limit for the task, hence intervention times ranged from 18 to 34 minutes per participant. The intervention was immediately followed by a surprise cued recall task (writing English words next to the definitions in French), and a delayed post-test one week later. In the post-tests, each correctly spelled syllable received 1 score.

Both immediate and delayed tests showed superiority

of the writing condition (Appendix 1). However, the significant difference between conditions concerned mainly concrete words. Results also suggest better recall of concrete nouns over abstract (Appendix 2, Appendix 3). Interestingly, the delayed recall test showed no difference in scores between abstract and concrete words. A delayed post-test also confirmed with borderline significance that writing tasks may lead to higher vocabulary retention.

3.2. Critical evaluation

Pichette, et al.'s (2012) findings regarding superiority of writing tasks are in line with the ILH, as *evaluation* is much stronger in writing tasks while both conditions represent a similar level of *need* and *search*. Indeed, permanence of writing gives writers an opportunity for repeated retrieval and deployment of L2 knowledge (Williams, 2012; Jung, 2020), which can support consolidation thereof (DeKeyser, 2007).

The biggest strength of this study lies in the way the tasks and the post-tests were executed. Training participants how to complete the tasks, giving them instructions in their L1, and only displaying one item per page during post-tests could preclude oversaturating participants' WM enabling them to direct more resources to acknowledge and process the new words (Craik, et al., 2000). Additionally, the intervention task randomly alternated between conditions (reading and writing), which could support participants' staying focused and alert (Posner & Boies, 1971), and could help equalise the time participants spend on tasks. Pichette, et al. (2012) also recognise that drawing participants' attention to target words could inadvertently promote intentional learning. Hence, participants were explicitly asked to move on to the new word item, as soon as they were done reading or writing the phrases, which could help minimise unwanted elaborative inferences (Wiley & Rayner, 2000). Lack of time limit per task increased its ecological validity (outside of the classroom, one is generally not timed when one reads for content). Moreover, the first post-test was conducted almost immediately after the task completion, giving a good image of freshly acquired knowledge.

As Pichette, et al. (2012) point out, the study focuses on only one type of writing task, and the aspects of semantic and syntactic processing are not explored in depth. Nevertheless, other studies confirm that although writing sentences is less effective than composition writing (Zou, 2017), with less attentional resources needing to be directed towards planning, sentences are still an appropriate unit to promote incidental vocabulary learning through reading and writing. (Jung, 2017; Zou, 2017) and 90% of the clues which facilitate guessing the meaning of a word from context can be found within the same sentence (Nation, 2022). Finally, the intervention was short, thus easy to conduct, and the study is based on a big sample which warrants using inferential statistics (Jung, 2020).

However, one issue with the population in this study is that the authors do not provide information on how students' proficiency was determined, nor about

and negative.

¹ For the purpose of this article emotional load is going to refer to the connotation of the word and operationalised as positive, neutral,

participants' educational background, which may lead to results being misconstrued or unclear. Moreover, as intermediate-level students tend to overestimate their vocabulary knowledge (Zareva, 2012), some items could have been discarded from analysis, even though they were not truly known. Finally, the age gap between participants might have confounded the results, since hippocampal response to novel visual information (in this case words on the paper) tends to lower with age (Liu, et al., 2018), and this region, among others, activates during information retrieval (Nyberg, et al., 1995).

The second major limitation concerns vocabulary

items. Although real words were used to achieve ecological validity, English words in this study are often misspelt, or impossible to find in dictionaries or encyclopaedias. Table 2 contains words used in Pichette, et al. (2012), including original spelling and definitions. Some words were not found in the dictionaries, even when similar spellings were considered. Moreover, varied lengths of definitions and uneven distribution of words' etymologies (see Figure 1) could also impact retention of specific words (Jucks & Paus, 2012). Additionally, little except for the education level and the L1, is known about the people who selected the words.

