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A Scoping Review of Studies into Dictionary Use and Language Learning

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Abstract: This study presents a scoping review of empirical studies on dictionary use and language learning, with the aim to systematically examine the development and trends of the field across a specific timespan. Based on the content analysis of 104 journal articles published between 1992 and 2024, this study has several major findings. The analysis of publication trends indicates that there is a surge in research interest after 2010, largely due to the rise of digital technology and the increasing recognition of the role of dictionaries in self-directed learning. While the "Big Six" dictionaries are widely used across studies, their electronic counterparts have evolved as the dominant dictionary form, mirroring the impact of the Digital Revolution. It is revealed that there is a growing presence of mixed-method design studies, reflecting the field's increasing concern for both the learning outcome induced by dictionary use and learners' cognitive processes involved in dictionary look-up behavior. It is also found that there is an overreliance on advanced and intermediate EFL/ESL learners to generate conclusions, underscoring the need for studies involving learners of diverse target L2s and varied L2 proficiency levels. Surprisingly, despite the huge potential evinced by electronic dictionaries to support language learning in areas like grammar, pragmatics, and pronunciation, research in these domains remains limited. This scoping review underscores the need for further research, especially those conducted with longitudinal design and in naturalistic contexts, to foster a holistic understanding of how dictionaries can enhance language learning.

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Opsomming: 'n Evaluerende oorsig van studies oor woordeboekgebruik en taalleer. In hierdie artikel word 'n evaluerende oorsig van empiriese studies oor woordeboekgebruik en taalleer aangebied, met die doel om die ontwikkeling van die veld asook die tendense in die veld oor 'n spesifieke tydperk, sistematies te ondersoek. Gebaseer op die analise van die inhoud van 104 joernaalartikels wat tussen 1992 en 2024 gepubliseer is, word daar verskeie belangrike bevindings in hierdie studie gemaak. Die ontleding van publikasietendense dui daarop dat daar 'n oplewing in navorsingsbelangstelling ná 2010 is, grootliks as gevolg van die opkoms van die digitale tegnologie en die toenemende erkenning van die rol van woordeboeke in selfgerigte leer. Terwyl die "Groot Ses"-woordeboeke wyd in studies gebruik word, het hul elektroniese eweknieë ontwikkel in die dominante woordeboekvorm, wat die impak van die Digitale Revolusie weerspieël. Daar word aan die lig gebring dat ontwerpstudies wat gemengde metodes behels, al meer voorkom, wat toenemende besorgdheid in die veld weerspieël oor sowel die leeruitkoms wat deur woordeboekgebruik teweeggebring word as die leerders se kognitiewe prosesse wat by woordeboeknaslaangedrag betrokke is. Daar is ook bevind dat daar oormatig gesteun word op gevorderde en intermediêre EVT-/ETT-leerders om resultate te verkry, wat die behoefte aan navorsing wat leerders van uiteenlopende tweedetaaldoeltale en gevarieerde tweedetaalvaardigheidsvlakke betrek, beklemtoon. Ten spyte van die groot potensiaal van elektroniese woordeboeke om taalleer in domeine soos die grammatika, pragmatiek en uitspraak te ondersteun, bly navorsing op hierdie gebiede, verrassend genoeg, beperk. Hierdie evaluerende oorsig beklemtoon die behoefte aan verdere navorsing, veral dié wat met longitudinale ontwerp en in natuurlike kontekste uitgevoer word, om sodoende 'n holistiese opvatting te bevorder van hoe woordeboeke taalleer kan verbeter.

Sleutelwoorde: WOORDEBOEK, WOORDEBOEKGEBRUIK, WOORDEBOEKNASLAANPOGINGS, TAALLEER, TAALVERWERWING, EVALUERENDE OORSIG, TWEEDE TAAL, EVT-/ETT-LEERDERS

1. Introduction

Nearly half a century ago, Wiegand had called on lexicographers to pay attention to knowledge about users gained from empirical studies "to write more adequate dictionary entries" (cf. Welker 2013: 532). However, "the take-off was very slow" (Tarp 2009). As noted by Nesi (2014), the increased interest in dictionary use research (see Atkins 1998) was to a very large extent fueled by the advent of 'learners' dictionaries' in the 1980s and 1990s, which has reshaped the dictionary content and design. Fast forward to the 21st century, the use of dictionaries has evolved. Benefited from the Digital Revolution (Fellbaum 2014; L'Homme and Cormier 2014; Lew and De Schryver 2014), users now employ a variety of dictionary forms — print, electronic, online, and dictionary applications — to assist their learning of both native and foreign languages. This also

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has triggered a new wave of dictionary use research, with a focus on electronic dictionaries (Lew and De Schryver 2014; Müller-Spitzer 2014).

Dictionary use research covers many sub-fields, and researchers seem to have not reached a consensus on its scope. For example, Hulstijn and Atkins (1998) outlined seven topics of dictionary use research while Nesi (2014) identified five recurring issues of dictionary use research. Different as their categorizations are, they all seem to agree that the relationship between dictionary use and L2 learning is a central issue in dictionary use research, as also observed by Hartmann (2001). As pointed out by Hulstijn and Atkins (1998), dictionary use itself is a complex and subtle activity, and investigating the effects of dictionary use on L2 learning involves many variables, including dictionary user-related variables (users' sophistication, proficiency, capability of understanding the metalanguage, familiarity with the target dictionary, and knowledge of the subject matter), task-related variables (task format and type), variables relating to both dictionary users and learning tasks (task difficulty, target L1 and L2, and type of linguistic unit), and dictionary-related variables (dictionary form, dictionary type, way of information presentation, source of information available, and adequacy of coverage). However, studies into dictionary use and language learning seem to be fragmentary and no study has ever attempted to systematically synthesize the findings, although there exist several preliminary brief reviews that touch upon certain aspects of this topic.

