

# Conundrum of Learning Vocabulary from Context:

## Lexical Inferencing

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### 1. Introduction

In second language pedagogy, vocabulary acquisition has long been one of the most difficult areas to investigate and deal with. Compared to teaching grammar, pronunciation or the four skills of listening, speaking, reading, and writing, teaching vocabulary has been tricky because how many of which words need to be taught with what kind of approaches has not been clear. At around the second half of the 20th century, however, digital data processing started to make it possible to have clearer views of vocabulary. Since then, vocabulary in the form of corpus, concordance, and collocations, has given some graspable idea of what vocabulary is all about. In addition, introduction of the concept of word frequency has greatly contributed to the exploration of how words are used or can be taught or learned (Nation, 2001). Learners need to assimilate some bulk of frequently used words first rather than meddling with rarely used words at the early stages of language learning to make proper progress. In a sense, what kinds of vocabulary words are to be taught or learned has become clearer. As a matter of fact, what approach to take to help learners acquire vocabulary, or in other words, how second language vocabulary is actually built up in learners, is still not known yet.

As one effective way to acquire second language vocabulary, scholars and teachers who know the beneficial scaffolding effects of extensive reading promote the idea of reading a good number of books at the learner's manageable vocabulary levels. This will help both building up vocabulary and enhancing reading comprehension skills at the same time. By cumulative experience of encountering

words in context, vocabulary knowledge is considered to develop incrementally. If learners acquire more vocabulary, reading becomes easier and is promoted as a result. If learners read more, additional vocabulary is gained. In other words, building up vocabulary and enhancing reading skills develop as virtuous circle (Pulido & Hambrick, 2008). Their relationship can also be described as the Matthew effect.

It is understood that in extensive reading, learners incidentally build up vocabulary by encountering unknown words in context, when they attempt to comprehend and acquire the meanings and properties while grappling to understand the meanings reading passages convey. Accumulation of this experience is supposed to lead to further expansion of vocabulary, which has a variety of properties such as phonology, script, meaning, grammatical function, collocation, and colligation. In this process, learner's inferencing the meanings of unknown words from context or available clues plays a major role in acquiring the vocabulary and understanding the text. In other words, incidental vocabulary learning presupposes successful lexical inferencing in context. Also, in the process of incidental vocabulary learning, accumulated knowledge about vocabulary words needs to be stored in the form of a semantic network for later uses, which ultimately becomes a part of the learner's acquired vocabulary knowledge. While it is desirable for L2 pedagogy to be able to clarify the processes of vocabulary inferencing and retention to effectively help learners, knowledge about them remains limited.

This paper is a preliminary attempt to illuminate a part of the process of incidental vocabulary learning with focus on lexical inferencing in context. The organization of this paper is as follows. First, research results of incidental vocabulary learning focusing on lexical inferencing from the point of view of second language learning are discussed. Then, similar discussions on first language acquisition are presented. Thirdly some preliminary studies on lexical inferencing in context by second language learners conducted by the present researcher and colleagues<sup>1</sup> will be introduced. Within the limited scope of this paper, some pedagogical implications will be deduced to conclude the paper.

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## **2. Lexical Inferencing and Incidental Vocabulary Learning in Second Language (L2) Pedagogy**

Since the late 20th century, such terms as “inferencing” and “lexical inferencing,” coined from the noun “inference,” have been commonly used to denote the process of figuring out the meanings and some properties of unknown words in incidental vocabulary learning. Originally this process in second language pedagogy was investigated from the point of view of strategy training in reading comprehension. Bialystok defined “inferencing” as a part of language learning strategies: “. . . the use of available information to derive explicit linguistic hypothesis. The information used for this purpose may be linguistic or nonlinguistic, it may be taken from the speaker or from the environment, and it may relate to the structure or the meaning of the language” (1981, p. 26). The concept of “inferencing” gradually gained attention and has developed into the lexical inferencing studies now familiar. This section reviews the reports on investigations into L2 lexical inferencing as a strategy followed by studies on lexical inferencing and incidental vocabulary learning from the point of view of success rates, and then discusses the characteristics of incidental vocabulary learning in L2 learning contexts.

