ASSESSING THE REPERCUSSIONS OF DICTIONARY FORMATS ON SCHOLARLY WRITING OUTCOMES: UNDERTAKING MIXED-METHOD APPROACH

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Abstract:

The complexity of foreign vocabulary and the multifaceted meanings of word combinations often pose significant challenges to language learners, potentially deterring their motivation. Dictionaries, however, serve as pivotal tools in surmounting these obstacles. Extant research has extensively explored the intersection of language acquisition and dictionary utilization, revealing a marked preference among EFL students for online or electronic dictionaries over traditional paper formats. Despite the recognized importance of dictionary use in fostering language proficiency, there remains a notable paucity of research investigating the specific impact of different dictionary formats on learners' writing skills. This study adopted a quasi-experimental between-groups design, including a control group and two experimental groups, involving a cohort of 67 Chinese EFL graduates from an international college in China. Over a ten-week experimental period, participants in the experimental groups utilized digital and paper dictionaries as reference aids for abstract writing, whereas the control group was deprived of any dictionary usage. Following the experiment, a semi-structured interview was conducted to assess the benefits of dictionary use in abstract writing and to elicit learners' perceptions of digital versus print English dictionaries. The weekly abstract writing submissions from all three groups were collected and meticulously analyzed. The findings revealed that both digital and paper dictionaries significantly enhanced the abstract writing performance of the Chinese EFL graduates in the experimental groups. Notably, participants who used digital dictionaries demonstrated a substantial and statistically significant improvement in overall abstract writing quality and language usage compared to those in the print-dictionary group. Furthermore, the study reported that digital dictionaries were particularly favored by Chinese EFL graduates due to their numerous advantageous attributes, including their reliability and efficacy in identifying appropriate linguistic expressions and vocabulary. In conclusion, the empirical evidence

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underscores the efficacy of digital dictionaries in augmenting the writing skills of EFL learners, suggesting a potential pedagogical shift towards the integration of digital lexicographical resources in language education curricula.

Keywords: abstract writing, EFL Chinese graduate learners, digital English dictionary, print English dictionary

1. Introduction

1.1. Research Background & Problem Statement

The acquisition of English as a Foreign Language (EFL) endows learners with essential cognitive, communicative, and cultural competencies, thereby augmenting their global comprehension and interaction capabilities (Abubaker & El-Badri, 2022; Alsmari, 2019; D'Astoli, 2016; Chen, 2014). This linguistic proficiency is of paramount importance in an era characterized by heightened global interconnectedness, which necessitates a profound understanding of diverse languages and cultures. Nevertheless, the pursuit of linguistic mastery is replete with challenges, particularly in the domains of vocabulary acquisition, pronunciation, and practical application, which present formidable obstacles for EFL learners (Elgort *et al.*, 2016; Lascarides & Copestake, 2015). In light of these challenges, dictionaries serve as indispensable tools that bridge the gap between unfamiliarity and comprehension. The transition of lexicographic resources from traditional print to digital platforms has markedly transformed the landscape of language learning, with contemporary scholarship increasingly examining the comparative efficacy of these formats in enhancing reading comprehension and overall language acquisition (Husaini, 2020; Ambarwati & Mandasari, 2020). Despite the acknowledged significance of vocabulary acquisition and its central role in language learning, there exists a discernible lacuna in the literature concerning the specific impact of dictionary format—print versus digital—on the development of productive language skills, particularly academic writing. This gap is especially pertinent for Chinese EFL postgraduates, who must navigate academic environments that demand a high level of written English proficiency. The choice of dictionary format and its utilization strategy could significantly influence their academic writing performance, affecting their ability to articulate complex ideas and engage in scholarly discourse effectively (Miyazaki, 2019; Norri, 2016). Hence, an in-depth exploration into how these learners leverage lexicographic resources and the consequent effects on their academic writing is not only timely but also critical for refining pedagogical strategies in EFL education.

The predilection for digital dictionaries over print counterparts among EFL learners in Asia signifies a notable paradigm shift in the utilization of lexicographic resources, mirroring the broader digital transformation trends in educational contexts (Chen *et al.*, 2021). Nevertheless, the pedagogical implications of this shift are not unambiguously positive. Some scholars have drawn analogies between the reliance on online dictionaries and the potential for attenuated language learning outcomes, similar

to the adverse effects observed with the use of calculators in mathematical education (Renkens *et al.*, 2016; Milic *et al.*, 2018). This scenario underscores the imperative for a nuanced understanding of the integration of digital tools, such as dictionaries, into language learning paradigms, aiming to enhance rather than inhibit academic proficiency. Proficiency in utilizing dictionaries, regardless of format, is posited as a fundamental skill that underpins language comprehension, effective communication, and academic success among EFL learners (Lew, 2015; Li & Xu, 2015). However, the extant literature reveals a significant lacuna in focused research concerning the role of dictionaries in EFL writing education, particularly in comparing the effects of print and digital formats on writing proficiency. Given the escalating reliance on digital resources, there is an urgent need to investigate the influence of these tools on the development of writing skills among Chinese EFL postgraduates. Such an inquiry is crucial for identifying pedagogical strategies that can harness the advantages of both digital and print dictionaries, thereby optimizing the academic writing performance of EFL learners. The exploration of this under-researched domain promises not only to contribute to academic knowledge but also to practical pedagogy, equipping educators with the insights needed to guide learners in the selection and utilization of dictionaries to effectively enhance their language production skills within academic and professional contexts.

1.2. Theoretical Framework
The inquiry into the influence of dictionary formats on the academic writing proficiency of Chinese EFL postgraduates necessitates a solid theoretical underpinning. Several intersecting conceptual and pedagogical frameworks provide the necessary foundation for this investigation.

1.2.1 Constructivism and Self-Regulated Learning
Constructivism, as articulated by Piaget (1977), vividly illustrates the active role of students in constructing knowledge, emphasizing their engagement in building upon pre-existing understandings and experiences (Smith, 2017). This paradigm aligns closely with the principles of self-regulated learning theories, where learners adopt a metacognitive approach, adeptly monitoring, evaluating, and strategically refining their educational journey (Zimmerman, 2002). Within this empowering framework, dictionaries evolve from mere repositories of definitions to critical scaffolds supporting autonomous vocabulary acquisition and the development of self-directed learning strategies. The present research delves into the intricate interplay between constructivist learning principles and the unique affordances of various dictionary formats. The study posits that the self-directed and strategic use of print and digital dictionaries may diverge significantly, thereby potentially affecting students' overall writing proficiency. This hypothesized divergence is examined through the lens of Vygotsky's theoretical framework, which emphasizes the essential role of the More Knowledgeable Other (MKO) in advancing a learner's understanding beyond their current capabilities. This

critical area, termed the Zone of Proximal Development (ZPD), represents the space between what a learner can achieve independently and the new concepts that remain just beyond reach without the guidance of an MKO. Thus, this research sets the stage for a compelling investigation within the ZPD, focusing on how Chinese postgraduates self-regulate their learning through the use of print and digital dictionaries. By exploring the potential disparities in their academic writing performance, the study aims to elucidate the intricate interplay between constructivist principles, MKO support, and the specific affordances of each dictionary format. Ultimately, this research seeks to offer valuable insights into optimizing dictionary-mediated learning experiences for this particular cohort of learners.