Literature reviews play a crucial role in guiding and benefiting researchers within a given field by summarizing and synthesizing existing knowledge. They come in various forms, including traditional literature reviews, scoping reviews, meta-analyses, and annotated bibliographies, each serving a distinct purpose in academic discourse. The present study aims to explore the interplay between dictionary use and language learning by employing a scoping review methodology.

A scoping review is a systematic and iterative approach to knowledge synthesis, designed to map the existing or emerging literature on a specific topic (Mak and Thomas 2022). It is particularly adept at providing researchers with a rapid overview of the main areas of interest and identifying significant gaps in the literature (Arksey and O'Malley 2005). Since its inception into the academia, numerous scoping reviews have been conducted in fields such as healthcare and education. This study attempts to adopt the scoping review methodology to offer a systematic and comprehensive review on the subject of dictionary use and its impact on language learning. Specifically, our investigation will be guided by the following questions:

— What research methods and research instruments were used to investigate the relationship between dictionary use and language learning in the selected studies?

— What trends could be revealed by the study distribution across publication year, academic journals, and study location?

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— What languages and language learners were covered in the selected studies? Are learners with diverse L2s and varied L2 proficiency levels well-represented in the sampled studies?

— What dictionaries were sampled as the subject of investigation in the selected studies? What forms and types of dictionaries have been the interest for research over time?

— What are the research foci of the selected studies?

2. Literature review

As mentioned in the introductory section, there have been several reviews conducted by scholars in the field (e.g., Hulstijn and Atkins 1998; Lew 2011; McCreary and Doležal 1998; Nesi 2014; Töpel 2014), but unfortunately, they failed to provide answers to the above-mentioned questions due either to the depth of analysis, analytical procedures, or the scope of investigation. In what follows, we will provide a brief review of these studies.

In the domain of lexicography, a notable tradition exists for creating annotated bibliographies. Hulstijn and Atkins (1998) contributed to this tradition by compiling an annotated bibliography encompassing approximately 50 publications focused on dictionary use and foreign language learning. Following in these footsteps, Doležal and McCreary (1999) assembled an annotated bibliography consisting of 521 publications on pedagogical lexicography, with a particular emphasis on language learners and dictionary users. Additionally, Welker's *O Uso de Dicionários: Panorama Geral Das Pesquisas Empíricas* provides a comprehensive annotated bibliography of 220 publications on empirical studies related to dictionary use (cf. Lew 2007). These works cover a wide range of studies involving multiple European languages, such as English, German, and Portuguese. Also, they often feature chapters that categorize the literature, highlight research gaps, and offer directions for future research. In a similar vein, the article by Nesi (2014) and the book chapter by Töpel (2014) could also be regarded as annotated bibliographies, with Nesi listing 35 publications on dictionary use by English learners and Töpel (2014) briefly reviewing 35 studies on the use of electronic dictionaries. Admittedly, these above-mentioned studies have touched upon various aspects of dictionary use research. However, they all did not concentrate the focus on the relationship between dictionary use and language learning. For example, among the five topics on dictionary use identified by Nesi (2014), only one was concerned with dictionary use and language learning, indicating that only a small number of studies was covered on this topic and that the scope of investigation was rather limited. Similarly, Töpel's (2014) review only covered several studies on electronic dictionary use and language learning. Also, more often than not, these surveys (e.g., Hulstijn and Atkins 1998; Doležal and McCreary 1999; Nesi 2014) only presented a brief summary of the

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included studies, and failed to offer an in-depth and systematic content analysis. One more limitation of theses studies is that they were not conducted by following standard procedures of scoping reviews or systematic reviews as they usually did not specify the literature retrieval procedures and coding schemes, making them not replicable.

Likewise, in the special issue "Studies in Dictionary Use: Recent Developments" of the *International Journal of Lexicography*, Lew (2011) authored an introduction to the studies within the issue and offered critical evaluations of the trends of dictionary use research. Illuminating as Lew's (2011) work was, it was also confined to only six studies on dictionary use included in the special issue. Interestingly, a review by McCreary and Doležal (1998) exhibited similarities to the more recent scoping reviews. In their proceedings paper, they reported on the trends and findings from a previous bibliography of 460 publications, signaling an early adoption of systematic review methodologies and the identification of research gaps within a focused topic, despite not adhering to modern scoping review protocols. However, few empirical studies into dictionary use and language learning were included, probably due to the fact that at the time of conducting the review, studies on this topic were rather limited in number.

In addition, there were two narrative reviews on vocabulary acquisition through dictionary use under intentional/incidental learning conditions (Ronald 2003a, 2003b) and a list of studies on dictionary-induced vocabulary learning (Welker 2010). However, like the most recent meta-analytic review in the field of dictionary use and vocabulary learning conducted by Zhang et al. (2021), which synthesized findings from 44 studies and examined the effects of dictionary use on second language vocabulary acquisition, the scope of these reviews was limited to vocabulary only, failing to cover other aspects of language learning.

To sum up, the review above reveals that there is a lack of systematic research synthesis and content analysis on the relationship between dictionary use and language learning. Given that scoping review has become a matured and useful method in helping researchers map out the landscapes of a research domain and that numerous fruitful outcomes have been yielded by using this methodology in areas such as health care and education, we attempt to present a scoping review of studies into dictionary use and language learning. In what follows, we will be guided by the research questions listed at the end of the Introduction section and present the procedures for conducting the scoping review, the generated results, the implications of the findings, and the conclusions drawn from the review.

3. Method

According to the framework proposed by Arksey and O'Malley (2005), there are five procedures to follow in conducting a scoping review, namely formulating the research questions, locating potential studies, selecting target studies, charting

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the data, and summarizing and reporting the data. Therefore, these steps were strictly executed to ensure that this study was methodologically transparent and replicable, and that the findings generated were reliable. As we have listed the research questions at the end of Section 1, we will outline the next steps regarding research methodology here.