The earlier studies of second language lexical inferencing in the framework of language learning strategy studies reported some partial but crucial effects of learner’s inferencing practice. Bialystok (1983) investigated the effects of such treatments as provision of pictures that depict the gist of a passage, prior training lessons to promote inferencing, and dictionary use to comprehend some texts and infer the meanings of unknown words. One of the experiments in the study reported that prior inference training and dictionary use showed significant effects compared to no treatment both on text comprehension and guessing vocabulary meanings. The treatment of inference training brought about a strong tendency of the participants producing cases of word inferencing both in failure and success compared to the cases without such a treatment. It was, however, intriguing that similar results were not obtained by another experiment in the same study. Although not definitive, this research suggested the potential of investigating the second language learner’s inferencing capacity and its possibility. In the similar vein, Fraser (1999) conducted a five-month learning strategy study on reading comprehension and vocabulary learning to identify what strategies eight Francophone ESL (English as a Second

Language) university students used to deal with unknown words in reading passages. They did use inferencing strategy, which produced 52% accuracy, and dictionary consultation with 78% accuracy as well. When retention rates one week after the whole procedure was analyzed, such treatments as combining inferencing and consultation of dictionary, using L1-based word-identification, and having previous partial knowledge of vocabulary items identified by VKS (*Vocabulary Knowledge Scale*) (Wesche & Paribakht, 2010) had stronger effects. The researcher emphasizes the incremental nature of vocabulary learning revealed by the retention effects of previously familiar but not known words as had been demonstrated in the study.

Summarizing the studies in the past decades of incidental vocabulary learning, from the point of view of success rates of lexical inferencing, Huckin and Coady (1999), reviewing the empirical research results, stated that incidental vocabulary learning had not been fully understood with many questions still to be settled. The riddle of the mechanism or effects of incidental vocabulary acquisition in text comprehension continued even to the middle of the 2000s (Waring & Nation, 2004). Referring to the vocabulary gain, i.e., success rates reported to have been brought about by lexical inferencing in context, in the nine research results obtained from 1989 to 1999, they admitted the complexity of the issue: "One of the most striking things . . . is that the results differ quite widely. We have success rates as high as 25% and as low as 5.8%" (p. 101). As possible reasons, they pointed out the frequency of encountering the target words in the passage used in the experiment, the types of the target words, and the kinds of test used for accuracy evaluation. This means that a variety of independent factors can be involved in the processes and the outcomes of incidental vocabulary learning.

Still further research into the process or mechanism of incidental vocabulary learning continued with focus on lexical inferencing. Haastrup (2008) investigated lexical inferencing by L1 Danish 13th, 10th, and 7th grade (13 years of age) learners of English as L2 with focus on the processes and success rates of lexical inferencing. Three identical English passages were used across the three grades, which revealed the processes and success rates characterized along with maturity development of the participants. The L2 lexical inference success rates were 48.10%, 37.27%, and 16.83% for grades 13, 10, and 7 respectively (p. 95). The results showed that lexical inferencing success rates tended to moderately and highly correlate with vocabulary sizes of learners and reading ability of them as well as all grade levels. This large-

scale study sheds more light to understanding lexical inferencing. Still, as Wesche and Paribakht (2010) concluded, “an integrated theoretical explanation of this [L2 lexical inferencing] process and its outcomes remain an elusive goal, one that will continue to draw from ongoing research on L2 comprehension and vocabulary acquisition studies” (p. 30).