Table 2. Words used in Pichette, et al. (2012), including original spelling and definitions. Emotional load and domain were assessed based on the definition given by Pichette, et al. (2012).

Noun	Concrete/ Abstract	French definition	Concreteness	Previous encounters	Etymology	Emotional Load	Domain
			(imagery) score (max.= 7)				
abscissus	C	côté pointu de la feuille d'une plante	6.2 (5.7)	0	Word found	not Neutral	Biology
acronyx	C	ongle incarné	6.4 (5.6)	6	Word found	not Negative	Biology
fustilug	C	personne obèse	6.1 (5.8)	4	Germanic	Negative	General
habergeon	C	manteau sans manches	5.9 (5.2)	2	Germanic	Neutral	Art and Fashion
huckabuck	C	textile pour fabriquer des serviettes	5.5 (3.5)	1	Word found, but etymology unknown	Neutral	Art and Fashion
inglenook	C	coin de cheminée	5.6 (4.7)	3	Germanic	Neutral	Architecture
liripipe	C	queue de chapeau, pour certains costumes	5.3 (4.0)	2	Classical: Latin	Neutral	Art and Fashion
opsimath	C	étudiant adulte	5.1 (4.3)	1	Classical: Greek	Neutral	Social Science
buoyancy	A	flottabilité	3.4 (4.1)	30	Classical: Latin / Old French	Neutral	Physics
byrthynsak	A	vol de bétail	3.0 (3.1)	0	Germanic	Negative	Humanities
dehiscence	A	action d'un fruit qui s'ouvre	4.1 (4.6)	3	Classical: Latin	Neutral	Biology
dysania	A	difficulté à se lever le matin	3.3 (4.5)	2	Classical: Latin	Negative	Biology
ekistics	A	étude des établissements humains	1.8 (1.6)	2	Classical: Greek	Neutral	Social Science
epincion	A	chant de victoire	3.9 (3.4)	4	Classical: Greek	Positive	Art and Fashion
monandry	A	le fait d'avoir un partenaire mâle	3.0 (3.3)	3	Classical: Greek	Neutral	Social Science
treppverter	A	revirement spectaculaire mais inutile	1.8 (2.1)	3	Word found	not Negative	Humanities

One can also observe a domain bias (see Figure 1), which might have advantaged certain participants. The distribution of etymologies, emotional load, and knowledge domains of the words from Pichette, et al. (2012) are available in Figure 1, Figure 2, and Figures 3 and

4, respectively.

Finally, given the reciprocal nature of the forgetting curve presented in Loftus (1985, p. 398) discrepancies between intervention task completion times might cause artefacts. Syllable-based scoring of the test results might

have increased the sensitivity of the method in comparison to word- or sentence-based scoring (Barcroft, 2004),

however choosing to use this method raises a question: what does it mean to know the form of the word?

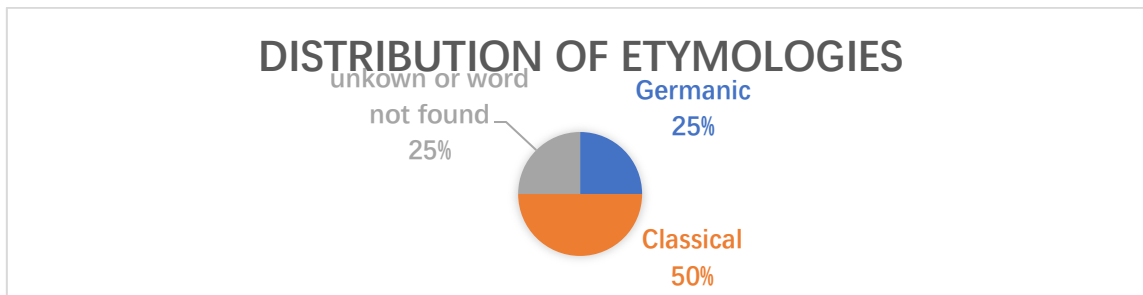


Figure 1. Distribution of word etymologies used in Pichette, et al. (2012)