3.1 Literature retrieval procedures

We firstly consulted Web of Science, Education Recourses Information Center (ERIC), and ProQuest Linguistics and Language Behavior Abstracts (LLBA) to locate relevant studies. These databases were chosen because they had a broad coverage and were frequently used in research synthesis. As the focus of this study was on dictionary use and language learning, two sets of keywords were used to launch the database search: dictionary-related keywords, including dictionary, monolingual dictionary, bilingual(ized) dictionary, electronic dictionary, paper dictionary, online dictionary, dictionary use, as well as language learning-related keywords, including vocabulary, grammar/syntax, pragmatic knowledge, reading, writing, and translation. Then, key academic journals in the field of lexicography, such as *Dictionaries*, *Lexicographica*, *Lexicography*, were manually searched to retrieve studies that were not identified through electronic database search. In addition, we also browsed the references of relevant books, book chapters, reviews, and research articles to trace potential studies.

3.2 Inclusion criteria

Five inclusion criteria were specified as the filters for appropriate articles selection. The following requirements had to be met if an article was to be considered for inclusion in this scoping review:

— It should be published before February 6th, 2024, which was the cutoff date for data collection;

— It should be reported in the English language, given that English is a de facto international lingua franca and is also prevalent in international lexicographical discourse;

— It should investigate language learning through dictionary use by language learners;

— It should provide empirical evidence about the effectiveness of dictionary use on learners' learning outcomes.

— It should explicitly report the information needed for data coding (See Section 3.3).

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Articles were excluded if it was not published within the cutoff date or not reported in English. Publication types such as literature reviews, book reviews, or editorials were also excluded for inclusion. Empirical studies that only investigate dictionary users' needs, learners' dictionary lookup behaviors, strategies or skills were not included, as they do not include language learning achievements as the outcome variable and the focus of this review was on empirical studies investigating the effects of dictionary use on language learning.

3.3 Coding scheme

Following the practices of previous scoping reviews (Hung et al. 2018; O'Flaherty and Phillips 2015) and in reference to our research questions, we classified the variables into five categories: publication-related variables, treatment-related variables, methodology-related variables, outcome-related variables, and learner-related variables.

3.3.1 Publication-related variables

This category contains four variables describing the meta-information of each selected article: study ID (the identification number of the study), author (the author of the study), year of publication (the year in which the study was published), and publication type (journal article, book chapter, or dissertation).

3.3.2 Treatment-related variables

This category mainly concerns dictionaries used, dictionary form, dictionary type, and research setting (laboratory or classroom). We firstly identified the dictionaries used in each study. As it would be cumbersome to list all individual dictionaries, dictionaries belonging to the same family or series were listed under one category, such as the Oxford series. Dictionary form was categorized as electronic or paper, while dictionary type consisted of three subcategories: monolingual, bilingual, or bilingualized. For research setting, studies were coded as laboratory or classroom depending on the location where they were conducted.

3.3.3 Methodology-related variables

This category included research methods, research design, research instruments, and type of assessment. Research methods were divided into the quantitative method (involving statistical analyses), the qualitative method (no statistical analyses), and the mixed method (involving both quantitative data and qualitative data) by following the practices of similar scoping reviews (e.g., Hung et al. 2018),

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while research design referred to whether a study adopted a between-groups design, a within-group design, or a correlational design, or whether it was observational or self-retrospective in nature. Research instruments denoted the specific measurement tools used in the study, such as vocabulary tests and eye-tracking technique. Assessment type was coded as productive test (usually requiring learners to produce language structures or texts), receptive test (usually in the form of multiple-choice tests or yes/no tests), or mixed.

3.3.4 Outcome-related variables

Outcome-related factors consisted of learning outcome and result orientation. The former referred to learners' learning outcomes. Following Stockwell (2007), it was coded as the macro skills of reading, writing and translation, as well as vocabulary, grammar, pronunciation. Results orientation indicated whether the study yielded a positive effect of dictionary use or not. Therefore, it was coded as positive, negative, no significance, or mixed.

3.3.5 Learner-related variables

This group of variables encompassed learners' educational level, proficiency, educational context, L1, and L2. Learners' educational level was coded as kindergarten, primary school, secondary school, university, or mixed. Proficiency was defined as low, intermediate, advanced, or mixed. Educational context was specified as foreign language context or second language context depending on whether learners learned a foreign language in a country or region where the target language is a foreign language, or the official language/second language. Learners' L1 and L2 were coded as their first language or second language, respectively.

3.4 Data collection and coding reliability

The procedures for literature retrieval, screening, and selection were presented in Figure 1 below. For all the 2707 articles identified through automatic database search, a researcher first read through the abstracts to make a judgment of their eligibility. This initial screening procedure culled out 2472 ineligible articles as they either failed to meet the inclusion criteria or did not directly address the research questions of interest, leaving 235 potentially useful ones. Then two researchers worked collaboratively through careful reading of the full texts to finalize the list of publications eligible for inclusion. In addition, three articles gleaned from the reference lists of relevant publications but not identified through database search were also included. Table 1 shows the distribution of articles across academic journals.

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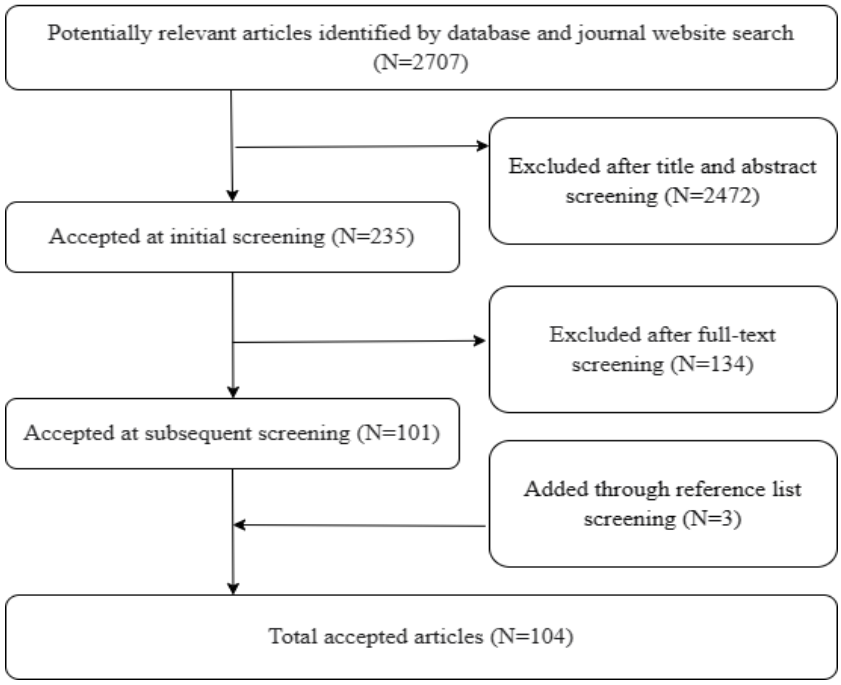

