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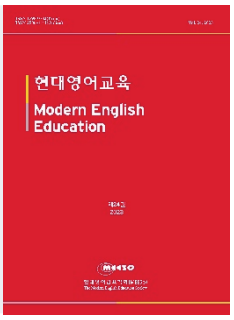

Comparing Incidental Vocabulary Learning Between Read-to-Comprehend and Read-to-Produce Groups

Hyung-Sun Kim (Chosun University)
Ung-Yong Choi (Chonnam National University)

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부수적 어휘 학습, 이해를 위한 읽기, 발화를 위한 읽기, 기억 추적 측정

Hyung-Sun Kim (First author)
Associate Professor
Division of Undeclared Majors
Chosun University
hskim4@chosun.ac.kr

Ung-Yong Choi (Corresponding author)
Professor
Business Administration
Chonnam National University
uychoi@jnu.ac.kr

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Abstract
This study investigated the nuanced dynamics of incidental vocabulary learning in L2 instruction, arguing that learning effectiveness may be guided not only by instructional methods but also by learners' expectations of the methods. To ascertain which group, read-to-comprehend or read-to-produce, excels in incidental development, this study compared two groups of Korean university students, each performing identical reading activities in English reading and writing classes with different objectives. The impact of unknown word quantities on incidental learning was also analyzed. Using the Tracing Measure of Retention (TMR) on customized target words, this study traced the trajectory from immediate learning to retention. Results indicated higher learning gains for the read-to-produce group in both the immediate and delayed posttests, implying deeper processing in the group. Unknown word counts inversely correlated with both immediate and retained learning in the read-to-comprehend group, but not in the read-to-produce group. These findings will have implications on L2 instructional design, suggesting ways to optimize learners' cognitive states for better learning outcomes and the importance of considering learners' existing vocabulary knowledge during planning. Overall, this study enriches our understanding of incidental vocabulary learning, providing new insights into the roles of instructional methods, cognitive processes, and learner vocabulary knowledge.

INTRODUCTION

Vocabulary plays a crucial role in L2 learning and is a frequent subject of discussion, particularly in relation to incidental

learning. Leading scholars in this field have underscored the significance of learner vocabulary development as an unintended consequence of instructional objectives. They generated two prevailing ideas: *learning from context* is crucial in the vocabulary learning process; pedagogical methods should promote *naturalistic acquisition* (Sok, 2014).

In this vein of research, Webb (2008) proposed that the meaning of both L1 and L2 words can be incidentally acquired via reading. Some researchers posit that L2 learners acquire their initial few thousand words through directed instruction or intentional learning, and then, the subsequent vocabulary is predominantly gained through extensive reading by guessing the meaning of unknown words (Durkin, 1978; Huckin & Coady, 1999; Jenkins & Dixon, 1983; Kim & Na, 2010). As Gass (1999) explicitly characterized, incidental vocabulary learning is often considered a by-product of comprehension exercises and is thus viewed as an outcome of comprehension-based-instruction.

However, other researchers, following the concept of *pushed output* proposed by Swain (1985) that compels learners to observe and adjust their output, have argued for the superior role of production in acquisition. According to Ellis and He (1999), the production of new words enables learners to process these words more deeply than mere comprehension, thus facilitating acquisition.

Indeed, in many studies examining the effectiveness of L2 classrooms, a common research setting has been the comparison between the two dominating learning environments: comprehension-based instruction (CBI) and production-based instruction (PBI), a trend rooted in the works of Krashen (1982) and Swain (1985). Consequently, research on L2 incidental learning has continued in this trend (Hulstijn & Trompetter, 1998; Rasuki, 2017; Shintani & Ellis, 2010). They compared different instructional approaches (such as teaching styles informed by CBI and PBI in this study) in terms of their effectiveness for incidental learning of unintended non-target elements, alongside the intended learning objectives. However, these studies typically focus their conception of incidental learning on the main pedagogical activities and learning objectives. In other words, these studies concentrated solely on the style of instruction, without adequately accounting for how learning processes might differ between the two different instructional methods, which could potentially contribute to variations in their incidental learning.

In this study, we propose that the learning effectiveness is not primarily determined by variation in teaching methods but rather depends on how learners individually respond to each instructional method. This response is contingent upon their internal learning processes, so the same principle should hold true for incidental learning. Therefore, it is worthwhile to attempt to substantiate, through precise experimental measurements, that, while educators diligently strive to promote learning, the essence of the learning process fundamentally resides within the learner.

To achieve this, we examined how different learning objectives—driven by varying anticipated after-reading tasks—affected incidental vocabulary learning among two groups of Korean university EFL students in this experimental study. One group was situated in a reading class with the anticipation of comprehension exercises and the other in a writing class geared toward producing text summaries. Both groups engaged in the identical reading activity, but with different post-reading tasks in mind, likely influencing their approach to the task differently. We aimed to explore how these differing purposes influenced incidental vocabulary learning. Specifically, we examined the contexts in which incidental vocabulary learning is more likely to occur between the read-to-comprehend and read-to-produce groups. This study was guided by the following research questions:

1) Do differences exist in incidental vocabulary learning between the read-to-comprehend and read-to-produce groups?
2) How does the number of unknown words contribute to differences in incidental vocabulary learning?

LITERATURE REVIEW

CBI and PBI and Incidental Learning of L2 Vocabulary

The fundamental distinction between CBI and PBI lies in the emphasis on comprehension (CBI) versus production (PBI), which reportedly influences learners' processing of information given in instruction. (Shintani et al., 2013). While CBI prioritizes understanding and meaning-making as a bedrock for language acquisition, PBI underscores language production from the beginning of language learning, treating production over comprehension as the primary vehicle for acquisition.