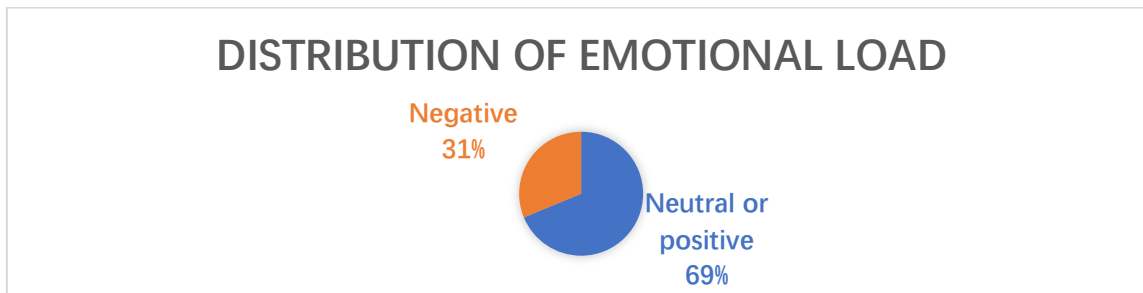


Figure 2. Distribution of emotional load of the words used in Pichette, et al. (2012)

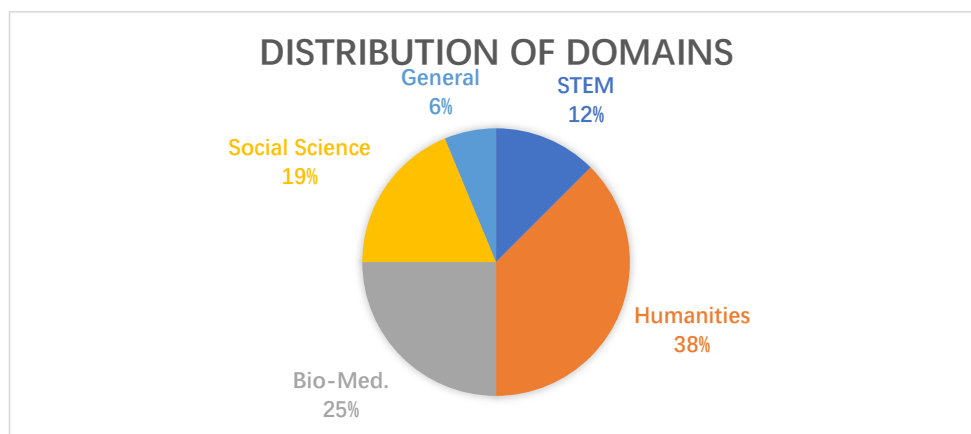


Figure 3. Distribution of words' domains for the words used in Pichette, et al. (2012)

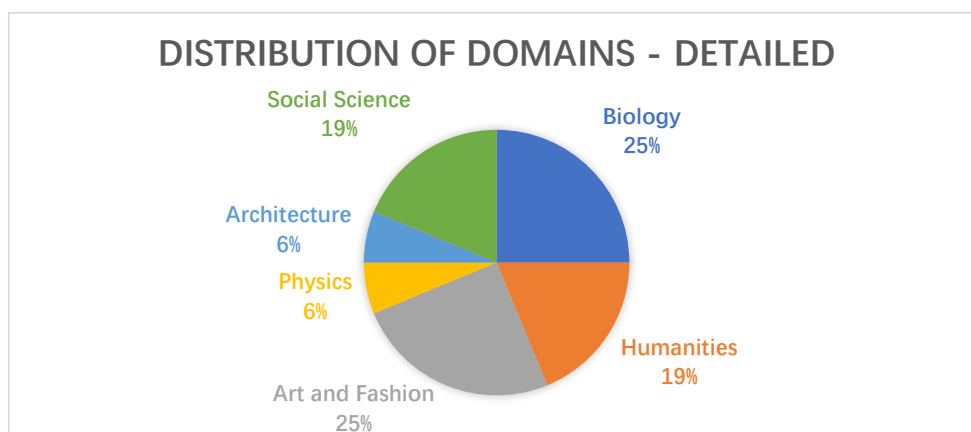


Figure 4. Detailed distribution of words' domains for the words used in Pichette, et al. (2012)

4. Replication Study

4.1. Hypotheses

H1: Writing sentences will promote incidental vocabulary learning better than reading sentences.