1.2.2 Cognitive Theory of Multimedia Learning

The Cognitive Theory of Multimedia Learning, as elucidated by Mayer (2021), posits foundational principles concerning the mechanisms through which individuals synthesize knowledge from both verbal and visual stimuli. Digital dictionaries, which frequently incorporate multimedia components such as audio pronunciations and contextual examples, facilitate enhanced cognitive processing. Conversely, traditional print dictionaries predominantly depend on textual descriptions, which may affect the manner in which learners develop semantic comprehension of the new lexicon. By examining these divergent cognitive processes through the framework of this theory, one may elucidate the relationship between the format of dictionaries and the development of writing proficiency.

1.2.3 Task-Based Language Teaching (TBLT)

Task-Based Language Teaching (TBLT), as elucidated by Lambert (2023), Michael (2023), and East (2023), underscores the paramount significance of engaging with language meaningfully within authentic contexts. Academic writing assignments serve as such authentic contexts wherein the utilization of dictionaries becomes integral. The employment of digital dictionaries affords expedient access to definitions and collocations, yet this rapidity and convenience may impede the comprehensive internalization of vocabulary—a critical element for proficient writing. Conversely, the manual consultation of print dictionaries might offer the requisite cognitive 'space' for more profound processing of vocabulary and grammar, aligning with TBLT principles. The amalgamation of these theoretical perspectives facilitates a nuanced comprehension of how Chinese EFL postgraduates interact with, process, and utilize information from print and digital dictionaries in the execution of their academic writing tasks. Furthermore, it illuminates potential avenues for investigating the influence of dictionary format on learning strategies and self-regulation in complex linguistic performance tasks. Table 1 meticulously delineates the integration of key theoretical frameworks within the purview of this study, serving as a bridge that connects theoretical foundations with empirical investigation. This tabulation not only highlights the applicability of these

constructs in enhancing the understanding of the phenomena under investigation but also underscores their relevance in advancing scholarly discourse.

Table 1: Theoretical Framework of the Present Study

Key Theoretical Construct & Scholars	Description	Implications for the Study
Constructivism Piaget (1977) Self-Regulated Learning (SRL) Zimmer & Schunk (1989)	- Learners actively construct knowledge, building on prior understanding - Dictionaries support vocabulary acquisition and help develop learner autonomy - Use of print vs. digital formats may lead to distinct differences in self-regulated learning strategies	- This study should examine how Chinese EFL learners demonstrate agency when using dictionaries - To investigate potential variances in learner autonomy and strategy deployment under the influence of different dictionary formats.
Cognitive Theory of Multimedia Learning Mayer (2021)	- Humans process information from words and images differently Multimedia in digital dictionaries may provide richer input - Text-heavy print dictionaries may promote different cognitive processes.	- To investigate whether richer learning resources afforded by digital dictionaries positively translate to better writing outcomes - To examine the specific ways different dictionary formats shape how learners understand and retain vocabulary
Task-Based Language Teaching (TBLT) Lambert (2023), Michael (2023), and East (2023)	- Emphasis on authentic, meaningful language use - Digital dictionaries facilitate rapid access but may hinder nuanced, deeper vocabulary acquisition crucial for writing - The 'slower' nature of print dictionary lookup may enhance internalization of new vocabulary	- To explore how dictionary formats may influence genuine written output quality beyond surface retrieval of definitions - To analyze whether students using print dictionaries develop more nuanced vocabularies for stronger academic writing

Note: Please be advised that the data source was independently compiled by the researcher (2024).

2. Research Objectives and Questions

Within the sphere of English as a Foreign Language (EFL) education, the effective integration of lexicographic resources remains crucial for the augmentation of linguistic proficiencies, especially within the scope of academic writing. This study endeavors to scrutinize the impact of dictionary formats—print versus digital—on the academic writing proficiency of Chinese postgraduate EFL learners, with a particular focus on abstract composition. Considering the evolving digital milieu and its implications for educational methodologies, this research is both timely and imperative.

The principal objectives and ensuing research questions are articulated as follows:

1) To rigorously assess and ascertain whether a significant, statistically measurable difference exists in the quality of abstracts produced by Chinese EFL postgraduates, dependent on their utilization of digital or print dictionaries.

2) To investigate and elucidate the perceptions and preferences of Chinese EFL postgraduates concerning digital and print dictionaries as facilitators in the process of abstract composition

2.1 Research Questions

1) Does the utilization of digital or print dictionaries significantly influence the quality of abstracts authored by Chinese EFL postgraduates?
2) What are the subjective experiences and preferences of Chinese EFL postgraduates regarding the use of digital versus print dictionaries in the context of abstract writing?

This investigation seeks to contribute to the existing corpus of knowledge by providing critical insights into the efficacy of different lexicographic formats in enhancing the academic writing skills of EFL learners, thereby informing pedagogical practices and lexicographic resource development.

2. Literature Review

2.1 Paradigm Shift in Learning with Dictionary: Digital Clinches the Spot

The progressive evolution in language learning methodologies prominently features the ascendancy of digital dictionaries, which are increasingly supplanting their traditional print counterparts. This shift signifies a pivotal transformation in pedagogical approaches, exerting a substantial impact on vocabulary acquisition and text comprehension. Empirical research substantiates the effectiveness of dictionaries, in both print and digital forms, in enhancing learners' lexical repertoire and their ability to interpret unfamiliar texts (Chen, 2012; Dashtestani, 2013; Davoudi, 2016; El-Sayed *et al.*, 2014; Rezaei & Davoudi, 2016). The digital age ushers in a novel paradigm in language education, with electronic dictionaries emerging as indispensable instruments for linguistic advancement (Eriska, 2022; Irhamia, 2021). The progression of digital dictionaries, from their inception in the early 1990s with CD-ROMs to the current prevalence of online platforms, illustrates a significant enhancement in both accessibility and functionality (Mohamad *et al.*, 2017). The advantages of electronic dictionaries—such as portability, extensive lexical databases, and efficient search capabilities—combined with their widespread availability on web and mobile platforms, have made them invaluable resources for EFL learners (Hafsha, 2020; Rezaei & Davoudi, 2016). The integration of advanced technology into the educational landscape not only facilitates the acquisition of new vocabulary but also significantly enriches learners' engagement with the language. Consequently, the transition towards digital dictionaries represents a notable advancement in educational practices, reflecting a deeper integration of technology in the pursuit of linguistic proficiency.

2.2 Evidence of Improved English Skills with Dictionaries

In the domain of educational research, particularly within the disciplines of English Language Teaching (ELT) and Linguistics, the deployment of dictionaries—both print and electronic—has attracted substantial scholarly interest, providing valuable insights into methods for enhancing English language proficiency. This review section, 2.2, rigorously examines empirical evidence affirming the effectiveness of dictionaries in bolstering English language skills among learners. The academic discourse, as delineated by Dashtestani (2013), Hua and Zarei (2013), Davoudi (2016), Li and Xu (2015), and Nesi (2009), predominantly focuses on the pivotal role that both print and electronic dictionaries play in the acquisition of English vocabulary, a critical element of language learning. Dashtestani's (2013) study on the integration of electronic dictionaries among Iranian EFL (English as a Foreign Language) learners and educators provides a thorough analysis of the pedagogical ramifications of digital tools in language education. Employing a mixed-methods approach, including surveys and semi-structured interviews with a substantial cohort of students and teachers, the research illuminates nuanced perspectives on electronic dictionary usage, highlighting both challenges—such as disciplinary issues and potential distractions—and notable benefits, particularly the significant improvement in English writing proficiency following adoption.