Researchers’ further exploration in pursuit of clarifying the characteristics of lexical inferencing brought in a new factor of lexical knowledge, i.e., the depth of vocabulary knowledge. Nassaji (2006) used the WAT (Word-Associate Test) (Read, 1993) to reveal learners’ depth of vocabulary knowledge that can contribute to lexical inferencing success and relate to different types of lexical inferencing strategies they used. Hu and Nassaji (2014) identified some inferencing strategies typically taken by successful learners and others by unsuccessful ones. Recently in order to support the idea of lexical inferencing and vocabulary learning from extensive reading, experiments from the point of view of adding some treatments to lexical inferencing or extensive reading have been conducted. Bahramlou and Esmaceli (2019) have incorporated the idea of implementing inferencing of target words in the frame work of group dynamic assessment (GDA) activity based on Vigotsky’s ZPD (Zone of Proximal Development) and compared it with doing vocabulary exercises and in combination. While GDA treatment and vocabulary exercise treatment mutually did not show significant differences in their effects, combining them showed significantly different effects on vocabulary learning. A similar attempt by Boutorwick, Macalister, and Elgort (2019) compared vocabulary learning effects from extensive reading only and extensive-reading-plus approaches. They found more facilitative effects of the extensive-reading-plus approach as well.

Although it seems that lexical inferencing and incidental vocabulary learning in reading is crucial, identifying how learner’s vocabulary is built up by such practices is still difficult to understand. Webb (2020), looking back on the past research, states that “Studies of incidental vocabulary learning reveal small gains after a relatively large amount of study time . . . . However, there are several reasons why incidental vocabulary learning gains are not only meaningful but central to L2 lexical development” (p. 231). With a similar view, but more accommodating to intentional vocabulary learning, Nation and Waring (2020) place vocabulary learning in a larger picture: “Although we have been comparing deliberate learning with learning from reading, deliberate vocabulary learning is not in competition with extensive reading

but should be seen as a support for extensive reading and a very useful part of a balanced learning program” (p. 115).

In second language pedagogy, lexical inferencing and incidental vocabulary learning have clearly been shown to play crucial roles although the process or mechanism of them is not empirically explained even today. One of the reasons why such concepts need to be discussed further can be that they play more eminent roles in L1 acquisition. Most of the vocabulary words L1 speakers acquire are considered to owe much to incidental learning. Although L1 children deliberately learn many words at school, it has been said that no deliberate L1 school programs have been able to explain the amount of vocabulary L1 speakers ultimately accumulate. Therefore, in L1 acquisition, Incidental Learning Hypothesis can also be called Default Learning Hypothesis (Webb & Nation, 2017). This means investigation is needed as to how L1 vocabulary is acquired by L1 children more in detail.

### **3. Lexical Inferencing and Incidental Vocabulary Learning in L1 Acquisition**

In L1 vocabulary acquisition research, lexical inferencing and incidental vocabulary learning have been investigated and discussed as in second language pedagogy. The size of acquired vocabulary in L1 is far larger than that in second language vocabulary and a great part of L1 vocabulary acquisition can be ascribed to incidental learning. According to Nagy and Scott (2000), “At least some children learn 2,000 or more new words per year, most of these apart from explicit instruction . . . . The high rates of vocabulary growth observed in many children occur only through immersion in massive amounts of rich written and oral language” (p. 280). Since measuring vocabulary size can be tricky, the reported ranges of vocabulary size could vary depending on different studies and individuals studied as well. As examples, Nagy and Herman (1987) quoted five different earlier studies ranging from year 1930 to 1974 on school children, reporting on the average annual vocabulary growth of 1,902 to 3,827 words by children, which led to the total of 32,290 to 41,570 words at the 12th grade (p. 22).

While this much vocabulary acquisition is the result of both instruction and incidental learning in both written and spoken contexts, explicit classroom instruction at school is considered to be limited. Therefore, much of such acquisition has to be ascribed to incidental learning in context. As a matter of fact, the effects of

determining the meanings of unknown words in context was extensively investigated in the field of reading comprehension from cognitive points of view around the middle of the 20th century. Ames (1966) tested L1 graduate students deducing the meanings of unknown words in contexts to classify contextual clues the participants used so that they can be applied for instruction of vocabulary. Sternberg and Powell (1983) tried to propose a theory of the process of verbally learning meanings of words sorting out from important to unimportant contextual clues as a cognitive process. These studies show broad interests in investigating contextual clues in L1 reading comprehension.