Figure 1: Flow chart for data acquisition

Two researchers were involved in coding the articles. At first, five articles were randomly selected and double-coded by the two coders. This was done to make sure that a tentative agreement on how each factor should be coded could be reached. Thereafter, one researcher undertook to code all the remaining articles and checked the results multiple times to maximize intra-coder reliability. Upon completion, twenty-five articles, accounting for almost one fourth of the remaining total, were selected and handed over to a second researcher for coding. The agreement ratio for all values in the coding sheet among the two coders was 91%. The observed discrepancies between the two coders were resolved through discussion. For example, as there is a lack of unified criteria for judging learners' proficiency level, one coder would rely on his own judgement and code learners' proficiency level as intermediate if they were from a middle school, while the other coder would code it as advanced if they were from a higher proficiency group or low if they were from a lower proficiency group based on the researcher's report, even if they were all middle school learners. The two coders then discussed about this issue and reached a consensus that learners' proficiency level should be coded based on the researcher' report, following the practice of similar scoping reviews, systematic reviews, or meta-analytic reviews. Finally, the overall results were re-examined thoroughly by the first coder to eliminate potential inconsistencies.

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3.5 Data analysis

According to Arksey and O'Malley (2005), the next stage is to analyze the data and a content analysis approach (cf. Krippendorff 2018) was adopted to do so. Summaries for each article were generated in terms of the 16 variables, subsumed under the five categories as outlined in Section 3.3. All the data were imported into Microsoft EXCEL and SPSS 22.0, and we mainly adopted frequency counts to describe the data and *t*-test for inferential statistical analysis. Data summaries and results were presented in the section that follows.

4. Results and discussion

4.1 Research methodology and research instruments employed in selected studies

In terms of research methods, it was revealed that all the sampled studies involved some sorts of statistical analysis, therefore they were all quantitative in nature. As for research design, the analysis of the 104 selected studies showed that a preponderance (n=90, 87%) was found to utilize experimental approaches, nearly half (n=44, 42%) incorporated survey techniques, and a significant minority (n=26, 25%) engaged observational methodologies. It is noteworthy that the aggregate number of methodological instances surpasses the total count of studies, a discrepancy attributable to the fact that 43 studies incorporated mixed-method designs.

We use 'experimental' as an umbrella term for both experimental and quasi-experimental designs. It is observed that numerous studies within the sample refer to 'experiments' in contexts that are more accurately described as quasi-experiments, particularly when the allocation of subjects to treatment and control groups lacks randomization. The research instruments commonly employed in these experimental studies include vocabulary retention tests, recall tests, fill-in-the-blank assessments, and matching tests.

Survey methods include questionnaire studies and interviews. Questionnaires and interviews are the instruments frequently adopted before or after the experiment to collect the subjects' attitudes toward the experiment conditions. They are also employed independently in survey studies. In contrast, observational studies are less frequently adopted in dictionary use studies. The instruments used for observation are screen-recordings, eye-trackers, search records, logfiles, and think-aloud recordings, each offering unique insights into the behaviors and processes of dictionary use.

Within the field of dictionary use, it is somewhat unexpected to find a scarcity of observational studies. While sophisticated tools like eye-trackers necessitate both laboratory settings and specialized expertise for effective use, alternative methods such as screen recordings and think-aloud protocols are more

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accessible yet remain underutilized. These latter instruments, despite their relative simplicity, have the potential to yield rich and valuable data when applied thoughtfully in research. For example, Chen and Liu (2022) leveraged the utility of screen recording to gain insights into the use of the Bing bilingual dictionary within the context of EFL writing. This approach facilitated a granular examination of the interactions between users and the dictionary interface. Similarly, Kim (2018) employed the think-aloud protocol to evaluate the effectiveness of teaching English article rules and to understand how dictionary consultation could improve the usage of articles among learners.

Another critical aspect to consider is the temporal scope of the studies. An overwhelming majority, constituting 87% of the total (n=90), are characterized as cross-sectional in design. In contrast, a considerably smaller subset, representing only 13% (n=14), employs a longitudinal approach. This discrepancy underscores an area that merits greater attention from researchers in future endeavors. The relative scarcity of longitudinal studies suggests an opportunity for longitudinal analyses that could offer more comprehensive insights into the long-term effects of dictionary use on language learning.

4.2 Distribution of studies across publication year, academic journals, and study location

As mentioned earlier, there is a total of 104 studies, published between 1992 and 2024, included in this scoping review. Figure 2 presents the publication frequency, namely the number of publications, of studies into dictionary use and language learning in each year. As can be seen from Figure 2, the number of publications before 2010 was relatively low and it remained stable across this time range. However, there was a remarkable increase in the number of publications since 2010, and there had already been two articles published in the first two months of 2024. Descriptive statistics showed that the average annual number of publications before and after 2010 was 1.44 (SD = 1.15) and 5.13 (SD = 2.39), respectively. Results from *t*-test revealed that the difference in terms of publication frequency between the two periods was significant ($F = 6.66$, $t = 5.81$, $p = .02 < .05$). These findings obviously suggest that the area of studies concerning the effectiveness of dictionary use on aspects of language learning has been increasingly gaining scholarly attention over the last decade. By analyzing the publications across the timespan, we can see that the increase in the number of publications after 2010 to a very large extent can be attributed to the rapid development of digital technology and the increasing recognition of the role of dictionaries in self-directed learning. The expansion of research into various aspects of dictionary use reflects a maturing field that is beginning to address more nuanced questions at the intersection of lexicography, language pedagogy, and technology.