Much of past research indicates a correlation between incidental vocabulary learning and CBI, particularly reading. For instance, Ponniah (2011) investigated the effectiveness of reading for L2 vocabulary learning among 49 Indian university students, who were given edited texts to facilitate comprehension. Of these students, 23 were allowed to consult a dictionary to find the meaning of unknown words, while the remaining 26 were instructed to focus solely on reading for comprehension.

He found that the participants in the latter group, who learned words subconsciously while reading, outperformed their counterparts in using those newly acquired words in contextually appropriate sentences. His research concluded that reading activities are not only beneficial for understanding the meaning of new words but also for grasping the sentence structures in which these words are typically used.

Another study on CBI by Vidal (2011) included 248 undergraduate students in Spain, partitioned into three groups. The first group read three academic texts, the second group watched three lectures, and the third group served as a control with no exposure to additional input. The independent variables were the modes of input—either reading academic texts or listening to lectures—while the dependent variable was the extent of incidental vocabulary acquisition and retention. The study found that reading was generally more advantageous for vocabulary gains across all proficiency levels. However, the gap between reading and listening narrowed as students' proficiency increased. Specifically, for higher proficiency-level participants, listening yielded comparable retention rates to reading in delayed posttest scores.

On the other hand, McCafferty et al. (2001) explored the impact of PBI in their experiment on the retention of L2 Spanish vocabulary among students at a US university. The control group was tasked with writing about a predetermined topic, along with a list of related vocabulary words provided by the instructor. In contrast, the experimental group engaged in peer interviews on the same topic, also using the given vocabulary list. They found that the experimental group showed greater vocabulary gain, which they attributed to increased mental effort and the goal-driven nature of the peer interview task. They also highlighted the importance of interaction in the experimental group as a significant factor contributing to learning enhancement.

An earlier study in this area investigated learner strategies of learning when they encountered new L2 vocabulary while reading, with volunteers from a Canadian university (Paribakht & Wesche, 1999). They employed a question task and a summary task (i.e., a comprehension task and a production task) and asked learners the words that they remembered and how those words were learned. The results revealed that learners ignored a large portion of unknown words; for some reasons, they paid attention to a small portion of the unknown words, for which they used contextual clues and previous knowledge when trying to infer the meaning of the words.

From this body of research, it can be tentatively surmised as follows. First, CBI generally promotes more incidental vocabulary learning than PBI, and within CBI, listening can be more advantageous for high-level learners (Vidal, 2011). Second, PBI can elicit more learning when combined with other aspects of a task, for example, goal-orientation (McCafferty et al., 2001). Third, among many unknown words encountered in input, learners happen to pay attention to some of them (Paribakht & Wesche, 1999).

Based on these points, we made several assumptions: i) Incidental learning of a word requires prior incidental attention to that word (Godfroid et al., 2013: Newton, 2013); ii) CBI and PBI work differently in terms of inducing incidental attention to words (Tang, 2020; Webb, 2020); and iii) it may not be the difference between CBI and PBI themselves, but the difference in learners' expectations of subsequent activities (i.e., comprehension-based or production-based activities) that induces different incidental attention to words (See Lee, S. M., 2023; Teng, 2022). The present study has been built upon these assumptions, specifically the third one, which is a novel idea we explore.

Cognitive Load and Incidental Learning of L2 Vocabulary

The concept of cognitive load, which represents the load a task imposes on a learner's cognitive system, is integral to the learning process; it is a determinant of the amount of information that the learner's working memory can handle at a given time (Paas et al., 2003). Cognitive Load Theory (Sweller, 1988) indicates that instructions need to avoid overloading, as it can make the acquisition of "domain specific knowledge in the form of schemas" (p. 257) unavailable. Schemata are categories of information stored in long-term memory that differentiate experts from novices; a schema holds words, concepts, or groups of linked memories (Anderson & Pearson, 1984).

Building on the essential role of cognitive load in the learning process, various studies within the domain of L2 learning have explored its impact in different contexts. Baranowska (2020) investigated the effects of different subtitling methods on cognitive load, subsequent amount of comprehension, and incidental vocabulary learning in a setting of L2 learning through media. She conducted a study with 63 intermediate Polish learners of English to assess the effects of various subtitling conditions on cognitive load, comprehension, and incidental vocabulary learning. Participants were divided into three groups: one watching a movie clip with Polish subtitles, another with English subtitles, and a third with no subtitles. The study found that intralingual (L2) subtitles facilitated vocabulary acquisition more effectively than interlingual (L1) subtitles. Additionally, both types of subtitles were found to reduce cognitive load, leading to enhanced comprehension of the material. These findings suggest practical implications for EFL instructors and learners seeking to leverage media for vocabulary

development.

On a related note, Nawal (2018) compared two L2 writing groups and found that those who wrote in L2 without using L1-L2 dictionaries resulted in more refined sentential structures within time constraints. This was attributed to their sole reliance on L2 vocabulary, which reduced L1 interference, thereby freeing up cognitive resources for focusing on L2 syntax. It suggests a more efficient integration of meaning and structure. These results led her to recommend that L2 learners avoid using L1 for idea generation or resource searching when writing in L2, to minimize attention split and lessen cognitive load on working memory.

Given the recognized influence of cognitive load on L2 learning as demonstrated in previous studies, it becomes pertinent to hypothesize that an excessive cognitive load could indeed obstruct L2 vocabulary learning, most certainly including its incidental aspects. This study posits that encountering a large number of unknown words in a text could overwhelm learners' cognitive capacities, consequently impeding the incidental learning process.

Measurement of Vocabulary Learning

The importance of vocabulary learning is deeply ingrained in language learning from the initial stage. An abundance of research has been conducted in this area exploring various perspectives. These include incidental learning (S. Lee, 2013) and intentional learning of words (Hunt & Beglar, 2002), the threshold level of vocabulary (Okamoto, 2015), input modification to enhance vocabulary learning (Ko, 2012), partial or full word-knowledge (Hemmati & Asmawi, 2015) and others. Within these topics, a variety of learning activities in different contexts were scrutinized to measure their efficacy in terms of vocabulary learning.