H2: Concrete nouns will be retained better than abstract nouns and will decay slower.

H3: Other factors, like length of definition and word connotation (bound with participants' culture) will also impact decaying rate.

4.2. Population

To address the limitations of the Pichette, et al. (2012) (hereafter: base study) the replication study shall involve no less than 120 Chinese university undergraduate students from varied domains (age 18-25), learning English as a second language. Participants of the study shall be advanced level users of English, with a minimum score of 25 on the reading module of a TOEFL Internet-Based Test², equivalent to knowledge of 3500 word

families (Chujo & Oghigian, 2009). Such choice of population should help minimising the domain bias and presents an opportunity for contrastive analysis, should one want to perform it.

4.3. Items

Similarly to Pichette, et al. (2012), 16 rare, three-syllable-long nouns (8 concrete and 8 abstract) have been selected. The words are not monosemous, however it is the case with most words in natural languages (Li, 2021). All the words come from classical languages, have positive or neutral connotations (see Table 3), and come from varied domains (Figure 5 and Figure 6). Translations of the words were negotiated between 2 Mandarin-English bilinguals (one whose L1 is English, the other one whose L1 is Mandarin). Some of the domains and word meanings provided below may differ from Pichette, et al. (2012), as the meanings of the words are based on the online English Oxford Dictionary, rather than the French translations provided in the original study.

Table 3. Words to be used in the study replicating Pichette, et al. (2012)

Noun	Concrete vs Abstract	Domain	Etymology	Connotation ³	Chinese definition	Simplified English definition
pergola	C	Architecture	Classical: Latin	neutral	凉棚	a shelter in the garden, on walls of which the plants can grow upwards
architrave	C	Architecture	Classical: Latin	neutral	框缘	ornamental moulding around the exterior arch
nepenthe	C	Medicine	Classical: Greek	culture dependent	忘忧草	a drug bringing relief from grief and pain
occiput	C	Medicine	Classical: Latin	neutral	枕骨	the back part of the skull
liripipe	C	History	Classical: Latin	neutral	披肩	an early academic robe
pomander	C	History	Classical: Greek	neutral	香丸	a mixture of aromatic substances carried in a box to protect one from bad smells
barbiton	C	Art	Classical: Greek	neutral	多弦吉他	a many-stringed guitar-like instrument
opsimath	C	Education	Classical: Greek	culture dependent	晚年开始学习的人	a person who begins to study late in life
ekistics	A	Education	Classical: Greek	neutral	人类群居学	a study of development of human settlements
buoyancy	A	Physics and Engineering	Classical: Latin / old French	neutral	浮力	an ability to float
effulgence	A	General	Classical: Latin	neutral to positive	光泽	a quality of shining brilliantly, radiance
ebullience	A	General	Classical: Latin	positive	兴高采烈	overflowing enthusiasm
celadon	A	Art	Classical: Greek	neutral	青釉	pale green colour tinted with grey
dehiscence	A	Biology	Classical: Latin	neutral	绽放	opening of a flower
nictation	A	Biology	Classical: Latin	neutral	眨眼	an act of winking or blinking
graticule	A	Physics and Engineering	Classical: Latin	neutral	格网	division into squares (of a map or plot)

² As pointed out by Wu Hao, relying on the original TOEFL iBT might not be the best option, as the test alone is expensive. Therefore, it might be difficult to recruit enough people who had taken it. One possible solution to ensure adequate proficiency level of the participants would be to prepare an own, paper or electronic version of a proficiency test based on the TOEFL iBT free samples available

online and administer it prior to the experiment.