Usefulness of contextual clues in vocabulary acquisition drew attention and was often used in vocabulary instruction in elementary school classrooms as well. Beck, McKeown and McCaslin (1983) closely studied the effectiveness of contextual clues. They tested adults with a naturally occurring basal reader passage for children with target words in context by classifying contextual clues into four different types: directive, general, nondirective, and misdirective, depending on the helpfulness for identifying the intended meaning. Although the sample size of 13 participants was small, they obtained the result that illustrated direct contextual clues to be identified more helpful with the descending order from directive to general, nondirective and to misdirective. They demonstrated that contextual clues are not always beneficial, but their facilitation can vary in naturally occurring texts. Sometimes they do not help inferencing or even can be misleading. This study sets the background where lexical inferencing occurs in natural text reading.

Contribution by contextual clues can be consequently variable, so one might ask if children are successful in inferencing meanings of unknown words in context and if acquiring them can actually contribute to the vocabulary size they obtain. What else can contribute to the large stock of vocabulary? Jenkins, Stein, and Wysocki (1984), pointing out the paucity of time spent on direct instruction in classroom, state that “it is hard to resist the conclusion that changes in word knowledge [in children] must result from something other than direct instruction...” (p. 769). Incidental vocabulary learning, therefore, is a “default explanation” or “default argument” (pp. 769-770).

A series of research attempts were made to explain the default hypothesis of learning vocabulary in context. Jenkins, Stein, and Wysocki’s (1984) study investigated the success rates of definition supply and definition choice (multiple-

choice) by fifth graders with unknown words with fairly directive contexts created particularly for the experiment. The participants correctly inferred the meanings of the words in the range of 17.1% to 50.2% for supplying definitions and 39.5% to 72.4% for choosing multiple-choice definitions in the frequency range of encountering the target forms from zero to ten times in context. It is hard to tell if this result directly explains the function of incidental vocabulary learning in vocabulary building, but the results show that fifth graders did learn new words from context. Nagy, Herman, and Anderson (1985) used natural context clues to examine lexical inferencing by eighth graders by having them read narrative and expository passages. They state that even by encountering a word just once only, “learning from context does take place . . . it was statistically robust . . .” (p. 245). Nagy, Anderson, and Herman (1987) also tried to identify the effectiveness of contextual clues on vocabulary learning with third, fifth and seventh graders using narrative and expository naturally occurring texts. The participants marked 3.3% gain on the words they encountered in the text read, which they claim to show a statistically significant effect.

It is difficult to decide if such results obtained in past studies can explain the size of vocabulary L1 youngsters are said to acquire by the time they graduate from high school. Incidental vocabulary learning, therefore, has been called the Default Learning Hypothesis by various researchers (Webb & Nation, 2017, p. 51). In order to explain at least numerically, some calculations have been made. For example, Nagy and Herman (1987) attempted the following calculation: “If students were to spend 25 minutes a day reading at a rate of 200 words per minute for 200 days out of a year, they would read a million words of text annually. According to our estimates, with this amount of reading, children will encounter between 15,000 and 30,000 unfamiliar words. If 1 in 20 of these words is learned, the yearly gain in vocabulary will be between 750 and 1,500 words, or between a quarter and a half of the average child’s annual vocabulary growth” (p. 26). This explanation could reflect what happens among L1 children; however, there is still no proof of this calculation to understand what L1 vocabulary acquisition is or how actually it can happen.