Problems are found in the method of measuring learners' vocabulary development before and after intervention activities in many of these studies. Kim and Choi (2017a) observed that in the process of selecting eligible target words—namely, words that participants did not know previously—many studies often relied on the participants' declaration, or used a pre-set list based on their proficiency level. However, vocabulary competence is highly individualistic, influenced by prior exposure, fields of interest, and personal needs, even among learners at the same level. Another issue arises in measuring vocabulary retention, defined as the ability to remember word knowledge over time. Accurate retention measurement requires tracking previously learned words, so the common method of simply calculating score differences between pre-intervention, post-intervention, and delayed posttests may lead to inaccuracies (See Figure 1). Words correctly answered in the delayed posttest for unrelated reasons (W10) might be illegitimately included in the retention calculation, as depicted in Figure 2.

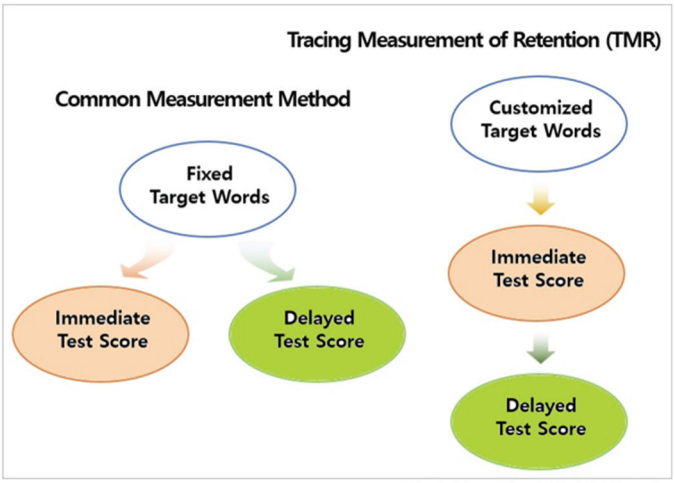

FIGURE 1
Common Measurement vs. TMR 1

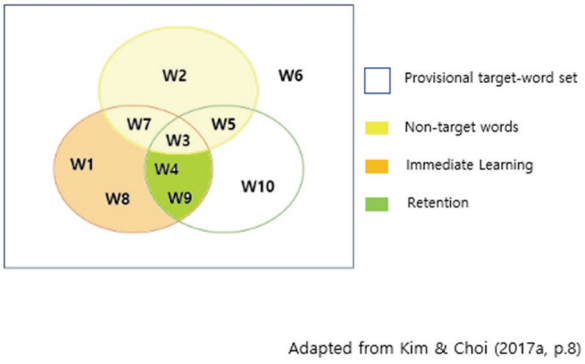

FIGURE 2
Retained Words Under TMR 2

This study employs the Tracing Measure of Retention (TMR) developed by Kim and Choi (2017a; 2017b), which gauges vocabulary gains by tracing immediate learning to the retention of words. Another advantage of the TMR lies in its customized target-word identification (CTI). The first phase involves participants taking the pre-knowledge test that contains all provisional target words (for instance, 10 words in this model, W1-W10), from which customized target words are determined, excluding those already known (words that were correct at the pre-knowledge test, shown in the yellow circle in Figure 2). The orange circle includes the words that are correct in the immediate test (W1, W3, W4, W7, W8, and W9), but W7 and W3 should not be included in immediate learning because the participant already knew the two words prior to the experiment. The Green Circle contains the words that are correct in the delayed test, W3, W4, W5, W9, and W10, but W3 and W5 should not be included in retention because the participant knew them previously. Most importantly, W10 should be also excluded from retention because the participant did not learn the word within the research setting. In other words, the participant did not answer W10 correctly in the immediate test, so it is not subject to retention.

METHOD

Participants

The initial participants consisted of 263 undergraduate students enrolled in English reading and writing courses at a Korean university. The top 60% of first-year students, determined by their English placement test scores at the university, had the option to choose from several courses provided within the compulsory liberal arts English program. Those who selected reading and writing courses participated in the study. The participants were drawn from various fields of study: business administration (47), education (38), humanities (55), engineering (32), social sciences (49), and natural sciences (42). Their English proficiency, as assessed by the English section of the national CSAT (College Scholastic Ability Test), was Level 3.79, roughly reflecting the average of the university's incoming freshmen of the majors at the university. At the beginning of the study, the participants were briefed about the research, and informed consents were obtained for data collection and the use of necessary personal information for research purpose.

Procedures

The experimental design and procedures in this study were crafted to investigate the disparate impacts of reading activities, ostensibly aimed at comprehension and writing objectives, respectively; namely comprehension testing and summarization. This design was intended to facilitate a natural and unobtrusive setting for incidental vocabulary learning.

The participants were partitioned into two groups: To-Comprehend and To-Produce groups. To preserve the ostensible objectives of engaging participants in comprehension and writing activities, students from English reading classes were assigned to the To-Comprehend group, while those from English writing classes formed the To-Produce group. This organizational scheme inevitably resulted in comparison groups of differing sizes.