³ Since the replication study described is purely theoretical, all the connotations to words were assigned by the author of the essay. In a real study, such connotations would need to be double-checked prior to the pilot, for example, with another group of students using a 5-step Likert-based scale.

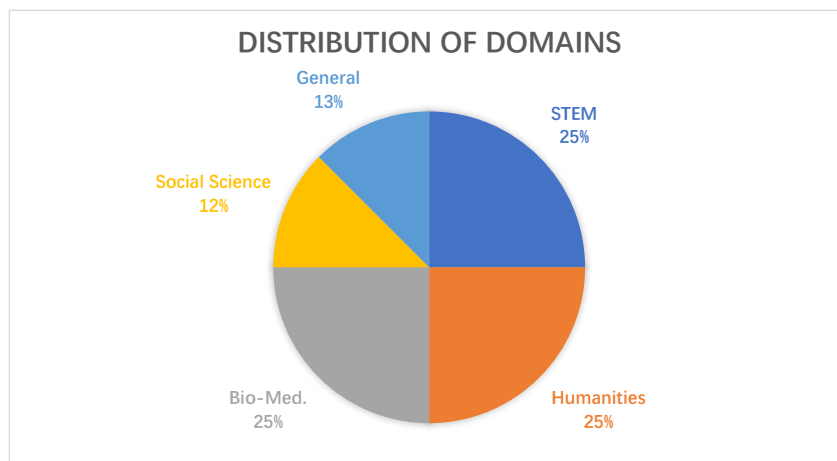


Figure 5. Distribution of words' domains for the words to be used in a study replicating Pichette et al. (2012)

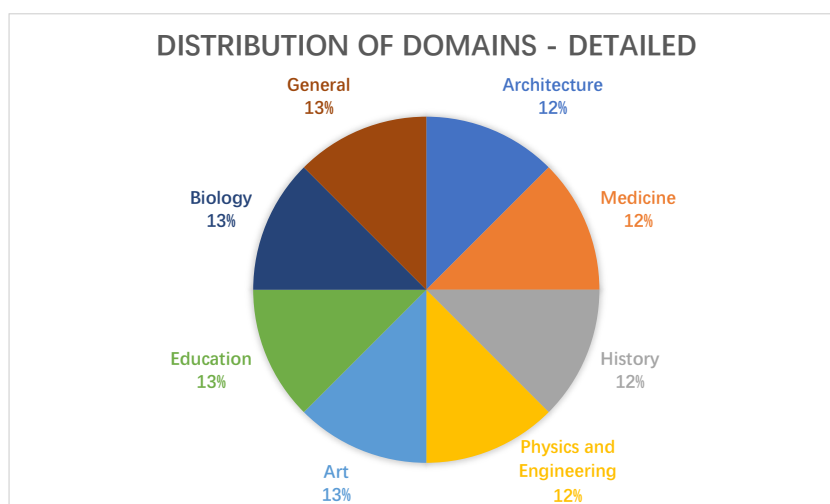


Figure 6. Detailed distribution of words' domains for the words to be used in a study replicating Pichette et al. (2012)

5. Methodology

To qualify as a “good-enough replication” (Singh, et al., 2003, p. 1), this replication study is designed not to divert too far from the original, hence it will also follow within-subjects design. However, in this study all the participants are going to receive the same words for the same conditions, to avoid potential effects of varied phonological complexity on participants’ WM (Kowialiewski, et al., 2022). Nevertheless, the task cards (Appendix 5) are going to be arranged randomly for each participant, to address potential serial-position effects (Murdock, 1962). To ensure that the participants are not familiar with the target items a short familiarity check task should be performed (see Appendix 7 for an example).