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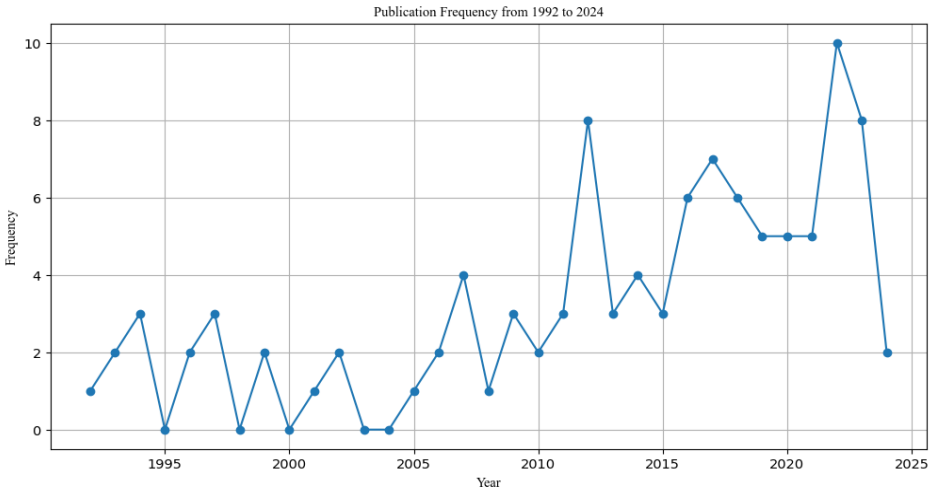

Figure 2: Distribution of studies across year of publication

Presented in Table 1 was the distribution of articles across different academic journals. It can be seen that academic journals that published relatively larger number of studies concerning the effects of dictionary use on language learning over the last three decades were *International Journal of Lexicography*, *Lexikos*, *Computer Assisted Language Learning*, *ReCALL*, and *Computers & Education*, respectively. Among these five journals, *International Journal of Lexicography* published a total of 43 articles, which was the largest number and accounted for 41.3% of all articles included in this scoping review, followed by *Lexikos*, which yielded 14 articles and accounted for 13.5% of all publications. Taken together, articles published in *International Journal of Lexicography* and *Lexikos* took up more than a half (54.8%) of all the included publications. This is perhaps not difficult to understand, as these two journals mainly publish articles in lexicography and its related disciplines, and are the only ones that are indexed by the Arts & Humanities Citation Index and the Social Sciences Citation Index in the field of lexicography. For example, on the homepage of *International Journal of Lexicography*, it is clearly stated that '*… it is concerned with all aspects of lexicography, including issues of design, compilation and use, and with dictionaries of all languages …*' [emphasis added]. Therefore, it can be seen that dictionary use is a key topic in the articles considered for publication in the journal.

However, it is somewhat surprising to see that the other three journals devoted to publishing articles in lexicography, namely *Dictionaries*, *Lexicography*, and *Lexicographica*, only published three articles on dictionary use and language learning, with two in *Lexicography* and one in *Dictionaries*, respectively. This might indicate that theoretical articles or meta-lexicographical/ontological studies dominate these three journals, or it could be because these three journals received relatively lower number of submissions on this topic as they do not boast the

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far-researching influence and impact when compared with *International Journal of Lexicography* and *Lexikos*.

Table 1: Article distribution across academic journals

Publication Title	Count	Publication Title	Count
International Journal of Lexicography	43	*PLOS ONE*	1
Lexikos	14	*Educational Technology & Society*	1
Computer Assisted Language Learning	7	*Early Child Development and Care*	1
ReCALL	6	*System*	1
Computers & Education	5	*Education and Information Technologies*	1
The Modern Language Journal	3	*Language Testing*	1
Applied Linguistics	3	*Journal of Research on Technology in Education*	1
Lexicography	2	*Journal of Educational Research*	1
Language Learning & Technology	2	*Educational Review*	1
Language Learning	2	*Journal of Adolescent & Adult Literacy*	1
Language Teaching Research	2	*Dictionaries*	1
Innovation in Language Learning and Teaching	1	*Educational Technology Research and Development*	1
TESOL Quarterly	1	*Applied Psycholinguistics*	1

It is also worth mentioning that studies into dictionary use and language learning also appeared relatively frequently in language learning technology related journals such as *Computer Assisted Language Learning*, *ReCALL*, and *Computers & Education*, or less frequently in *Language Learning & Technology*, *Educational Technology & Society*, *Education and Information Technologies*, *Journal of Research on Technology in Education*, and *Educational Technology Research and Development*. This obviously reflects the impact of the Digital Revolution on lexicography and dictionary user research (Fellbaum 2014; L'Homme and Cormier 2014; Lew and De Schryver 2014), where researchers began to focus on how the use of electronic or online dictionaries might influence language learning outcomes (e.g., Chen 2022; Chen and Liu 2023; Dziemianko 2022; Li and Xu 2015; Lo 2024; Rees and Lew 2024; Tsai 2019). It also mirrors the interdisciplinary nature of lexicography and the pervasive influence of computer science and educational technology on dictionary making and lexicographical studies. This may explain why some early scholars (e.g., Sinclair 1984) even challenged the status of lexi-

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cography as an academic subject and placed it at the crossroads of linguistics and information technology. The importance of computer science and information technology to lexicography is also reflected in the aims and scopes of academic journals in the field. For example, the publication policy of *Lexikos* states that '*articles dealing with all aspects of lexicography or the implications that research in related disciplines such as linguistics, computer and information science, etc. has for lexicography will be considered for publication*' [emphasis added].