Selection of Reading Material and Input Enhancement

In selecting the text for this study, several key factors were considered to ensure its suitability for incidental vocabulary learning among first-year EFL students at a Korean University. The chosen text, "Processes of a Virus at Work" (Jordens & Zeter, 2013), is a 677-word piece with a Flesch-Kincaid Grade Level of 8.8 and a Flesch Reading Ease Score of 57.2, denoting a fairly difficult level of readability.[1]

While this level might be considered easy for university students in a general context, it aligns with the guideline that a text's grade level, as typically determined for native English-speaking school environments, often corresponds to a higher grade level when applied in an EFL context due to the additional language challenges faced by EFL learners. Moreover, the text's specialized content, although relatively accessible, offers an appropriate level of complexity for university students. According to the criteria for appropriate reading text presented by Waring and Takaki (2003), a text should not be so complex as to impede word guessing. In consideration of this, the chosen text balances its lower syntactic complexity with specialized medical contents, thereby meeting their guidelines for an appropriate reading level. The choice of the text was also influenced by its topical relevance during the COVID-19 pandemic, a period when the data collection took place. It was

[1] https://www.textcompare.org/readability/flesch-kincaid-reading-ease/ https://linguapress.com/teachers/flesch-kincaid.htm

assumed that the heightened public awareness of respiratory issues and virus functions would make the text content familiar to the learners, in line with research showing that topic familiarity can facilitate comprehension and vocabulary learning (Nagy et al., 1985; Pulido, 2004). The text's medical topic, in contrast to humanistic subjects, was expected to promote vocabulary learning through the use of relatively clear, context-specific vocabulary, potentially making it easier for students to infer and learn new words incidentally (Schmitt, 2008).

An additional strategy employed in this study was the use of input enhancement to facilitate the incidental learning of target vocabulary. Research has shown that input enhancement can effectively promote vocabulary learning. For instance, Leow et al. (2003) found that typographical enhancement can aid in the learning of new words by making them stand out in the text, thereby increasing the likelihood that learners will notice and process these words. Similarly, a study by Macaya and Perea (2014) found that bolding words could increase visual word recognition, with lower-level students benefiting the most. Therefore, in the reading material provided to the participants in the present study, the provisional target words were highlighted in bold as a form of typographical enhancement, with the expectation that the words would become sufficiently salient to draw learners' attention (Smith, 1993).

The selection of the target words was based on a specialized vocabulary list provided by the course developer, who revealed that the list was designed with pedagogical considerations and grounded in lexical research and corpus analyses. The researcher chose the 20 provisional targets from the list to match the level of difficulty appropriate for first-year university EFL learners, who comprised the study's focus group.

Reading Activities for Intervention

Before commencing the individual silent reading phase, the entire class (reading or writing classes) participated in a reading while listening (RWL) activity. This choice of pedagogical approach was driven by several significant benefits associated with RWL that have been highlighted in the literature.

First, it improves pronunciation and phonological awareness (Chang, 2011; Chang & Millett, 2014). By hearing the text read aloud by a native speaker, learners get a chance to enhance their understanding of English phonology and pronunciation patterns, a critical aspect of language acquisition. Second, it promotes comprehension and recall (Webb & Chang, 2015). When students listen while they read, they can better understand and retain the content of the text. Third, it reduces cognitive load (Marsden et al., 2018). RWL allows learners to focus more on understanding the meaning of the text, as some of the cognitive demands of decoding written text are alleviated. Fourth, it provides a model for prosody (Woodall, 2010). The prosodic elements of language, such as stress, intonation, and rhythm, can be demonstrated to learners through listening to a native speaker's reading, thus facilitating their understanding of these elements. Particularly for the purpose of this study, having the text read aloud by a native speaker can reduce cognitive load even further by breaking the reading into semantic or meaningful units.

As for the operation of the reading activity, first, the RWL component was conducted twice with the whole class, each taking approximately 3 minutes. After this, the researcher uploaded MP3 files of the reading material to the course's Learning Management System (LMS). It allowed the students to listen to the reading again using individual earphones during the activity if they wished.

Following the initial RWL activity, the students then transitioned to their individual silent reading tasks, with the entire reading activity process lasting approximately 50 minutes. The researcher, who was also the instructor for these classes, oversaw the activity and explicitly instructed the students not to use dictionaries or search on their smartphones during this time. This regulation ensured that the learning environment was well-controlled and conducive to incidental vocabulary learning.

For the remainder of the time, students were given the freedom to read the texts repeatedly at their own pace, individually preparing for the subsequent activity they each expected, either a comprehension test or a summary writing task. Students were allowed to make notes on the hard copies of the text they were given, but no other forms of note-taking were permitted. These hard copies were collected back at the end of the activity.

The reading activity was explained to students as a form of performance assessment reflected in their grades. As such, student engagement levels were observed to be high. This combined RWL and silent reading approach aimed to enhance students' incidental learning of the target vocabulary, by providing both auditory input and ample opportunity for silent, intensive reading. This structure ensured that students were given sufficient exposure to the text and the target vocabulary in a setting that maximized their potential for incidental learning.

Three Stages of Vocabulary Tests

Incidental vocabulary learning was measured through three stages of testing.

1) Pre-Knowledge Test: The first testing stage, the pre-knowledge test, aimed to identify unknown words among 20 provisional target words (see Figure 3). From these, each participant's customized target words were identified. The pre-knowledge test was administered in the class hour preceding the reading activity through the course's LMS application.
2) Immediate Test: In accordance with the typical course activities of the English reading and writing classes, as noted, the To-Comprehend group was told they would undertake comprehension exercises following the reading activity, while the To-Produce group was informed they would summarize the text content. However, this was a pretext; in reality, both groups were subjected to the same immediate vocabulary test, constituting the second testing stage.
3) Delayed Posttest[2]: The third testing stage, the posttest was carried out four weeks later, without prior notice.

Data Analysis

Data Collection

All three tests were administered against the 20 provisional target-words. The immediate test assessed the words correctly recognized by each participant, focusing on their customized target words (i.e., the unknown words identified in the pre-knowledge test). The delayed test also counted the words correctly recognized by each participant but restricted to those marked as correct in the immediate test. Figure 3's hypothetical case of retention illustrates this, indicating the target words (W1, W4, W6, W8, W9, and W10) for the learner; among them, the learner learned W1, W4, W8, and W9 after the reading activity and retained W4 and W9 (the light green cells). The three test results of 177 participants were recorded as 0, or 1 in an Excel worksheet, and the immediate learning and retention rates of individual participants were calculated using the Excel's "IF" functions.[3] Figure 4 is a part of the actual worksheet.