Still, in the field of L1 vocabulary instruction, it looks like the tentative explanation about vocabulary development is assumed and teaching vocabulary presupposes the inherited explanation as has been stated by Farstrup and Samuels (2008): “The average child enters school with a very small reading vocabulary,



typically consisting largely of environmental print. Once in school, however, a child's reading vocabulary is likely to soar at a rate of 3,000-4,000 words a year, leading to a reading vocabulary of something like 25,000 words by the time he or she is in eighth grade, and a reading vocabulary of something like 50,000 words by the end of high school" (p. 58). They strongly encourage "to immerse them in a rich array of language experiences so that they learn words through listening, speaking, reading, and writing" (pp. 59-60). Similarly, Graves (2016) further supports the idea of promoting incidental vocabulary learning for L1 children: "[S]ince most words are learned incidentally, students need to be immersed in rich reading, listening, discussion, and writing experiences through the school day" (p. 69). Hence, in L1 pedagogy, incidental vocabulary learning seems to have been supported and has its own place. Children who presumably enter school with a relatively small vocabulary size can be estimated to acquire roughly 10 words a day during the 12 years of schooling and will roughly obtain 43,800 words. These calculations partly explain the growth of L1 vocabulary size, but there is still no plausible explanation about how this can occur, if it follows a linear development, or is something like an exponential growth. Either way, why such a shape of development takes place has not been clarified. In order to illustrate what happens when L2 learners try to identify the meanings of unknown words, the following section reports on some preliminary studies of a closer look at lexical inferencing attempted by L2 learners.

#### **4. Cases of lexical inferencing in L2 text comprehension**

The present researcher and colleagues tried to investigate the process of lexical inferencing in context attempted by L2 learning university students. The main concern of these studies is how learners make use of naturally occurring contextual clues when inferring the meanings of unknown words in reading passages. Data was elicited by asking the participants what the target words meant and why or on which ground they thought so. The participants responded in writing down in their L1 "because . . ." on a response sheet for each inferencing case they worked on. As has been reported on in both L1 and L2 lexical inferencing studies discussed above, success rates of figuring out unknown words are not very high in the studies reported below either.

Study I (Saito et al., 2015) used an expository passage of 303 words taken

from Nation (2009a) with 10 target words, *controversy, factor, genetic, genomes, intellectuals, multiply, offspring, regulate, vast, vegetarian*, to elicit inferencing behavior taken by 79 high, mid, and low vocabulary level university students (Schmitt, 2000). Since the study investigated the strategy the participants took in terms of bottom-up or top-down approaches in inferencing, the contextual clues examined ranged from word, sentence, discourse, i.e., beyond the sentence, general background knowledge, to interlingual knowledge, i.e., borrowing, levels. While across all the vocabulary levels the participants showed some tendency to use word-level-knowledge based clues, higher vocabulary level participants achieved significantly more correct inferencing and showed more effective uses of multiple levels of clues for inferencing. In other words, higher vocabulary level learners showed a difference from lower vocabulary level ones in terms of lexical inferencing. Still the simple percentage average of overall success rates ranged from 36% correct, 32% partially correct, and 42% incorrect.

Study II (Okuwaki, et al., 2016) investigated 81 intermediate level university students' lexical inferencing behavior by using an expository passage quoted in the study by Wesche and Paribakht (2010). This naturally occurring passage was not controlled for vocabulary levels. The seven target items were three nouns, *breakthrough, coverage, quest*, and four verbs, *hail, backfire, snoop, incubate*. This study revealed success rates in simple percentage averages of 30% correct, 13% partially correct, and 57% incorrect. No obvious patterns of the kinds of clues that contributed to success in inferencing was identified, but sentence-level clues seemed to have generated more cases of correct inferencing. Presumably because the target words were fairly difficult, the participants reported on their attempts to analyze the target words themselves to attain the meanings. When nouns and verbs are compared, verbs elicited more accurate inferencing, which was brought about by making use of sentence-level contextual clues.