This study also does not assume a time limit to complete the tasks, to preserve ecological validity of the conditions. However, during the pilot phase, average expected time and standard deviation per task would be calculated to exclude participants taking too little time,

who might be skipping the reading tasks, and participants taking too much time, who might be trying to memorise the words. After Bao (2019), an additional question in the reading condition was added to promote attentive reading.

To minimise the risk of participants’ attempts to memorise the words, and ensure that the post-test is indeed a surprise, participants will be told to leave the classroom and go home as soon as they are ready. Participants who leave will then be directed to another classroom for the post-test before the actual dismissal.

A form recognition test task was added after cued recall test task to increase the overall test’s sensitivity, but avoid additional exposure to words’ definitions before the recall test. The form-recognition task includes a Likert scale-based item to control to what extent the answers come from guessing (Appendix 6). A second delayed post-test will help observing the rate of knowledge decay. Finally, word-based scoring will be used for cued recall tasks. Words will receive one point, irrespective of the spelling, provided the scorer can sensibly approximate it. Figure 8 presents a detailed flow of the study.

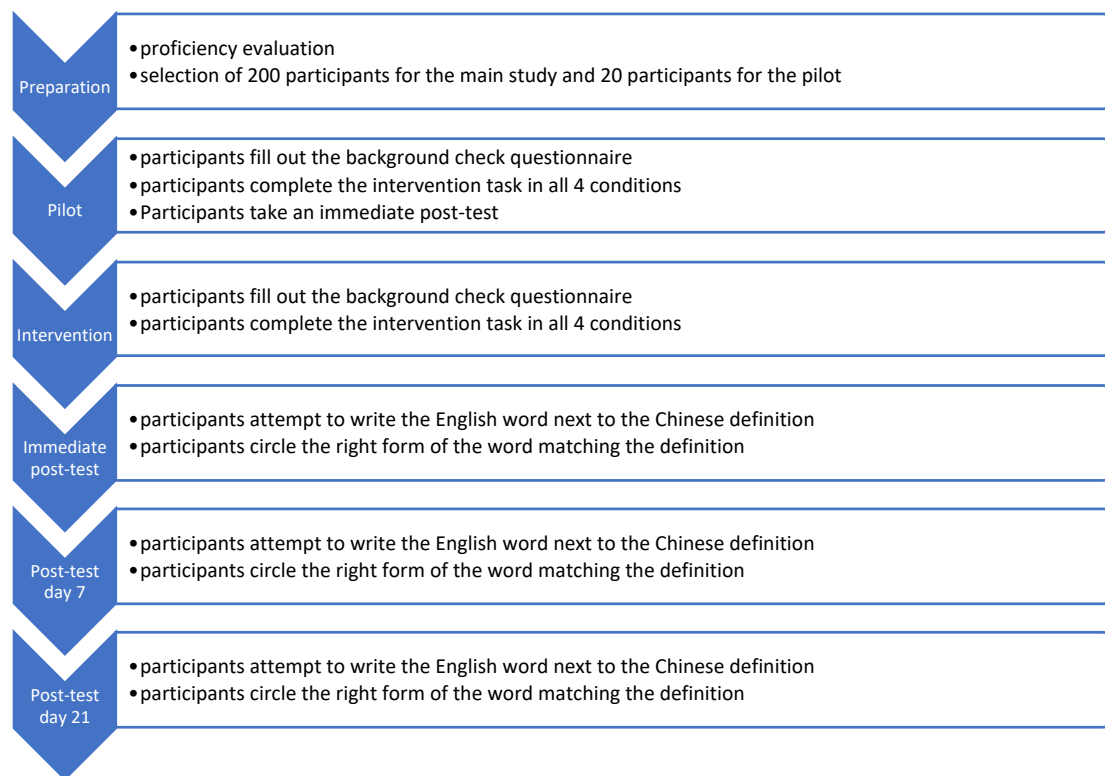


Figure 7. Replication study design - simplified flowchart

6. Expected results and discussion

Presented replication study is expected to strengthen the results of Pichette, et al. (2012) by showing that the superiority of retention of concrete nouns encountered and processed through the writing condition. Aside from the increased depth of processing due to the generative nature of the writing task (Joe, 1998), its superiority can also be attributed to glossing in L1 (Nation, 2022). Unlike in reading, where the reader does not control what words occur in the sentence, during writing, new vocabulary will only be surrounded only by words already known. This can facilitate deliberate creation of words' image, which could in turn lead to faster activation of the new vocabulary (Laufer, 2020). Word retention might also be affected by connotation, which in some cases can be culturally dependent. Although this study aims to use words that are neutral in English, some words might have a negative connotation in Chinese, thus decay faster (Gotoh, 2012).

Participants are also expected to remember more words on the second post-test than they did in the base study, due to increased vocabulary breadth associated with higher proficiency level, which can facilitate activation spread (Nation, 2005). Higher proficiency level should also enable the participants to focus more attentional resources on the words, rather than on processing the morphosyntactic clues from the sentences in reading condition, or forming syntax of the structures they are writing (Jung, 2017).