The collected data underwent an initial cleaning process and subsequent analysis with the aid of SPSS 27. Out of the initial participant pool, certain subjects were removed based on the following criteria, resulting in a final sample size of 177 participants deemed suitable for the analysis: i) Participants who did not participate in any of the tests; ii) Participants who took part in the pre-knowledge test but received a score of zero, indicative of a lack of engagement.

For both the To-Comprehend and To-Produce groups, several variables were computed:

V1: The number of unknown words (specifically, those words each participant missed on the pre-knowledge test, thus determining the customized target words)
V2: Of each participant's customized target words, the number of words correctly identified in the immediate test
V3: Of each participant's correctly identified words in the immediate test, the number of words correctly identified in the delayed test
V4: The percentage of words correctly identified in the immediate test (V2/V1)
V5: The percentage of words correctly identified in the delayed test, drawn from those words correctly identified in the immediate test (V3/V2)

[2] While the term, "posttest" generally refers to a test conducted after a specific event or intervention, in this study, it is used solely to refer to the delayed posttest, distinct from the immediate test.

[3] V2=IF(F3=0,AK3)+IF(G3=0,AL3)+IF(H3=0,AM3)+IF(I3=0,AN3)+IF(J3=0,AO3)+IF(K3=0,AP3)+IF(L3=0,AQ3)+IF(M3=0,AR3)+IF(N3=0,AS3)+IF(O3=0,AT3)+IF(P3=0,AU3)+IF(Q3=0,AV3)+IF(R3=0,AW3)+IF(S3=0,AX3)+IF(T3=0,AY3)+IF(U3=0,AZ3)+IF(V3=0,BA3)+IF(W3=0,BB3)+IF(X3=0,BC3)+IF(Y3=0,BD3)+IF(Z3=0,BE3)+IF(AA3=0,BF3)+IF(AB3=0,BG3)+IF(AC3=0,BH3)+IF(AD3=0,BI3)+IF(AE3=0,BJ3)+IF(AF3=0,BK3)+IF(AG3=0,BL3)+IF(AH3=0,BM3)+IF(AI3=0,BN3)
V3=IF(AND(F3=0,AK3=1),BX3)+IF(AND(G3=0,AL3=1),BY3)+IF(AND(H3=0,AM3=1),BZ3)+IF(AND(I3=0,AN3=1),CA3)+IF(AND(J3=0,AO3=1),CB3)+IF(AND(K3=0,AP3=1),CC3)+IF(AND(L3=0,AQ3=1),CD3)+IF(AND(M3=0,AR3=1),CE3)+IF(AND(N3=0,AS3=1),CF3)+IF(AND(O3=0,AT3=1),CG3)+IF(AND(P3=0,AU3=1),CH3)+IF(AND(Q3=0,AV3=1),CI3)+IF(AND(R3=0,AW3=1),CJ3)+IF(AND(S3=0,AX3=1),CK3)+IF(AND(T3=0,AY3=1),CL3)+IF(AND(U3=0,AZ3=1),CM3)+IF(AND(V3=0,BA3=1),CN3)+IF(AND(W3=0,BB3=1),CO3)+IF(AND(X3=0,BC3=1),CP3)+IF(AND(Y3=0,BD3=1),CQ3)+IF(AND(Z3=0,BE3=1),CR3)+IF(AND(AA3=0,BF3=1),CS3)+IF(AND(AB3=0,BG3=1),CT3)+IF(AND(AC3=0,BH3=1),CU3)+IF(AND(AD3=0,BI3=1),CV3)+IF(AND(AE3=0,BJ3=1),CW3)+IF(AND(AF3=0,BK3=1),CX3)+IF(AND(AG3=0,BL3=1),CY3)+IF(AND(AH3=0,BM3=1),CZ3)+IF(AND(AI3=0,BN3=1),DA3)

	A	B	C	D	E	F	G	H	I	J	K
1	A hypothetical case of retention		(0: unknown word 1: known word)								
2		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
3	Pre-knowledge Test	0	1	1	0	1	0	1	0	0	0
4	Immediate Test	1	0	1	1	0	0	1	1	1	0
5	Delayed Test	0	0	1	1	1	0	0	0	1	1
6	Provisional target-words										
7		infect	host	transmit	abnormal	respiratory	combat	passage	microscopic	immune	particle
8		dormant	organism	symptom	airborne	hereditary	reproduction	detach	strain	invade	virion

(Adapted from Kim & Choi, 2017a, p. 7)

FIGURE 3
Case of a Hypothetical Participant & Provisional Target-Word Set 3

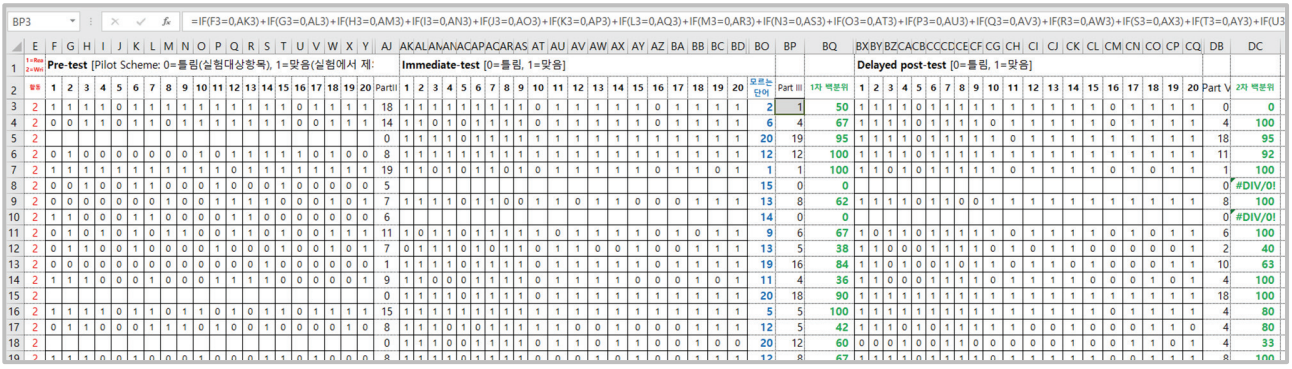

FIGURE 4
Part of the Worksheet for Reference

Descriptive statistics, including minimum, maximum, mean, and standard deviation, were computed for each of these variables. Given that V2 was predicated on each participant's individual target words and that V3 was based on each participant's individual performance in the immediate test, a direct comparison of these two variables was not possible. Hence, they were employed solely as the basis for the normalized figures, V4 and V5.