Moreover, the works of Sabarun (2018) and Thomas (2017) corroborate the advantageous impact of electronic dictionaries on English writing tasks, indicating a crucial shift towards digital aids in language learning environments. The preference for electronic over print dictionaries, especially in mobile formats, underscores the evolving nature of language acquisition strategies, which are in alignment with contemporary technological trends. Additionally, Veliz (2017) extends this discourse by examining the attitudes of EFL teachers and students towards pocket electronic dictionaries. The findings reveal a consensus on the utility of such devices in promoting autonomous learning and enhancing linguistic competence, with teachers observing proactive student engagement with the technology to consult and expand their vocabulary, thereby enriching their writing skills.

2.3 Classic Empirical Studies Related to Dictionary Use and Writing Performance

The ongoing exploration into the effects of various dictionary formats on academic writing proficiency, particularly among Chinese postgraduate students, necessitates a thorough examination of foundational empirical studies that elucidate the correlation between dictionary utilization and writing competence. The seminal research reviewed herein consistently highlights the pivotal role of dictionaries—both electronic and print—in enhancing learners' linguistic capabilities and, consequently, their writing proficiency. Yükselir (2016) offers a comprehensive analysis of the use of electronic dictionaries, positing that these tools enhance vocabulary comprehension and facilitate precise sentence construction, thereby positively influencing second language writing skills. This assertion is corroborated by subsequent studies (Chen *et al.*, 2021; Takkac, 2017; Nauman *et al.*, 2013), which demonstrate the widespread adoption of electronic dictionaries among

Asian EFL learners, underscoring a significant link between electronic dictionary use and improved lexical processing abilities that contribute to superior writing performance.

Conversely, Jacobs' (1989) research on the impact of monolingual dictionaries illuminates their effectiveness in helping learners identify and rectify textual inaccuracies, thereby expanding vocabulary and enhancing overall writing quality. Complementing this perspective, Nesi and Meara (1994) investigate dictionary-related errors and advocate for the inclusion of high-frequency terms to prevent the replication of example sentences from dictionary entries, thereby promoting more authentic and varied lexical usage. Jiang and Eslami (2021) extend this discourse by demonstrating that dictionary use invariably leads to increased lexical complexity across different proficiency levels. They argue that individuals with higher linguistic proficiency tend to utilize dictionaries more effectively, a concept warranting further investigation, particularly concerning how learner ability influences the efficacy of dictionary use in enhancing writing skills (Lütge, 2022; Rahimi & Fathi, 2021; Kim & Moon, 2019). Despite substantial evidence supporting the utility of dictionaries in language learning and writing proficiency, a notable research gap persists regarding the differential impact of print versus digital dictionary formats on the writing abilities of EFL learners. This gap calls for an empirical investigation to elucidate the comparative advantages and limitations of each dictionary format, thereby informing pedagogical strategies and technological advancements in language education.

3. Methodology

3.1 Quasi-Experimental Between-group Mixed-Method Design

In the domain of educational research, particularly concerning the impact of dictionary formats on academic writing performance among Chinese postgraduate students, a nuanced exploration is paramount. This investigation adheres to a quasi-experimental between-group mixed-method design, a methodological choice underscored by seminal works such as those by Leavy (2022), Leppink (2019), and Cebula (2018). The design's bifurcation facilitates a comparative analysis across two distinct experimental groups—designated EXP. A and EXP. B—and a control group, CTRL. C.

This tripartite configuration is instrumental in dissecting the intricate dynamics between dictionary format selection (digital versus print) and its consequential impact on academic writing proficiency. The research unfolds in three meticulously structured phases, starting with a diagnostic pre-test aimed at establishing a baseline for participants' abstract writing skills. The intervention phase then introduces the variable of dictionary format, with EXP. A utilizing digital dictionaries and EXP. B employing print versions, to delineate the effect of each on academic writing outcomes. The control group, CTRL. C, proceeds without dictionary assistance, serving as a crucial benchmark for evaluating the intervention's efficacy. A post-intervention assessment further facilitates a holistic analysis of the impact on academic writing performance. This methodological framework, encapsulated in Figure 1, not only provides conceptual

clarity but also reinforces the study's academic integrity. It lays a solid foundation for advancing both pedagogical praxis and theoretical discourse in language acquisition and educational psychology. By rigorously examining the pedagogical implications of dictionary format choices on academic writing, this study aims to contribute valuable empirical insights to the broader educational research community, thereby enhancing our understanding of effective language learning tools and strategies.

Figure 1: Conceptual Presentation of Quasi-Experimental
Between-group Mixed-Method Designs

Phase 1   Phase 2   Phase 3
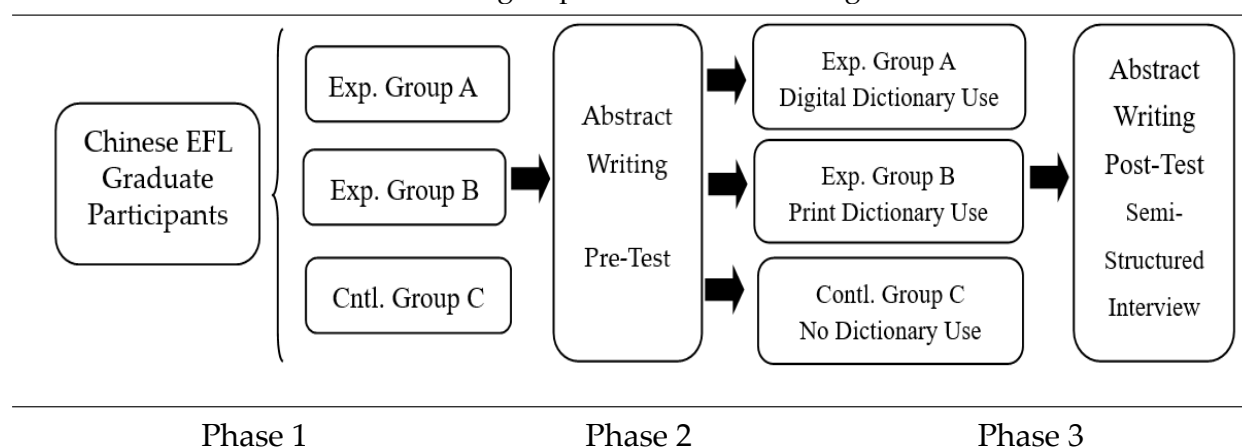
3.2 Research Samples

This study investigates the potential effects of dictionary formats (print and digital) on the academic writing performance of sixty-seven Chinese postgraduates specializing in English as a Foreign Language (EFL), with a particular focus on abstract composition. The participant pool was meticulously selected to ensure internal validity and generalizability, exhibiting significant characteristics worth detailed examination. Firstly, the gender distribution among the participants is balanced, with 47.8% male and 52.2% female, thereby mitigating potential gender biases. Secondly, all participants share a homogeneous academic background, being enrolled in graduate-level English courses and having completed coursework in research methodology and academic writing, which minimizes extraneous variables influencing writing abilities. Thirdly, the experimental design involved random assignment into three groups: Experimental Group A (N=26, 38.8%), Experimental Group B (N=21, 31.3%), and Control Group C (N=20, 29.9%). This methodological approach enhances the causal inferences that can be drawn regarding the impact of dictionary format on writing performance. Fourthly, all participants are pursuing master's degrees in Education Management, indicating a common academic goal and anticipated consistency in writing styles and content.