7. Limitations

This replication study was designed to strengthen the

results of Pichette, et al. (2012) by resembling it closely (Singh, et al., 2003). Nevertheless, some limitations still remain. First, the study did not differentiate between phonotactic regularity of syllables in used items. Additionally, definitions for four words were significantly longer than others, which might affect retention of these items. Moreover, the tasks proposed for the interventions also highlight the new words, which increases the chances of intentional learning during intervention. Finally, measuring participants' WM capacity, especially when working with a homogenous group of students combined with a study of WM training effectiveness, could provide insight into what actions teachers should take to exploit incidental learning most successfully.

8. Conclusion

A number of studies proves that one can learn vocabulary as a by-product of other tasks. Learning words incidentally can happen through inferring the meanings of the new words based on the context while attending receptive tasks, or when attempting to use newly met vocabulary in a combination of receptive-productive tasks. Tasks involving production seem to be more effective in promoting word retention. The latter is most commonly attributed to deeper levels of processing in such tasks, stemming from higher involvement load.

Nevertheless, incidental learning is a multifaceted process, which might be difficult to control for the teachers. Rates of acquisition and knowledge decay of vocabulary learned incidentally are moderated by a multitude of intertwined factors, ranging from individual differences between the students, to intricacies of parts constituting the word. Although presented replication extends the study of Pichette, et al. (2012) adding the aspect of word

connotation, other factors can still affect the validity of the claims to be made based on the results, hence further examinations are needed.

9. End Note

Kindly contact the author, should you be interested in using the designed replication to conduct an experiment based on the design proposed in this article.

Katarzyna Li (Jasinska-Belfort) is a polyglot and an experienced language teacher. She has been teaching English, German, and French as first and foreign languages in various academic settings for over 10 years in Japan, Poland, Brazil, Hong Kong, the UK, and Switzerland. Ms. Li is currently working towards a DPhil in Education course at the University of Oxford. Her research interests include neurolinguistics, child multilingualism, vocabulary acquisition, factors that affect one's ability to attain high proficiency in L2, computational linguistics, and the use of neural networks and statistical methods for data analysis.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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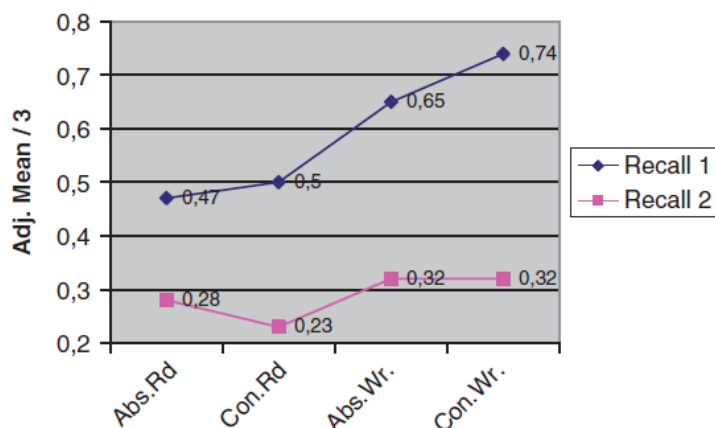
APPENDIX 1: Scores in task vs recall (Pichette, et al., 2012, p. 75)