Statistical Analysis

Next, the differences between the To-Comprehend group and the To-Produce group for the variables V1, V4, and V5 were examined by employing an Analysis of Variance (ANOVA). This statistical test was selected to determine if significant differences existed between the means of the two groups. For the ANOVA, the dependent variables were the number of unknown words (V1), the percentage of words correctly identified in the immediate test (V4), and the percentage of words retained from the immediate to the delayed posttest (V5). The independent variable was the group's ostensible assignment, namely To-Comprehend group and To-Produce group.

Furthermore, Pearson correlation was utilized to explore the interrelationships among the number of unknown words, immediate learning, and retention for the overall participants, as well as separately for the To-Comprehend group, and the To-Produce group. This statistical method was chosen for its common use in analyzing the strength and direction of relationships between sets of data.

All of the statistical analyses were considered significant at the .05 level. The detailed results derived from this analysis process will be discussed in the following section. The descriptive statistics, ANOVA, and correlation findings were interpreted in light of prior research and theoretical considerations.

RESULTS

Descriptive Statistics

Table 1 presents the summary statistics of this study, showing the mean number of initially unknown words (out of 20 items) to be 8.45 overall across both groups. The To-Comprehend group has a slightly higher mean (8.76) than the To-Produce group (7.72). The immediate test results display the average number of words understood right after the learning activity, along with the percentage, as the mean score itself cannot be directly compared due to the varying number of target words for each participant. The To-Produce group achieved a slightly higher score (66.99%) compared to the To-Comprehend group (56.53%). This tendency remains in the posttest results with the To-Produce group demonstrating 70.17% and the To-Comprehend group, 59.81%.

TABLE 1

Descriptive Statistics: To-Comprehend vs. To-Produce Groups

	No. of Unknown Words[a]		Immediate Test		Posttest	
	n	Mean	Mean[b] (%)	SD (%)	Mean[c] (%)	SD (%)
To-Comprehend	124	8.76	4.38 (56.53)	2.93 (28.21)	2.55 (59.81)	2.12 (32.01)
To-Produce	53	7.72	5.13 (66.99)	3.77 (27.04)	3.60 (70.17)	3.09 (29.74)
Total	177	8.45	4.60 (59.64)	3.21 (28.20)	2.86 (62.84)	2.49 (31.63)

[a] Number of words that the learner got wrong in Pre-Test (out of 20 items)

[b] Number of words that the learner got right in Immediate Test (out of the unknown words, a)

[c] Number of words that the learner got right in Posttest (out of the words that learners got right in Immediate Test, b)

Figure 5 serves as a visual representation of Table 1, displaying the average number of unknown words (i.e., target words) of the participants and the number of words they recalled in the subsequent tests across two groups: *To Comprehend* and *To Produce*. The height of each bar represents the total number of unknown words, with the light orange and green segments signifying the words correctly identified in the immediate test (i.e., immediate learning) and the posttest (i.e., retention) respectively. The graph illustrates that participants were generally successful in recognizing over half of the unknown words during the immediate test, with a somewhat smaller proportion also recognized in the posttest.

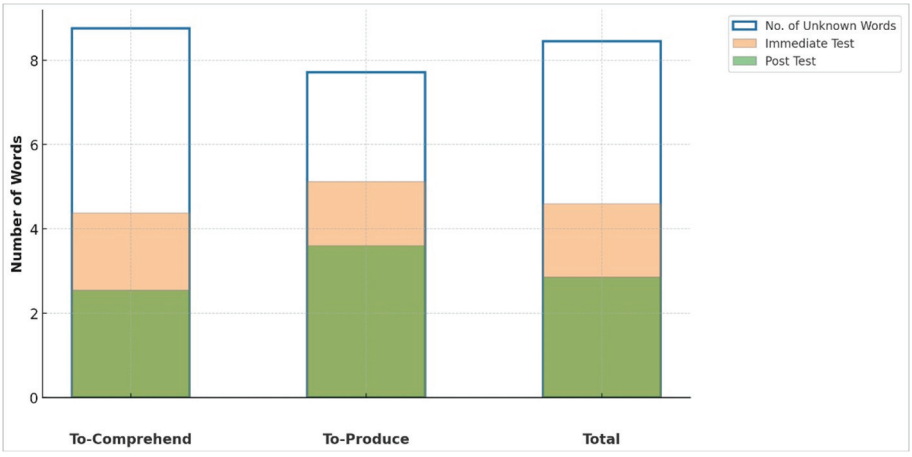

FIGURE 5

Tracking Vocabulary Learning: From Immediate Learning to Retention

Comparison of Immediate Learning and Retention Between Groups

For the first research question, an ANOVA was conducted to determine whether the To-Comprehend and To-Produce groups demonstrated different performance levels in terms of immediate learning and retention. Table 2 first shows that there was no significant difference in the number of unknown words (V1) between the two groups (F = 1.554, p = .214), suggesting that the groups were on a similar level in terms of vocabulary competence and thus could be compared for other variables. The table also reveals a significant difference in the immediate learning (V4) between the groups (F = 4.848, p = .029), indicating that the To-Produce group scored higher on the immediate test compared to the To-Comprehend group. Regarding retention (V5), the p-value was slightly higher than the conventional .05 level (F = 3.628, p = .059), which means that there was no substantial evidence to suggest a significant difference in the longer-term retention of the words between the two groups.