This homogeneity further strengthens the study's internal consistency and reduces potential variability from diverse academic fields. Lastly, the requirement for a Master's thesis completion ensures a shared level of research and writing experience, establishing a baseline standard of writing proficiency among the participants. Overall, the participant selection and characteristics in this study demonstrate careful consideration

to mitigate bias, enhance internal validity, and provide a robust foundation for drawing meaningful conclusions about the relationship between dictionary format and academic writing performance among Chinese postgraduate students. Table 2 encapsulates the demographic stratification of the participants, providing a foundational understanding of the study's participants' substratum.

Table 2: Summary of Demographic Information Regarding Research Participants (N=67)

Demographic	Characteristics	Frequency (N)	Percentage (%)
Total (Overall)		67	100%
Gender	Male	32	47.8%
	Female	35	52.2%
Graduate Profession	Education Management	67	100%
Group Type	Experimental Group A	26	38.8%
	Experimental Group B	21	31.3%
	Control Group C	20	29.9%

3.3 Research Instruments

In the exploration of the comparative effectiveness of print and digital dictionaries in enhancing the academic writing proficiency of Chinese postgraduate students, a comprehensive and multifaceted methodological approach was adopted. The quantitative component incorporated abstract writing exercises, pre- and post-test assessments, and evaluative scoring rubrics for abstracts, alongside the examination of dictionary usage in both print and digital formats. Simultaneously, qualitative insights were obtained through semi-structured interviews, providing a nuanced understanding of the impact of these dictionary modalities. This dual-method strategy enabled a thorough and holistic evaluation of the pedagogical efficacy of these tools in fostering academic writing capabilities.

a) Abstract Writing Exercises

This quasi-experimental, between-group mixed-method study critically examined the comparative efficacy of print versus digital dictionaries in enhancing academic writing among Chinese postgraduates. Over an eight-week period, participants were divided into three distinct groups, each engaging in abstract writing exercises. These exercises required participants to analyze and abstract selected articles from the Education Resources Information Center (ERIC), which were presented without their original abstracts. Participants were tasked with composing comprehensive abstracts that included the introduction, methods, results, and conclusion, strictly adhering to academic writing standards. This pedagogical intervention aimed to refine abstract composition skills within the domain of educational management and administration. Consequently, this study not only highlighted the practical application of academic writing principles but also contributed to the discourse on the pivotal role of educational technology and language acquisition in scholarly advancement.

b) Pre- and Post-test of Abstract Writing

This study meticulously evaluated the abstract writing abilities of Chinese EFL graduate students. Prior to the instructional intervention, a single research paper, deliberately devoid of an abstract, was distributed to three distinct groups: two experimental groups (A and B) and one control group (C). For the post-test, participants were given a different yet structurally analogous research article, also without an abstract, spanning approximately 12 pages. The research papers used in both the pre-test and post-test phases were sourced from the Education Resources Information Center (ERIC), a reputable online database. This methodological approach ensured a rigorous and equitable assessment of the participants' abstract writing proficiency following the intervention.

c) Scoring Rubrics for Abstract Writing Evaluation

In the sphere of academic evaluation, particularly concerning abstract writing by Chinese EFL graduate students, the Research Abstract Evaluation Rubric (RAER), derived from the pedagogical framework of the University of South Florida (Kinkade & Wilson, 2022), epitomizes an exemplary evaluative instrument. This tripartite scoring rubric, wherein scores range from 1 (indicating an unsatisfactory writer) to 3 (denoting an outstanding writer), delineates the performance criteria for abstract compositions with precision. The RAER meticulously dissects the evaluative process into five pivotal components: introduction, methodology, results, conclusion, and language usage and conventions, as delineated in Table 3. This stratified rubric facilitates a nuanced assessment across four dimensions: introduction, methods, results, and conclusions, each rated on a scale reflective of the writer's proficiency. An aggregate score, derived from the mean of these components, encapsulates the participant's overall performance in abstract writing. For instance, an abstract awarded scores of 2 (introduction), 3 (methods), 3 (results), 2 (conclusion), and 2 (language/conventions) results in a performance score of 2.4. The RAER has proven instrumental in both pre- and post-evaluation phases, consistently serving as a benchmark of excellence for abstract writing tasks undertaken by the participants.

Table 3: Rubrics for Abstract Writing Evaluation

Component	Criteria	1 Point Unsatisfactory	2 Points Satisfactory	3 Points Outstanding
Introduction	Clarity of purpose and contextual background	Lacks clear purpose or background	Provides adequate context and purpose	Clearly articulates research purpose and background with exceptional clarity
Methodology	Description of methods and appropriateness for the research question	Methods are poorly described or inappropriate	Methods are described adequately and are appropriate	Methods are described with excellent detail and perfectly suited to the question
Results	Presentation of findings and their relevance to the research question	Findings are unclear or irrelevant	Findings are clear and relevant	Findings are presented with exceptional clarity and direct relevance
Conclusion	Coherence of conclusion and implications for the field	Conclusion is vague or unrelated to research	Conclusion is coherent and relates to the research	Conclusion is insightful, well-articulated, and advances the field
Language & Conventions	Grammar and conventions adherence to academic writing standards; word choice, appropriateness, precision, and sophistication of vocabulary use. Effective word choice supports clarity, enhances the argument	Multiple errors in grammar and conventions, hindering comprehension Ineffective Word Choice - The text frequently uses inappropriate, incorrect, or overly simplistic vocabulary that significantly hinders comprehension and fails to convey the intended meaning	Minor errors in grammar and conventions, does not hinder comprehension Adequate Word Choice - The text occasionally uses less precise or less sophisticated vocabulary, but these choices do not significantly impede comprehension or fail to convey the intended meaning	Impeccable grammar and adherence to academic writing standards Sophisticated Word Choice - The text demonstrates a consistent use of precise, contextually appropriate, and sophisticated vocabulary that enhances clarity, enriches the argument, and engages the reader

Note: The Research Abstract Evaluation Rubric (Kinkade & Wilson, 2022) was adapted from the Office for Undergraduate Research, University of South Florida, retrieved from http://lib.usf.edu/undergraduate-research/

d) Longman Dictionary: Print and Online Version

The Longman Dictionary, a pivotal lexicographic resource in EFL contexts, merits scrutiny as a research instrument. The print version, currently in its sixth edition (2014), published by Pearson Education Limited, offers comprehensive lexical information, including etymologies, collocations, and usage notes. Conversely, the online iteration (www.ldoceonline.com) provides enhanced functionalities such as audio pronunciations, corpus-based examples, and real-time updates. This digital platform facilitates rapid access to lexical data, potentially expediting the writing process. However, the cognitive

engagement fostered by physical page-turning in print dictionaries may engender deeper lexical processing. The juxtaposition of these formats within the research framework enables a nuanced exploration of their respective impacts on abstract composition quality among Chinese postgraduate EFL learners. This comparison is particularly salient given the evolving landscape of educational technology and its implications for academic writing proficiency.

e) Semi-Structured Interview

A cohort of twenty-eight Chinese EFL graduate participants willingly engaged in a semi-structured interview. These individuals were selected based on their voluntary participation and were subsequently scheduled for post-experiment interviews and discussions. The primary objective was to provide an exhaustive analysis of their responses to the statistical data regarding their personal views on the efficacy of digital versus print dictionaries and the resultant impact on their abstract writing proficiency. The interviews were not merely supplementary to corroborate questionnaire responses but also served to uncover significant insights that might have been previously undisclosed. The researcher meticulously crafted a series of interview questions aimed at obtaining a nuanced comprehension of the perspectives of these Chinese EFL graduate students concerning the practicality and limitations of dictionary usage in the context of abstract writing. The initial question focused on individual preferences regarding the benefits and applicability of a specific dictionary format to their abstract writing. In contrast, the subsequent question delved into the positive rationale behind selecting that particular dictionary format, along with its inherent qualities. An example of a question posed during the interview is as follows:

> Example 1:
> *"Given your past experiences with dictionaries, do you perceive this format as the most beneficial and applicable to enhancing your abstract writing skills, considering its attributes?"*

3.4 Data Collection and Analysis

The investigation transpired between July and October 2023, encompassing three postgraduate academic writing courses. For the purpose of data collection, the researcher, in conjunction with the course instructor, received the list of Chinese EFL postgraduate students in July 2022. These students were enrolled in a mandatory graduate-level course in academic writing. Prior to the experimental intervention, all postgraduates in the two experimental groups, as well as the control group, undertook pre-tests on abstract writing. Subsequent to a ten-week instructional period, post-tests on abstract writing were administered to all three groups. During the eight weeks of classroom instruction—the initial and final weeks being designated for pre-tests and post-tests, respectively—all participants engaged in abstract writing assignments. Quantitative data were amassed from pre- and post-tests and weekly abstract writing activities, which were evaluated

using a research abstract evaluation rubric. The pre- and post-test scores across the three groups were juxtaposed to discern the intervention's impact on overall abstract writing performance and specific language usage. Additionally, scores from the weekly abstract writing assignments were collated and analyzed as part of the status report for all groups. Cohen's d effect size was employed to ascertain the statistical significance of the pre- and post-test outcomes for the experimental groups. In addressing qualitative data, post-intervention semi-structured interviews were conducted to gauge Chinese EFL graduate students' comprehension of the experiment and their utilization of digital or print dictionaries in the academic writing course. Participants' responses revealed their perceptions of the dictionary-based pedagogical intervention and its influence on their ability to compose academic abstracts. The interview data, collected qualitatively in English, underwent discourse analysis for thematic coding. This analysis aimed to explore the impact of digital or print dictionary usage on the abstract writing abilities of Chinese EFL graduate students, as well as their opinions regarding the specific characteristics of the English dictionary format utilized. Table 4 below provides an overview of the complete research methodology, encompassing the experimental intervention, gathering of data, and analytical techniques employed.

Table 4: Summary of Complete Research Procedure

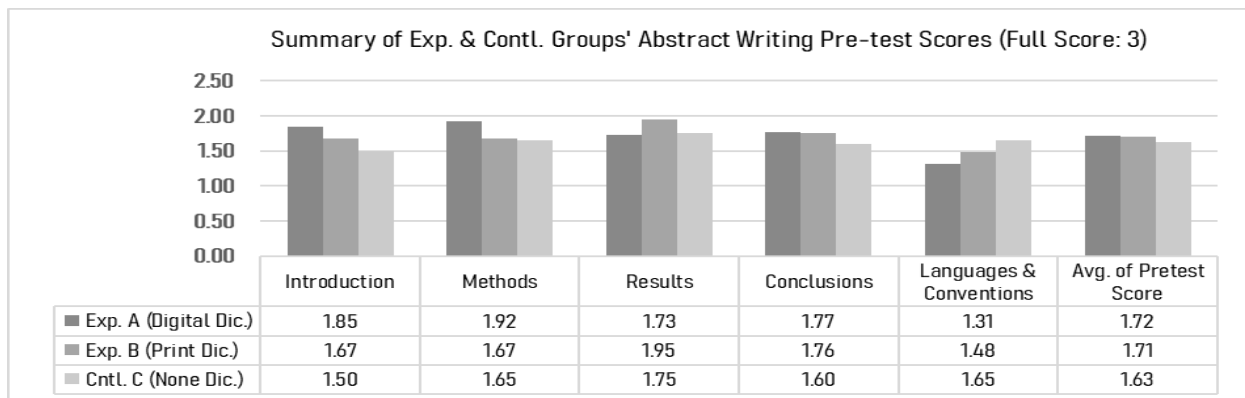| Step	Description
Research Duration	July to October 2023
Participants	Chinese EFL postgraduates enrolled in a mandatory academic writing course
Groups	Two experimental groups and one control group
Pre-Intervention	Administration of pre-tests on abstract writing to all participants
Intervention	Eight weeks of classroom instruction involving abstract writing assignments
Post-Intervention	Administration of post-tests on abstract writing to all participants
Data Collection (Quantitative)	Collection of pre- and post-test abstracts, weekly writing assignments; evaluation using a research abstract rubric
Data Analysis (Quantitative)	Comparison of pre- and post-test scores; calculation of Cohen's d effect size
Data Collection (Qualitative)	Semi-structured interviews in English; analysis through discourse analysis and thematic coding
Data Analysis (Qualitative)	Exploration of participants' perceptions of dictionary use and its impact on abstract writing abilities and preferences

4. Results

4.1 Online Dictionary Significantly Better Enhance Abstract Writing Performance

The initial research inquiry sought to determine whether the format of English dictionaries (online versus print) significantly impacts the abstract writing proficiency of Chinese graduate students learning English as a Foreign Language (EFL). The study included one control group and two experimental groups. The researcher employed the
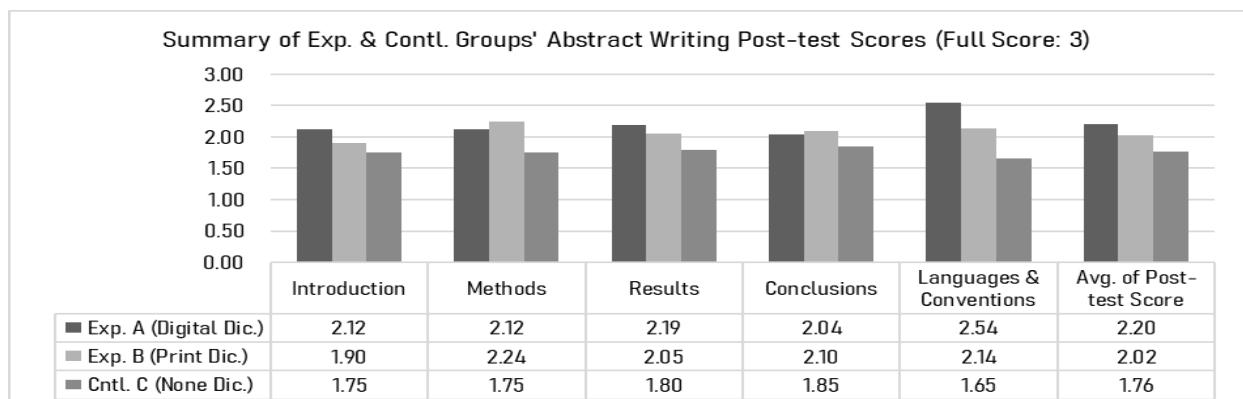
Research Abstract Evaluation Rubric (RAER) to assess abstract writing capabilities. Chart 1 elucidates that, prior to the intervention, the mean scores for abstract writing in the control group (X=1.63) and the experimental groups (X=1.72 for Experimental Group A and X=1.71 for Experimental Group B) were statistically comparable. However, following the intervention, the control group (X=1.65) exhibited superior performance in language and conventions, achieving the highest score relative to Experimental Group A (X=1.31) and Experimental Group B (X=1.35), out of a possible score of 3 on the RAER.