Study III (Tajika, et al. 2021) investigated the lexical inferencing behavior by 58 intermediate university students with the vocabulary levels of 4400 to 9600 words. The reading passages used were two narratives of some 260 words taken from Nation (2009b). The targets were, four nouns, *shepherd, hatred, prejudice, spectacle*, and six verbs, *discourage, deceive, neglect, exaggerate, trick, drag*, all replaced with non-words. The vocabulary coverage rate was within 98% of the text known. Non-words were used to eliminate the variance of lexical knowledge about

the target items among the participants. Simple percentage average success rates were 40% including correct and partially correct with 60% incorrect inferencing. The rates of success among the ten words ranged very wide, from the lowest 10.2% correct, *prejudice*, to the highest 76.3% correct, *drag*. This variation clearly shows how contextual clues can affect success rates of lexical inferencing. In this study no strong connection was shown between the success rates or the kinds of contextual clues used and the differences of the participant's vocabulary size. The past L2 studies, as in Study I, observed the differences in success rates related to vocabulary sizes of the participants. Study III, however, did not show such a tendency. In order to identify this difference, further study is needed. As a result, lexical inferencing studies obtain a variety of results, as has been in the past studies both in L2 and L1. Possible variables can be numerous including the participants' linguistic or other backgrounds, the text itself, effectiveness of contextual clues, text types like expository or narrative, or contextual environment the target word is placed. This may not be all.

As has been indicated in the above studies, investigating lexical inferencing in context can be very tricky and it is not easy to capture how it happens. Further attempts are needed. When comparing all the success rates across L2 and L1 studies discussed above, it is quite intriguing that across all the studies, success rates of lexical inferencing are not very high in general.

## **5. Implications and conclusion**

On the basis of what has been learned from the research on L2 and L1 lexical inferencing in context, it is possible for learners to infer and learn the meanings of unknown words by making use of contextual clues, which can lead to incidental vocabulary learning. Although the levels of attainment vastly differ depending on the target items and effectiveness of contextual clues, learners do obtain the meanings of unknown vocabulary words. What remains as a puzzle is how such learning can lead to the vocabulary size, which, in the case of L1, can be quoted as somewhere in the range of 25,000 items at the 8th grade and 50,000 by the time children leave high school. The picture of the process of such development has not been clarified yet. Does this happen in a linear development, as a gradual increase, or exponentially at some certain stages? Explanation of L2 vocabulary development is in a similar

or more incomprehensible situation. Incidental vocabulary learning, therefore, still presumes a default hypothesis as its background, which needs to be explained more specifically.

Another point to be made is why incidental vocabulary learning both in L2 and L1 tends not to be quick or all at one time, but seems slow and haphazard. Summarizing what researchers commonly mentioned, Shelfelbine (1990) stated: “[L]earning word meanings from context is a relatively slow, incremental process with a strong cumulative effect across many years of wide reading” (p. 72). In L2 learning, being able to memorize a word list can give an impression that the words have been acquired, but vocabulary, as a matter of fact, has more complex characteristics with its cumulative, incremental, multi-faceted, and multi-dimensional nature. Words are not just items listed in a dictionary, but have complicated relationships with other words especially in terms of meanings. The fact that numerous words have multiple meanings or even such tendency can be a more common nature of vocabulary words. Numerous researchers point out that words have depths of meaning that can be multi-layered and cannot be learned only in a single context. Rather, words reveal different connotation, collocation, connection, and colligation which have to be learned in the variety of contexts in which they occur. Therefore, words are not just items like dictionary entries but they form networks that connect each item in a complex way. Developing such networks of words requires learners to extensively encounter words in a variety of contexts. This probably calls in the scaffolding effects of extensive reading in L2 learning.

From an L2 pedagogical point of view, what learners are suggested to do is both implicit learning, i.e., extensive reading with incidental vocabulary learning, and explicit word learning. This is what has been suggested by numerous researchers (Zimmerman, 2009; Horst, 2019; Nation & Waring, 2020). Above all, L2 learners often are more advanced in terms of knowledge, cognition, and experience of the world compared to L1 children trying to acquire vocabulary, and making use of such advantage is imperative. At the same time, utilizing incidental learning should be essential if the nature of vocabulary is taken into consideration. How L2 vocabulary can be built up still needs to be explored with special attention to the incremental and cumulative nature of vocabulary.

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