TABLE 2
ANOVA: To-Comprehend vs. To-Produce Groups

		Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Number of Unknown Words (V1)	Between Groups	40.243	1	40.243	1.554	.214
	Within Groups	4,531.497	175	25.894		
	Total	4,571.740	176			
Immediate Learning (V4)	Between Groups	.377	1	.377	4.848*	.029
	Within Groups	12.668	163	.078		
	Total	13.045	164			
Retention (V5)	Between Groups	.357	1	.357	3.628	.059
	Within Groups	15.648	159	.098		
	Total	16.006	160			

* Significant at .05 level

Correlation Between Number of Unknown Words and Incidental Learning

Tables 3, 4, and 5 illustrate the Pearson correlations among the number of unknown words, immediate learning, and retention for the overall participants, To-Comprehend group, and To-Produce group, respectively. This analysis was conducted to answer the second research question concerning the interrelationships among these variables.

Overall, as Table 3 demonstrates, the negative correlation between the number of unknown words (V1) and both immediate learning (V4) and retention (V5) implies that participants with a greater number of unknown words at the outset performed less well on both the immediate test and the posttest. Conversely, the positive correlation between immediate learning and retention suggests that participants who performed better on the immediate test were more likely to retain words over the longer term.

TABLE 3
Correlations: Number of Unknown Words & Immediate Learning/Retention_Overall

		Number of Unknown Words	Immediate Learning	Retention
Number of Unknown Words (V1)	Coefficient		-.351**	-.218**
	Significance		.000	.005
	n		165	161
Immediate Learning (V4)	Coefficient			.212**
	Significance			.007
	n			161
Retention (V5)	Coefficient			
	Significance			
	n			

** Significant at .01 level

Within the To-Comprehend group (Table 4), similar trends can be observed to those in the overall sample. A higher number of unknown words correlated with lower scores in both immediate learning and retention. Additionally, better immediate learning corresponded to improved retention. Conversely, in the To-Produce group (Table 5), none of the correlations were found to be statistically significant, suggesting a distinct learning pattern within this group in comparison to the To-Comprehend group. These results will be discussed in the context of prior research and theoretical considerations in the following section.

TABLE 4

Correlations: Number of Unknown Words & Immediate Learning/Retention_Read-to-Comprehend Group

		Number of Unknown Words	Immediate Learning	Retention
Number of Unknown Words (V1)	Coefficient		-.458**	-.243**
	Significance		.000	.009
	n		116	114
Immediate Learning (V4)	Coefficient			.193*
	Significance			.039
	n			114
Retention (V5)	Coefficient			
	Significance			
	n			

* Significant at .05 level; ** Significant at .01 level

TABLE 5

Correlations: Number of Unknown Words & Immediate Learning/Retention_Read-to-Produce Group

		Number of Unknown Words	Immediate Learning	Retention
Number of Unknown Words (V1)	Coefficient		-.034	-.114
	Significance		.817	.444
	n		49	47
Immediate Learning (V4)	Coefficient			.168
	Significance			.259
	n			47
Retention (V5)	Coefficient			
	Significance			
	n			

FINDINGS AND DISCUSSION

Diverging from conventional research that focuses on post-implementation effects of various instructional methods on incidental learning, this study explored how differing anticipations of post-reading tasks may lead to varying degrees of success in incidental learning. This study observed that the mere difference in anticipation can yield different outcomes in incidental learning, implying that varying expectations might indirectly stimulate different cognitive processes.

Effects of Different Reading Goals on Incidental Learning

In response to the first research question—*Do differences exist in incidental vocabulary learning between the read-to-comprehend and read-to-produce groups?*—the study revealed a significant difference in incidental vocabulary learning between the read-to-comprehend group and the read-to-produce group, despite both groups having engaged in identical reading activities. What set these groups apart was not the activities themselves but the differing expectations established beforehand regarding whether the subsequent activities would relate to Comprehension-Based Instruction (CBI) or

Production-Based Instruction (PBI). Notably, the read-to-produce group, which expected a PBI, demonstrated statistically better results in incidental learning.

This advantage observed in the read-to-produce approach could be interpreted in line with Izumi (2002), who proposed that production required deeper processing in learners' mind. The results of this study further suggest that mere anticipation of PBI could elicit similar effects. The improved incidental learning effects when students expect PBI has significant implications for L2 instruction. This could involve making explicit the objective of a particular reading activity, whether it is intended for comprehension or forming the groundwork for anticipated production activities, regardless of whether these activities are subsequently carried out or not. In practice, this suggests that by informing learners about upcoming writing or speaking tasks, educators can condition their cognitive processing of the reading material differently, thereby enhancing incidental vocabulary learning. Consequently, instructors could implicitly optimize the incidental aspects of vocabulary learning even before or without the execution of the tasks.

The findings emphasize the importance of addressing the internal cognitive processes of learners. By simply incorporating an awareness of these processes into instructional design, educators may be able to facilitate more effective incidental learning of various L2 elements. This approach could lead to teaching methods that encourage learners to engage more actively and intentionally with L2 input, even when the focus is not explicitly on, for example, vocabulary learning. Further research is required to explore how the anticipation of different post-reading tasks influences these internal cognitive processes, and how this knowledge can be leveraged in diverse instructional contexts.

Impact of the Number of Unknown Words on Learning and Retention

The analysis of data in response to the second research question—*How does the number of unknown words contribute to differences in incidental vocabulary learning?*—generated intriguing insights. To begin with, it was found that the quantity of unknown words negatively correlated with both immediate learning and retention. This indicates that participants with a greater number of unknown words were less successful in incidental vocabulary learning, both in terms of immediate learning and long-term retention.