Figure 3 presents the number of publications on studies into dictionary use and language learning across study locations. It can be seen from the figure that countries or regions with more than five publications on this topic were Poland, China, USA, Taiwan, Japan, and Hong Kong, respectively. This finding confirms our general impression that some scholars from these countries or regions are rather active in the field of dictionary use and language learning, from example, Robert Lew and Anna Dziemianko from Poland, Yuzhen Chen and Hai Xu from China, and Alice Chan from Hong Kong. Also, it is interesting to note that scholars across all the continents publish studies on this topic. For instance, Dion Nkomo from South Africa in Africa, Jim Ranalli from the United States in North America, Vilson J. Leffa from Brazil in South America, and Helen Fraser from Australia in Oceania.

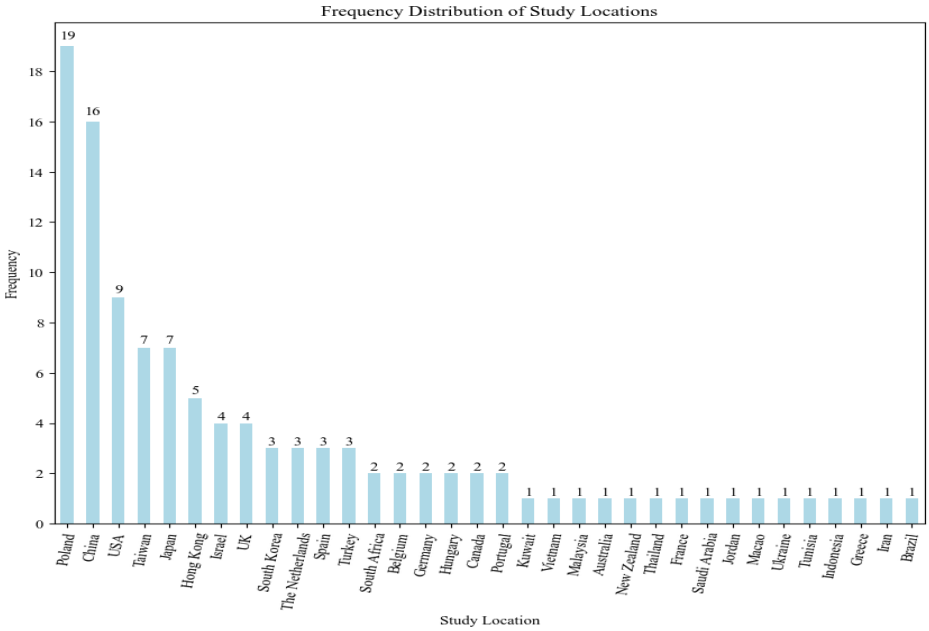

Figure 3: Distribution of studies across study location (Note that Taiwan, Hong Kong, and Macao are geographical concepts, and that they do not bear any political connotations)

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4.3 Learners' L1s, L2s, proficiency levels, and educational levels involved in the selected studies

Figure 4 shows that participants in the included studies were from diverse L1 backgrounds, with a total of 47 languages involved. Out of these studies, 34 were conducted with Chinese as participants' L1, and 20 were conducted with Polish as the participants' L1, which echoes the finding that Poland and China ranked top two in terms of the number of publications.

Unlike participants' diverse L1s, their L2s involved in the selected studies were rather limited. Table 2 demonstrates the distribution of participants' L2s in the literature pertaining to dictionary use and language learning. It should be pointed out that although this scoping review was conducted mainly to chart the landscape of studies into dictionary use and L2 learning, two studies with native speakers as participants were also identified. Wolfer et al. (2018) conducted an empirical study to examine whether and to what extent lexicographical tools might help to improve L1 text revision results. Korat et al. (2022) compared whether e-book reading with a dictionary and the teacher's support, or e-book reading with a dictionary would outperform e-book reading only in fostering L1 kindergarten learners' vocabulary knowledge. These two studies, though limited in number, all consistently lent supporting evidence to the effectiveness of dictionary use in improving L1 learners' language learning outcomes.

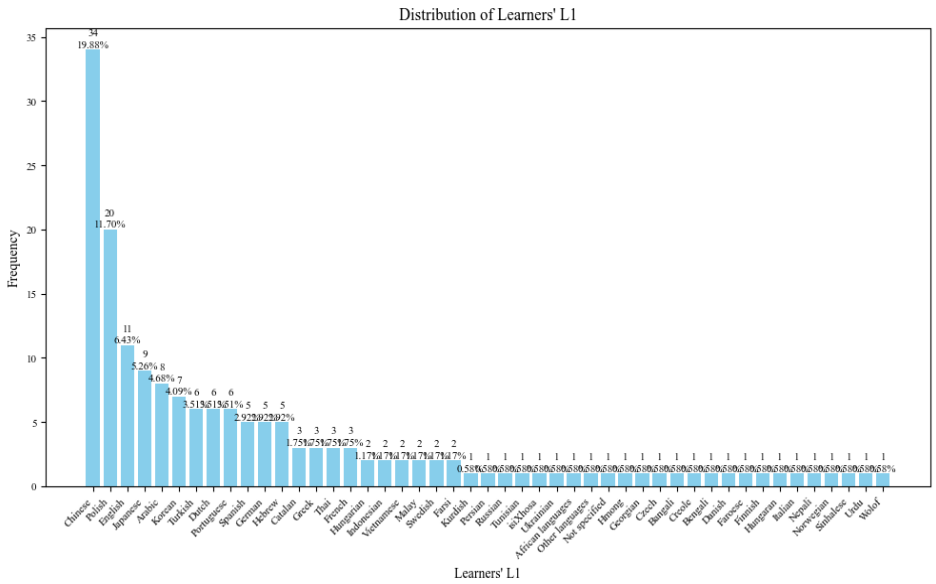

Figure 4: Learners' L1 backgrounds

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Table 2: Learners' L2s involved in the studies

Target L2	N	Percentage
English	93	91.20%
French	3	2.94%
German	2	1.96%
Spanish	2	1.96%
Greek	1	0.98%
Chinese	1	0.98%

Out of the remaining 102 studies involving L2 learners, 93 were conducted with English as the L2, making it the most common target language being investigated among the included studies, followed by French (n = 3), German (n = 2), Spanish (n = 2), Greek (n = 1), and Chinese (n = 1), respectively. This result reinforced findings from Zhang et al. (2021) that the area of empirical dictionary use research has over-relied on conclusions drawn from L2 English learners, and that learners with other L2s, especially non-Indo-European languages, are under-represented. Such a result is probably not difficult to understand, as English has long been an international language and plays an important role in cross-national and cross-cultural exchanges, which has driven numerous L2 learners to devote themselves into English learning (McKay 2002). More studies are needed to investigate how different target L2s might influence the effectiveness of dictionary use on L2 learning outcomes, as language distance and script distance have been proved to exert an influence on L2 learning gains (Melby-Lervåg and Lervåg 2014).