Chart 1: Analysis of Pretest Abstract Writing for Control and Experimental Groups

Summary of Exp. & Contl. Groups' Abstract Writing Pre-test Scores (Full Score: 3)

	Introduction	Methods	Results	Conclusions	Languages & Conventions	Avg. of Pretest Score
Exp. A (Digital Dic.)	1.85	1.92	1.73	1.77	1.31	1.72
Exp. B (Print Dic.)	1.67	1.67	1.95	1.76	1.48	1.71
Cntl. C (None Dic.)	1.50	1.65	1.75	1.60	1.65	1.63

Regarding the mean scores on the posttest for abstract writing proficiency, experimental group A achieved the highest average (X=2.20), followed by experimental group B, which employed dictionary-based learning (X=2.02). The control group, conversely, exhibited the lowest average score (X=1.76). Notably, experimental group A attained the superior score in the domain of language and conventions, with an average of 2.54 out of a possible 3, closely succeeded by experimental group B (X=2.14). The control group received the lowest average score in this domain (X=1.65). As illustrated in Chart 2, the experimental groups A and B, comprising Chinese EFL graduate students utilizing digital and print dictionaries as instructional aids, demonstrated a marked enhancement in their abstract writing skills compared to the control group.

Chart 2: Analysis of Posttest Abstract Writing
Performance for Control and Experimental Groups

Summary of Exp. & Contl. Groups' Abstract Writing Post-test Scores (Full Score: 3)

	Introduction	Methods	Results	Conclusions	Languages & Conventions	Avg. of Post-test Score
Exp. A (Digital Dic.)	2.12	2.12	2.19	2.04	2.54	2.20
Exp. B (Print Dic.)	1.90	2.24	2.05	2.10	2.14	2.02
Cntl. C (None Dic.)	1.75	1.75	1.80	1.85	1.65	1.76

4.2 Online-dictionary Learners: Abstract Writing and Language Use Improved Significantly

The refined analysis of the data depicted in Chart 3 elucidates the pre- and post-test performance metrics in abstract writing and adherence to language conventions for the experimental cohort A, comprising Chinese EFL graduate students who utilized a digital dictionary. In the domain of abstract writing, the pre-test outcomes exhibited a range from the highest score of 2.2 (recorded by participant A12) to the lowest score of 1 (recorded by participant A11), culminating in a mean score of 1.72. Conversely, the post-test scores in this category revealed a range from the highest score of 2.6 (achieved by participants A1, A20, A21, and A24) to the lowest score of 1.6, indicating a notable enhancement. Regarding language conventions, the pre-test scores ranged from a maximum of 3 points (achieved by participant A13) to a minimum of 1 point, with the mean score calculated at 1.31. The post-test scores in this category demonstrated substantial improvement, with a mean score of 2.54 points and the highest score reaching 3 points (achieved by participant A14). The data underscores a significant advancement in both abstract writing and language conventions among the participants of experimental group A. Specifically, abstract writing scores improved from a pre-test mean of 1.72 to a post-test mean of 2.20, reflecting an increment of 0.48. Similarly, scores in language conventions surged from a pre-test mean of 1.31 to a post-test mean of 2.54, representing a substantial increase of 1.23. This empirical evidence signifies the efficacy of digital dictionary use in enhancing the academic writing proficiency of Chinese EFL graduate students.

Chart 3: Summary of Exp. Group A's Abstract
Writing & Lang. Conventions amongst Pre-Posttest
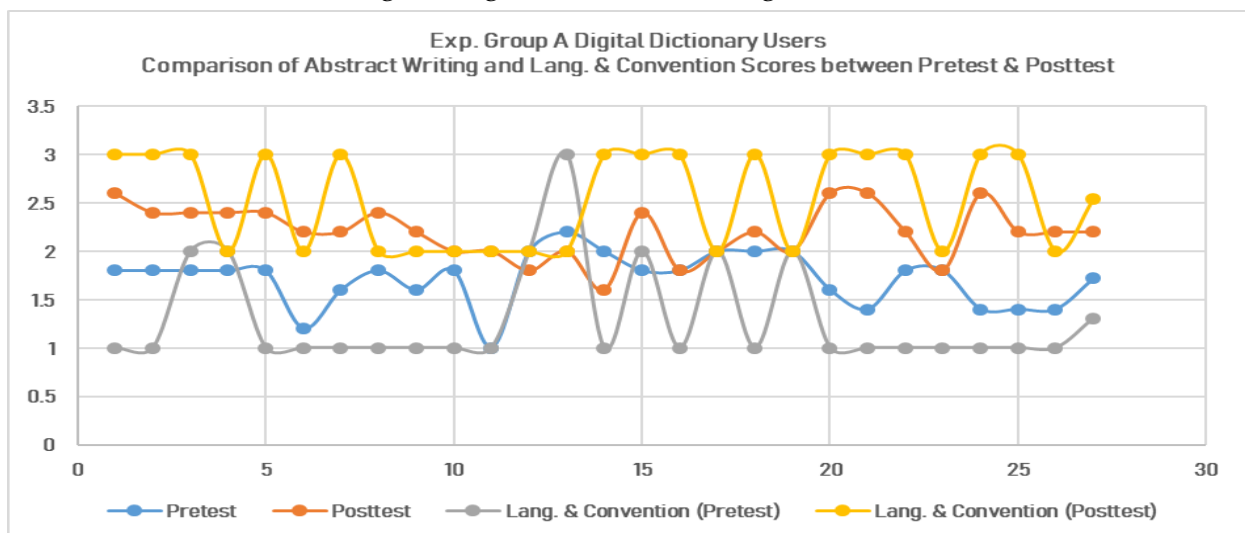
4.3 Print Dictionary Learners Improve Abstract Writing and Language Marginally

The following analysis of the research outcomes pertains to abstract writing and language conventions among Chinese EFL graduate students in experimental group B, who

utilized print dictionaries. These outcomes are delineated in Chart 4. For abstract writing, the pre-test scores of experimental group B ranged from a highest value of 2.20 (achieved by B15) to a lowest value of 1.20 (B13), with a mean score of 1.70. Comparatively, post-test scores varied from a peak of 2.4 (achieved by B6, B11, and B12) to a nadir of 1.8 (observed in B14, B16, and B18). Regarding language conventions, the pre-test scores fluctuated between a maximum of 3 points (B15) and a minimum of 1 point (observed in 12 participants), yielding a mean score of 1.48. The post-test results exhibited an enhanced mean score of 2.14 points, with the highest score reaching 3 points (achieved by B8, B11, B12, B17, and B20). Overall, the experimental group B demonstrated a marginal improvement in abstract writing, with the mean score increasing from 1.70 (pre-test) to 2.02 (post-test), indicating an increment of 0.32. Similarly, for language conventions, the mean score progressed from 1.48 (pre-test) to 2.14 (post-test), reflecting a gain of 0.66.