Divergences emerged when examining the two groups separately. In the To-Comprehend group, the results mirrored those of the overall participants, revealing negative correlations between the number of unknown words and both immediate learning and retention. Conversely, the To-Produce group showed no significant correlations among the three variables. This finding suggests that, even if a large number of unknown words is present, it does not detrimentally affect incidental vocabulary learning in the To-Produce group.

The findings underscore the intricate relationship between learners' initial vocabulary knowledge, as represented by the number of unknown words, and their capacity for incidental vocabulary learning and retention. For the To-Comprehend group, the data emphasize the importance of considering learners' pre-existing vocabulary knowledge in instructional planning and implementation. In contrast, the To-Produce group did not show a negative impact from encountering a large number of unknown words. This suggests that this instructional approach may be particularly advantageous for learners with limited vocabulary knowledge. It seems that the anticipation of a productive task enables learners to engage more deeply with learning activities, leading to successful incidental vocabulary learning, even in the presence of numerous unknown words. This observation provides assurance that L2 learners' deficiency in vocabulary need not impede their engagement with productive tasks.

These findings, at first glance, appear to be in conflict with the cognitive load theory previously reviewed, as well as with VanPatten's assertion (2004) that limited processing capacity might hinder learners' ability to notice linguistic form. This seeming contradiction emerges since our results spotlight the benefits of the PBI approach for incidental vocabulary learning—an approach that demands deeper processing and, as a result, greater cognitive load. Nevertheless, it might be more enlightening to view these findings not as conflicting but as indicative that the PBI and To-produce approach operate differently in their execution of intended goals. Both strategies promote a deeper learning process; however, the former invokes a higher cognitive load, while the latter does not exert the same level of cognitive strain.

Although speculative, this interpretation reconciles our findings with established theories and proposes an intriguing direction for further investigation. We advocate that future research should explore this hypothesis, scrutinizing the unique benefits of different instructional methods, both implemented and intended, in a more comprehensive manner.

Moreover, the absence of a significant correlation between immediate learning and retention within the To-Produce group calls for further scrutiny. This result defies the expectation that potent immediate learning would invariably result in better retention. Such an outcome indicates a potential necessity for supplemental strategies or interventions for sustained vocabulary learning within a productive task-based approach. This could encompass techniques such as modifying input or

implementing strategies like repetition and review within the memory span to augment retention, which will be fruitful areas for future research.

Overall, the findings highlight the pivotal role of pedagogical approach and the volume of unfamiliar words in determining the results of incidental vocabulary learning. The study also underscores the need for additional research to deepen our understanding of these factors and how they interact in different learning contexts. By doing so, we can continue to refine and enhance the effectiveness of L2 instruction in both the immediate and longer term.

CONCLUSION

This study set out to explore the effects of different reading goals, specifically *read-to-comprehend* and *read-to-produce*, on incidental vocabulary learning, and how the quantity of unknown words influences this learning and subsequent retention. Adopting a quasi-experimental research design, the study involved two groups of Korean university EFL students, employing statistical analyses of their vocabulary tests scores and other related variables.

Our key findings suggest that the anticipation of different post-reading tasks, whether grounded in CBI or PBI, can stimulate differential internal cognitive processes in learners, consequently influencing the degree of incidental vocabulary learning. In particular, those anticipating a PBI approach showed superior incidental learning outcomes probably due to a deeper learning process. These findings shed light on the cognitive intricacies of L2 learners, emphasizing the importance of strategic planning in instructional design, to enhance incidental vocabulary learning and retention. Drawing on the findings of this research, instructors might advise L2 learners to approach reading L2 articles with the intention of writing a review, since such an approach could enhance incidental vocabulary learning. Furthermore, the quantity of unknown words was corroborated as a key factor affecting both immediate learning and retention. This effect, however, differed between the groups, implying a complex interplay between initial vocabulary knowledge, the reading goal, and the resulting incidental vocabulary learning outcomes. In particular, the data suggests that the *read-to-produce* approach may be beneficial for learners with limited vocabulary knowledge, as it promotes deeper engagement even in the face of a significant number of unknown words.

However, our study is not without limitations. While our research sample was diverse and substantial in size, it consisted exclusively of Korean EFL learners, thereby potentially limiting the generalizability of the findings. Another limitation to consider is the selection of only 20 provisional target words. This limited scope of target vocabulary could potentially affect the study's reliability and introduce variability in future replications. Such a selection was guided by practical considerations, including the level of vocabulary difficulty and time constraints on the reading activity, which together set the upper limit for the effective length of the text used in this study. Additionally, it should be also acknowledged that this study focused solely on reading activities as the medium for incidental vocabulary learning.

Given the dynamic interplay observed in this study between the cognitive processes and learning outcomes, as well as the effects of cognitive load, future research could benefit from expanding the scope to other language skills such as listening, speaking, or writing. It could particularly benefit from not only comparing the results of this study, which did not actually include comprehension tests and summary tasks, but also from implementing these tasks to see how the outcomes would contrast with both the current study and existing literature on CBI vs. PBI. Investigations into the effects of different types of productive tasks on incidental learning, or how varied input activities impact the learning and retention of new vocabulary, could add depth to our understanding of the phenomenon as well.

Our study has made modest contributions to the field of L2 education by revealing the significant role of learners' internal cognitive processes and the anticipation of different post-reading tasks in incidental vocabulary learning. L2 educators and curriculum designers may find insights into strategic planning, emphasizing the significance of setting clear expectations for learning tasks and their objectives. By highlighting the influence of the number of unknown words on learning and retention, it encourages instructors to consider learners' existing vocabulary knowledge in planning and delivering instruction. Through these contributions, this study underscores the potential for refining and enhancing the effectiveness of L2 instruction to promote incidental learning of non-target elements in both immediate and long-term contexts. Explicit course objectives will be pursued anyway; incidental gain of non-target elements is a bonus.

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