	Reading task		Writing task	
	Raw data, mean (SE)	Transformed data, mean (SE)	Raw data, mean (SE)	Transformed data, mean (SE)
Recall 1	0.4718 (0.0350)	0.4887 (0.0282)	0.7645 (0.0457)	0.6937 (0.0309)
Recall 2	0.2371 (0.0285)	0.2590 (0.0249)	0.3150 (0.0346)	0.3173 (0.0285)

APPENDIX 2: Scores in correctness vs recall (Pichette, et al., 2012, p. 76)

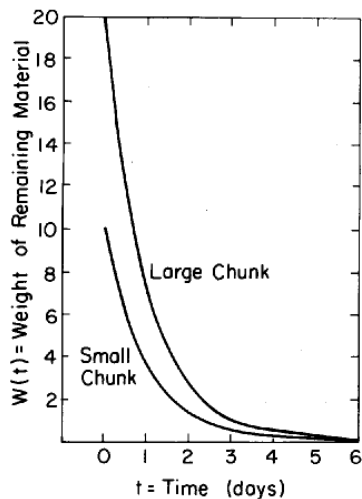
	Abstract words		Concrete words	
	Raw data, mean (SE)	Transformed data, mean (SE)	Raw data, mean (SE)	Transformed data, mean (SE)
Recall 1	0.5619 (0.0279)	0.5697 (0.0365)	0.6205 (0.0304)	0.6666 (0.0427)
Recall 2	0.3010 (0.0257)	0.2810 (0.0298)	0.2753 (0.0265)	0.2711 (0.0328)

APPENDIX 3: Adjusted cued recall scores (Pichette, et al., 2012, p. 77)



Note: Abs = abstract; Con = concrete; Rd = reading; Wr = writing.

APPENDIX 4: Forgetting curve (Loftus, 1985, p. 398)



Cued recall task (meaning)
阅读定义，然后写下英文单词。 - DEFINITION 完成后，请转到下一页 ¹⁰

Form recognition task
阅读定义，然后圈出正确的单词 ¹¹ 凉棚 ¹² a) peargola b) purgolia c) pergola d) pergolia 你有多确定？ ¹³ 1. 我正在猜测 2. 比较确定 3. 非常确定 4. 绝对确定 完成后，转到下一页 ¹⁴

¹⁰ Read the definition, then write the English word. Once done, move on to the next page.
¹¹ Read the definition, then circle the right English word.
¹² Word definition in Mandarin for “pergola”
¹³ How certain are you? 1. I’m guessing 2. Quite certain 3. Very certain 4. Completely certain
¹⁴ Once done, move on to the next page.

<p>Cued recall task (meaning)</p> <p>你知道这个词吗？圈出正确答案¹⁵</p> <p>pergola</p> <p>a) 不，我从未见过这个词¹⁶ b) 是的，我以前见过这个词¹⁷</p> <p>如果是答案 B，请写出该词的意思或你在哪里看到过它（你在什么语境中使用了这个词）¹⁸</p> <p>词义（请用普通话书写）¹⁹.....</p> <p>你在哪里看到的？（请说明背景）²⁰.....</p>
--

¹⁵ Do you know this word? Circle the correct answer.

¹⁶ A) No, I've never seen that word before

¹⁷ B) Yes, I've seen that word before.

¹⁸ If it is answer B, write the meaning of the word or where you have seen it before (in what context have you encountered the word)

¹⁹ Meaning of words (please write in Putonghua)

²⁰ Where did you see it? (please give context)

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