Hulstijn and Atkins (1998) pointed out that users' l2 proficiency should be a main variable in empirical studies into dictionary use. Presented in Table 3 is the distribution of learners' L2 proficiency levels across studies. We treated each independent sample as an individual study, and therefore, there are 136 individual studies in total. It can be seen that one study did not report learners' proficiency. Out of the remaining studies, 54 dealt with advanced learners, 72 focused on intermediate learners, and 7 investigated low-level learners. In addition, 2 studies recruited participants of mixed proficiency levels. From the descriptive results, it can be concluded that almost all studies were conducted under instructional settings, as the proficiency levels were explicitly reported by the teacher researchers. Future studies should take account of learners using dictionaries in naturalistic settings, which, however, would increase the difficulty of data collection. Hulstijn and Atkins (1998) argued that participants of differed proficiency levels should be sampled when systematically investigating the effects of dictionary use on L2 learning outcomes. Our results revealed that a large majority of studies were conducted with advanced and intermediate learners as participants, and that only a small portion examined low-level learners. Therefore, low-level learners were under-represented in this area of research. This finding is consistent with Zhang et al. (2021), who also revealed in their

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meta-analysis of studies into dictionary use and vocabulary learning that there is a scarcity of research that recruited low-level learners as participants. Also, it should be pointed out that a large proportion of studies relied on researchers' impersonal judgement or learners' grade levels in deciding their proficiency level, with only a handful of them categorizing learners' proficiency depending on scores from standardized tests such as TOFEL or IELTS. It remains unclear how such a hazard in proficiency categorization would influence the results. Future studies should make improvements in this regard by adopting standardized measures of proficiency when profiling participants.

Table 3: Learners' L2 proficiency levels

Proficiency	N	Percentage
Advanced	54	39.71%
Intermediate	72	52.94%
Low	7	5.15%
Mixed	2	1.47%
Not reported	1	0.74%

Table 4 demonstrates learners' educational levels. As is shown below, 86 studies were undertaken in higher or tertiary education context (e.g., Ptasznik 2020), followed by the 18 studies conducted in secondary education context (e.g., Bartelds 2021), and two in primary education context (Hall and Louw 2022; Tall and Hurman 2002). It is also worth noting that there was one study conducted in the preschool context (Korat et al. 2022). This finding is similar to scoping reviews conducted in other domains, such as digital game-based language learning (Hung et al. 2018), where researchers also found that college/university students were the most common research samples. This is probably because empirical dictionary use studies were mainly conducted by researchers from universities, where university students were more skilled dictionary users and it would be convenient to sample university students. Therefore, in order to draw a fuller picture of the effects of dictionary use and language learning, more studies are needed to investigate the dictionary lookup patterns of primary school students and kindergarteners.

Table 4: Learners' educational levels

Educational levels	N	Percentage
College	86	78.18%
Secondary school	18	16.36%
Mixed	3	2.73%
Primary school	2	1.82%
Kindergarten	1	0.91%

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Taking together the results from Tables 3 and 4, it would be more obvious to see which groups of learners were relatively unrepresented. Table 5 is the cross tabulation showing the number of studies focusing on learners' proficiency levels by educational contexts. It can be seen that there is a severe scarcity of research dealing with kindergarten and primary school learners across all frequency levels.

Table 5: Number of studies focusing on learners' proficiency levels by educational contexts

Education levels	Language proficiency levels						Total
	Low	Intermediate	Advanced	Native	Mixed	Not specified	
Kindergarten	0	0	0	1	0	0	1
Primary	1	1	0	0	0	0	2
Secondary	0	8	2	0	2	0	12
Tertiary	2	33	21	1	23	1	81
Mixed	0	1	1	0	4	0	6
Other	0	0	1	0	1	0	2
Total	3	43	25	2	30	1	104

4.4 Dictionaries, dictionary type, and dictionary form

It is perhaps not surprising to find that among these included studies, the 'Big Six' dictionaries were frequently used by researchers in the field of dictionary use and language learning. The descriptive result shows that the most commonly used dictionary is the 'Oxford' series (n = 34), followed by the 'Longman' series (n = 30), the 'Collins' series (n = 14), the 'Cambridge' series (n = 12), the 'McMillan' series (n = 7), and the 'Merriam-Webster' series (n = 3), respectively. It mirrors the fact that researchers tend to appeal to authoritative dictionaries that have relatively large market share and learners are relatively familiar with when undertaking the studies.

In terms of dictionary type, 66 studies investigated L2 learners' use of monolingual dictionaries (e.g., Alzi'abi 2017; Chen 2022), 38 studies dealt with bilingual dictionaries (e.g., Chen and Liu 2023; Ptasznik 2023), and 17 focused on bilingualized dictionaries (e.g., Chan 2017; Kim 2018), respectively. In addition, there are four studies which did not specify which type of dictionary was adopted (e.g., Uchihara et al. 2022). These findings echo Welker's (2013) observation that "very few have investigated the use of monolingual dictionaries by native speakers," considering the observation was made a decade ago. Also, according to the meta-analysis conducted by Zhang et al. (2021), dictionary type was found to moderate the relationship between dictionary use and vocabulary learning. Therefore, we would suggest that future studies should explicitly specify the type of dictionary involved when investigating this topic so that results from different studies could be more interpretable and comparable.