Chart 4: Summary of Exp. Group B's Abstract
Writing & Lang. Conventions amongst Pre-Posttest
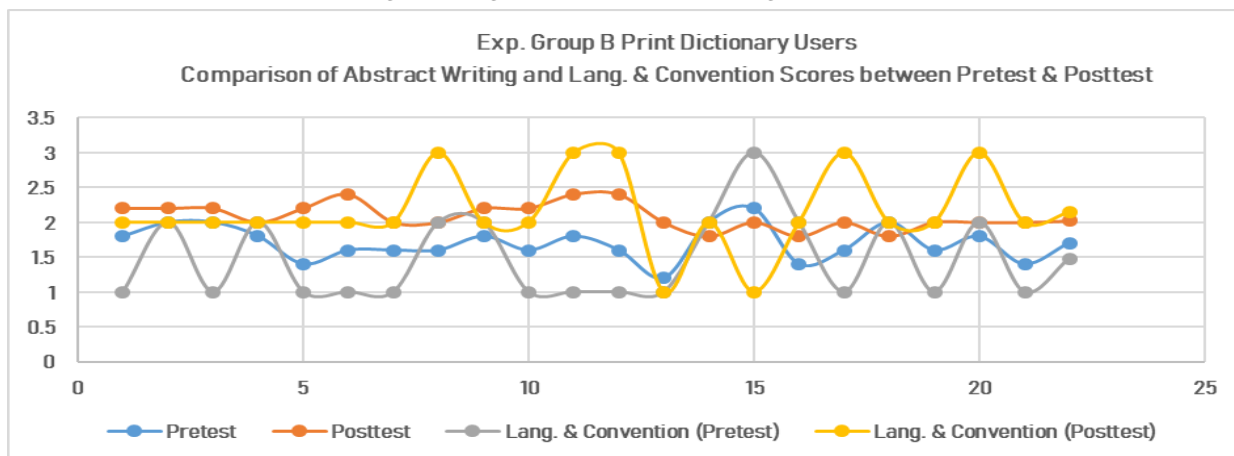
4.4 More Quantitative Evidence from Cohen's d Effect Size Calculation

The paramount outcome of empirical research is often the magnitude of effect sizes. Predominant scholarly literature accentuates the utility of effect sizes in elucidating the practical significance of research findings. In the domains of education and language studies, researchers may employ effect sizes to determine requisite sample sizes for future inquiries or to facilitate comparative analyses across different studies. In an investigation examining the differential impact of digital versus print dictionaries on the abstract writing performance of Chinese EFL graduate students, Cohen's d effect size was utilized to compare pre-test and post-test outcomes across both experimental cohorts. Following the computation of mean scores and standard deviations for abstract writing in the pretest and posttest phases for groups A and B, it was observed that the Cohen's d value for the digital dictionary in group A was 1.780, markedly surpassing the value for the print dictionary in group B (d = 1.026). Extant literature indicates that an effect size of d = 0.2 is indicative of a "small" effect, d = 0.5 denotes a "moderate" effect, and d = 0.8 signifies a "large" effect (Chen *et al.,* 2021; Wilcox, 2019; Larner, 2014). Consequently, these

findings suggest that the digital dictionary exerted a significantly stronger influence on the abstract writing proficiency of Chinese EFL graduates compared to the print dictionary.

The results are detailed in Table 4, which delineates the Cohen's d effect sizes for the two experimental groups.

Table 4: Summary of Cohen's d Effect Size from both Experimental Groups

Experiment Group A: Digital Dictionary				Experiment Group B: Print Dictionary			
Pretest Abstract Writing		Posttest Abstract Writing		Pretest Abstract Writing		Posttest Abstract Writing	
Mean	1.715384	Mean	2.20	Mean	1.704761	Mean	0.180701
SD	0.272724	SD	0.271746	SD	0243928	SD	2.085714
Sample Size	26	Sample Size	26	Sample Size	21	Sample Size	21
Cohen's d	(2.2-1.715384)/0.272235 = *1.780136			Cohen's d	(0.180701-1.704761)/1.484874 = 1.02639		

Note: Effect size: 0.2 = small; 0.5 = medium; 0.8 = large; 1.20 = Very Large; 2.0 = Huge *$P<0.05$ (Cohen's, 1992)

4.5 Learners Inundated with the Primary Benefits of Using a Digital Dictionary

The researcher conducted and scrutinized semi-structured interviews with forty-five randomly selected Chinese EFL graduates from experimental groups A (N=25) and B (N=20) to ascertain their attitudes toward the utilization of digital and print dictionaries. The findings revealed a spectrum of perspectives concerning the use of digital dictionaries. A significant proportion (N=15, 60%) asserted that they could efficiently search for any term pertinent to their abstract writing. Conversely, a minority (N=3, 12%) contended that the information provided by digital or online dictionaries could be erroneous or ambiguous. Nevertheless, an overwhelming majority (N=22, 88%) concurred that digital dictionaries are reliable and trustworthy for locating appropriate language, quotations, or sentence expressions in abstract writing. Table 5 encapsulates the responses of interviewees from experimental group A to the initial interview question.

Table 5: Exp. Group A *Digital Dictionary* Participants'
Excerpt toward Responses to Interview Question

Interview Q: *Having used various types of dictionaries before, how would you compare the digital dictionary format to other formats in terms of its usefulness and applicability for writing abstracts? What specific qualities of this digital dictionary do you find most helpful for abstract writing?*	
Group A2	When I write the abstract, I am confused with word choice sometimes….and I just directly turn on my digital dictionary on my phone and search for the word and its related usage to complete my sentence in abstract writing…
Group A3	During the abstract writing, I find myself stumped for a suitable phrase. At such instances, I just pull up a digital dictionary on my phone and look up the word and its associated use to help me finish my statement…

Group A7	I'm having trouble coming up with an acceptable word when writing the abstract. When I find myself in this situation, I just open the digital dictionary app on my phone and look up the phrase and its associated meaning to help me finish my thinking…
Group A9	I often struggle to find a good term while writing the abstract. In these situations, I simply open a digital dictionary on my phone, hunt for the term, and then utilize that information to complete my line of text…
Group A11	Online or virtual dictionaries are dependable and trustworthy whenever it involves finding the proper vocabulary, quote, or language expression for abstract writing…
Group A12	In my view, when something comes to discovering the appropriate keywords, term, or word expression for abstract writing, online dictionaries are safe and reliable…
Group A13	The use of digital dictionaries is a risk-free and dependable method for identifying the proper keywords, terms, or word expressions for abstract writing…
Group A22	Whenever it concerns to selecting the ideal trigger words, phrase, or word meaning for abstract writing, virtual dictionaries are possibility and reputable resources to consult…
Group A24	I believe that electronic dictionaries may help me choose the suitable trigger words, phrase, or word meaning for conceptual abstract writing…

4.6 Print Version: Outdated, Expensive, Heavy, Credible, Detailed Usage and Examples

In examining the perspectives of Chinese EFL graduate students who utilized a print dictionary in experimental group B, several critical observations were noted regarding the dictionary's physical characteristics. A significant proportion of respondents (N=15, 75%) articulated that print or paper dictionaries appeared antiquated and incongruent with contemporary information technology. Furthermore, a notable number of participants (N=9, 45%) remarked that acquiring a paper dictionary necessitates a considerable financial outlay for a single copy, whereas a digital dictionary application for a smartphone is presently more cost-effective. Additionally, it was observed that individuals are disinclined to carry a physical dictionary during travel due to its substantial weight. However, when queried about the efficacy of print dictionaries in aiding abstract writing, the respondents (N=20, 100%) unanimously affirmed their belief that any commercially published print dictionary, being a product of collaborative efforts by linguists based on extensive textual corpora, offers superior credibility and reliability. They emphasized that print dictionaries provide precise spelling, concise explanations, comprehensive usage examples, and are devoid of grammatical errors, thereby significantly enhancing learners' writing capabilities. Table 6 presents a detailed breakdown of the comments from experimental group B's print dictionary users in response to the interview question.

Table 6: Exp. Group B *Print Dictionary* Participants'
Excerpt toward Responses to Interview Question

Interview Q: *Given your experience with print dictionaries, how do you perceive their usefulness and applicability for writing abstracts? What specific qualities of print dictionaries do you find helpful or limiting in this context?*	
Group B1	In my view, the idea of using a print or paper dictionary seems outdated and out of date with current information technology.
Group B2	Well, I feel that traditional dictionaries in the form of books or paperbacks seemed so 20th century and unfit for the age of the internet.
Group B3	Honestly, paper or print dictionaries seemed hopelessly out of date and unsuitable for the information age.
Group B5	Based on my learning experiences, dictums in print or on paper seemed quaint and out of sync with the information age.
Group B7	You know, ah… One must pay a high price for a paper dictionary, but these days it is much more cost-effective to get a digital dictionary app for a smartphone.
Group B9	Well, when compared to the current price of a digital dictionary app on a smartphone, the price of owning a paper dictionary is prohibitive for the purchase of a single copy.
Group B13	A paper dictionary is expensive, but a digital app for a smartphone is much cheaper.
Group B14	In today's society, for a single copy of a paper dictionary, you have to pay a lot of money, but it would be much cheaper to buy a digital dictionary app for a smartphone right now.
Group B16	Like I say…Any publicly available print dictionary was constructed by linguists based on a huge textual corpus, resulting in increased credibility and dependability, accurate spelling, succinct explanations, in-depth use, and zero grammatical mistakes, benefiting learners' writing skills.
Group B17	Basically, linguists used a massive collection of texts to create any public print dictionary, which means that its entries are more likely to be correct and reliable, and that its definitions and examples are clearer and more thorough.
Group B18	Public print dictionaries were built by linguists using a massive textual corpus, which ensures that they are correct in spelling and reliability, have clear and concise definitions, provide extensive coverage of their subject, and have no grammatical errors.
Group B20	Any openly accessible print dictionary was developed by linguists based on a large corpus of text, resulting in greater credibility and reliability, proper writing, condensed descriptions, in-depth usage, and nearly zero grammatical mistakes, all of which improve students' writing abilities.

5. Conclusion and Discussion

This research elucidates the efficacy of digital and print dictionaries in enhancing the abstract writing skills of Chinese EFL graduates across both experimental cohorts. Participants utilizing digital English dictionaries exhibited significant improvement in overall abstract writing performance and language usage compared to their counterparts employing print dictionaries. This outcome aligns with existing literature, corroborating prior studies which indicate that an in-depth comprehension of lexicon and precise sentence interpretation positively influence second language acquisition, particularly in writing proficiency (Chen *et al.*, 2021; Tackkac, 2017; Gromik, 2017; Yükselir, 2016). Furthermore, the findings support the assertion that dictionary use, regardless of the language skill, augments lexical complexity (Jiang & Eslami, 2021). A notable secondary

finding highlights the appeal of digital dictionaries among Chinese EFL graduates, attributed to their reliability and effectiveness in identifying appropriate language expressions and words. Digital dictionaries facilitated the lookup of term meanings and sentence examples during the abstract writing process, corroborating the results of numerous empirical studies that have demonstrated the practical benefits of digital dictionaries in expediting word consultation, locating multi-word expressions, and providing real-time lexicographic assistance (Kondal, 2018; Li & Xu, 2015; Truong, 2012). Digital dictionaries meet learners' high expectations by providing instant and in-depth lexicographic descriptions, enhancing access to comprehensive lexicographic content. Conversely, while print dictionaries were deemed outdated, cumbersome, and costly, their proponents asserted their superior reliability and comprehensive usage knowledge. This finding is consistent with earlier studies indicating that print dictionaries, updated periodically and constructed by linguistic experts, are highly trustworthy (Sharma, 2020; Tulgar, 2017; Mohamad *et al.*, 2017).

Collectively, the research underscores the substantial influence of both conventional and digital dictionaries on foreign language learning, particularly in terms of utility and precision. The study contributes to the understanding of EFL learners' vocabulary enhancement, which is closely related to the development and performance of language output skills, such as writing and speaking. Consequently, this research broadens our comprehension of the benefits of digital and print dictionaries, establishing a foundation for further investigation into the integration of both dictionary types in EFL instruction and language learning within technologically advanced context.

6. Recommendations and Limitations

In light of the findings from this comprehensive study, several recommendations emerge to enhance the academic writing proficiency of Chinese postgraduate EFL learners through the strategic use of dictionary formats. Firstly, educational institutions should consider integrating digital dictionaries into their academic writing curricula, given their demonstrated efficacy in improving abstract composition skills. Digital dictionaries provide immediate access to a plethora of lexical resources, facilitating a more efficient and effective writing process. Consequently, it is advisable for educators to familiarize students with advanced features of digital dictionaries, such as corpus-based examples and real-time updates, to optimize their utility. Furthermore, training workshops aimed at developing students' proficiency in using digital dictionaries can significantly bolster their academic writing capabilities. Secondly, despite the advantages of digital formats, print dictionaries should not be entirely disregarded. They offer unique cognitive engagement that can deepen lexical processing. Hence, a balanced approach that encourages the use of both digital and print dictionaries may be optimal. This dual strategy ensures that students benefit from the comprehensive lexical information in print dictionaries while also leveraging the convenience and speed of digital formats. Lastly, further research should explore the longitudinal impact of dictionary usage on

different aspects of academic writing beyond abstracts, such as research papers and literature reviews, to provide a holistic understanding of their pedagogical value.

While this study offers valuable insights into the impact of dictionary formats on the academic writing proficiency of Chinese postgraduate EFL learners, several limitations warrant consideration. Firstly, the study's quasi-experimental design, though robust, may not account for all extraneous variables that could influence writing performance. Factors such as prior exposure to academic writing, individual learning styles, and varying degrees of familiarity with dictionary usage were not controlled, potentially affecting the outcomes. Secondly, the sample size, though adequate for initial exploratory analysis, limits the generalizability of the findings. Future research should encompass a larger and more diverse cohort to validate the results across different educational contexts. Thirdly, the study's focus on abstract writing, while significant, may not fully capture the broader implications of dictionary usage on other genres of academic writing. Thus, expanding the scope of research to include various academic writing tasks could provide a more comprehensive understanding of the efficacy of dictionary formats. Additionally, the reliance on self-reported data from semi-structured interviews introduces the potential for response bias. Participants' perceptions and preferences may be influenced by social desirability or recall bias, thus skewing the qualitative insights. To mitigate this, future studies could incorporate more objective measures, such as direct observations and longitudinal tracking of writing progress. Lastly, technological advancements and updates in digital dictionary interfaces may rapidly outdate the findings, necessitating continual research to keep abreast of evolving educational tools and their impacts on language learning.

Conflict of Interest Statement
The author declares no conflicts of interest.

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Dr. Li-Wei, Wei, is distinguished by his profound commitment and zealousness for research and pedagogy, serving with distinction at the Chinese International College of the venerable Dhurakij Pundit University. His scholarly pursuits embrace an extensive ambit, including English as a Second Language (ESL) and English as a Foreign Language (EFL), English for Specific Purposes (ESP), alongside his significant contributions to the realms of Writing Instruction, Language Education Studies, Media Education, Tourism Education, Higher Education Research, and Educational Psychology. Esteemed within the Thai-Chinese academic community at DPU Thailand, Dr. Wei's prolific output of scholarly publications has markedly advanced the academic discourse within his fields of expertise. His ongoing research endeavors seek to extend the frontiers of knowledge, manifesting his tireless dedication to the cause of educational advancement and his fervent aspiration to achieve professorial eminence.

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