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As for dictionary form, it is interesting to see that electronic dictionaries play a dominant role in the included studies (n = 53), accounting for 50.96%. There were 38 studies were conducted based on paper dictionaries, taking up 36.54% of the total. Twelve studies used both electronic and paper dictionaries (e.g., Alahmadi and Foltz 2020), accounting for 11.54%. One study failed to specify which dictionary form was chosen (Fajt et al. 2023) quite possibly due to the fact that the study was designed as a large-scale survey to investigate the relationship between learners' motivation and dictionary use. The dominance of electronic dictionaries in such studies reflect the impact of the Digital Revolution on dictionary use research, as mentioned earlier in Section 4.2, where researchers have begun to shift their attention onto electronic dictionaries (Müller-Spitzer 2014).

4.5 Study focus and language learning outcomes

The term "study focus" refers to the specific linguistic aspects that the research within the domain of dictionary use and language learning addresses, including vocabulary, writing, reading, grammar, translation, and pronunciation. Reflecting the foundational importance of vocabulary in language acquisition, it is anticipated that a substantial portion of these studies would concentrate on this area. This expectation is confirmed by the data presented in Table 6, where more than half of the studies (n=68; 52%) have a primary focus on vocabulary enhancement.

As detailed in Table 6, writing and reading are the subsequent areas of focus, with 18% (n=23) and 15% (n=20) of the studies dedicated to each, respectively. Studies focusing on grammar and translation are less prevalent, accounting for 6% (n=8) and 5% (n=6) of the total, respectively. Additionally, a small subset of studies (n=4) defies straightforward categorization into these linguistic aspects. Among these, two studies (Fajt et al. 2023; Liu et al. 2019) examine the motivations behind dictionary use, one (Ptasznik 2020) explores defining models, and another (Nkomo 2017) investigates dictionary use behavior during examinations. Notably, only one study (Fraser 1997), dating back nearly three decades, has specifically addressed the aspect of pronunciation.

Given the potential of electronic dictionaries and dictionary applications in assisting language learners with pronunciation, the relative neglect of this area in recent research is striking. This observation, highlighted in Table 6, suggests a gap that warrants further investigation. Recent survey studies (El-Sawy 2019; Hakim et al. 2020; Metruk 2017) indicate that a significant portion of EFL learners worldwide use the pronunciation features of electronic dictionaries to improve their own pronunciation, yet relevant experimental studies examining the extent to which electronic dictionaries could influence L2 pronunciation learning as well as the potential moderator variables remain insufficient. Future studies should be conducted to explore the use of these technological resources in the context of pronunciation learning, thereby contributing to a more comprehen-

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sive understanding of how dictionaries can be leveraged to support language acquisition holistically.

Table 6: Distribution of study focus

Study Focus	Frequency	Percentage
Vocabulary	68	52.30%
Writing	23	17.69%
Reading	20	15.38%
Grammar	8	6.15%
Translation	6	4.62%
Other	4	3.08%
Pronunciation	1	0.77%

5. Conclusion

This scoping review assembles a large body of empirical studies examining the effects of dictionary use on various aspects of language learning. It illuminates the evolving landscape of dictionary use and language learning research, highlighting both its strengths and areas for further exploration. The dominance of experimental approaches and the increasing adoption of mixed-method designs reflect the field's maturation and commitment to rigorous research practices. However, this review also reveals several gaps and challenges that warrant further attention. While the rapid development of electronic dictionaries and dictionary applications offers new opportunities for language learning research, studies into their potential as a learning tool are limited and confined to their impact on the improvement of vocabulary knowledge, reading comprehension, and writing competence. Further efforts are needed to explore the effectiveness of these technological resources in supporting language learning in areas like grammar, pronunciation, and pragmatic competence. Also, although researchers have begun to focus their attention on learners' dictionary look-up behavior and their cognitive processes involved in it, much of the data were collected using questionnaires or surveys. Researchers are encouraged to explore methods such as screen recordings, eye-tracking and think-aloud protocols to gain deeper insights into how learners interact with dictionaries in authentic contexts. In addition, it is noted that a large proportion of the sampled studies adopted a cross-sectional study, which limits our understanding of the long-term effects of dictionary use on language learning. Given that longitudinal studies boast higher ecological validity, studies with longitudinal design are crucially needed to track the changes of learners' dictionary use skills and reveal their sustained impact on language proficiency over time. Finally, the over-reliance on English as a second language and the underrepresentation of low-level and

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primary/secondary school learners necessitate a more inclusive research agenda. Future studies should investigate the unique challenges and opportunities faced by diverse language learner populations and explore the potential of dictionaries in supporting their language learning processes. By addressing these gaps and challenges, we believe that researchers could contribute to a more thorough understanding of the interplay between dictionary use and language learning, which will facilitate the design of more user-friendly dictionaries, formulate pedagogical strategies that cater to the diverse needs of language learners, and harness the full potential of dictionaries as powerful tools for language learning.

Admittedly however, it is important to acknowledge the limitations of the review when interpreting these findings. The synthesis of studies is confined to the search terms used and the journals examined, potentially overlooking relevant monographs, conference papers and book chapters. Therefore, it is recommended that future reviews should aim for a broader scope, covering a wider array of journals, books, and conference proceedings. Additionally, it should be noted that we only included literature written in English, which further limits the scope of the study.

To recapitulate, this study should be recognized as a pioneering effort in systematically synthesizing research on dictionary use and language learning. To our knowledge, this is the first study to introduce the scoping review methodology to the field of lexicography, and it provides a guide for researchers in this area as to how a scoping review could be conducted. Also, by systematically examining the research methods applied, the demographics of the learners involved, the dictionaries used, and the research foci of the sampled studies, this study not only map out the current landscape of research in this field but also serve as a guidepost for identifying research gaps and charting the course for future scholarly endeavors.

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