http://lexikos.journals.ac.za; https://doi.org/10.5788/34-1-1914 (Article)

Adaptation and Validation of the Strategy Inventory for Electronic Dictionary Use (S.I.E.D.U.) for Chinese Learners

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Abstract: This study aimed to adapt and validate the S.I.E.D.U. questionnaire for assessing electronic dictionary (ED) use in the Chinese context. Six specialists translated the questionnaire into Chinese and then back-translated it into English to ensure accuracy. The Chinese version was administered to 518 participants. Factor analysis revealed seven factors, differing from the original four-factor structure. In addition to factors related to ED conventions, functions, and strategic skills, the study identified additional factors, including learners' preparation and troubleshooting, acceptance and usage context, storage format and advantages of ED, and ED subscription. These findings provide a comprehensive understanding of ED use strategies from the perspective of Chinese learners, benefiting both learners and educators. This study not only validates the S.I.E.D.U. in the Chinese context but also underscores the importance of enhancing learners' strategies for effectively utilizing electronic dictionaries.

Keywords: ELECTRONIC DICTIONARY, ELECTRONIC DICTIONARY USE QUESTIONNAIRE, ELECTRONIC DICTIONARY USE STRATEGIES, LANGUAGE LEARNERS, CHINESE CONTEXT, CULTURAL ADAPTATION

Opsomming: Die aanpassing en bevestiging van die Strategie-inventaris vir Elektroniese Woordeboekgebruik (S.I.E.W.G.) vir Chinese leerders. In hierdie studie is beoog om die S.I.E.W.G.-vraelys vir die assessering van elektroniese woordeboekgebruik (EW-gebruik) in die Chinese konteks aan te pas en te bevestig. Ses kundiges het die vraelys in Chinees vertaal en dit toe terugvertaal in Engels om die akkuraatheid daarvan te waarborg. Die Chinese weergawe is aan 518 deelnemers uitgedeel. 'n Faktoranalise het sewe faktore blootgelê wat van die oor-

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spronklike vier-faktorstruktuur afwyk. Bykomend tot faktore wat verband hou met EW-konvensies, -funksies, en strategiese vaardighede, het die studie addisionele faktore, insluitende leerdersvoorbereiding en foutopsporing, aanvaarding en gebruikskonteks, bergingsformaat en voordele van EW, en EW-intekening, geïdentifiseer. Hierdie bevindings verskaf 'n omvattende begrip van EW-gebruikstrategieë vanuit die perspektief van Chinese leerders wat beide leerders en opvoeders baat. Dié studie bevestig nie net die S.I.E.W.G. in die Chinese konteks nie, maar beklemtoon ook die belangrikheid van die uitbreiding van leerderstrategieë vir die effektiewe benutting van elektroniese woordeboeke.

Sleutelwoorde: ELEKTRONIESE WOORDEBOEK, VRAELYSTE VIR ELEKTRONIESE WOORDEBOEKGEBRUIK, STRATEGIEË VIR ELEKTRONIESE WOORDEBOEKGEBRUIK, TAALLEERDERS, CHINESE KONTEKS, KULTURELE AANPASSING

1. Introduction

Dictionaries play a crucial role in the language learning process (Campoy-Cubillo 2021). According to Nation (2001: 296), "dictionary use is a kind of language-focused learning: the deliberate, explicit study of words". Specifically, they aid learners in their acquisition of essential information necessary for effective communication, both within and outside the classroom (McAlpine and Myles 2003). Serving as a dual-purpose instrument for comprehension and production, dictionaries empower learners to enhance their language skills. Therefore, learners are encouraged to integrate dictionary use with other learning strategies to fully utilize the wealth of information dictionaries provide (Summers 2013).

The evolution of information technology has led to the digitization and storage of dictionary entries in electronic formats. Defined as "any reference material stored in electronic form that gives information about spelling, meaning, or use of words" (Nesi 2000: 839), electronic dictionaries (EDs) have emerged as an alternative to their traditional paper counterparts. In contrast to the latter, EDs boast additional features, including audio pronunciation, video, animation, etc. (Nesi 2000; Joffe 2009; Winkler 2001). Moreover, EDs provide advanced look-up routes such as fuzzy searches, hyperlinks, pop-up windows, data boxes, multi-access, and menus (Gouws and Prinsloo 2021; Pastor and Alcina 2010; Rundell 2013; Verlinde et al. 2009). These functions not only enrich the language learning experience but also make the dictionary consultation more engaging and effective. Besides, the enhanced functionality and convenience offered by EDs have rendered them indispensable tools for language learning. Accordingly, learners are compelled to adapt and employ novel strategies, such as leveraging hyperlinks to explore related words and concepts, and utilizing fuzzy search functions to find words even with uncertain spelling, to effectively harness the potential of EDs in their language acquisition endeavors.

To the best of our knowledge, the Strategy Inventory for Electronic Dictionary Use (S.I.E.D.U.) (Mavrommatidou et al. 2019) represents the pioneering effort to assess Greek users' strategies in electronic dictionary (ED) searches. Mavrommatidou et al. (2019) emphasize the necessity of employing the S.I.E.D.U.

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in subsequent research endeavors to bolster its reliability and validity. Furthermore, they call for its translation and cultural adaptation into other languages. However, there exists a notable gap in the availability of an instrument specifically tailored to gauge Chinese learners' strategies for ED use. Adaptation and validation of the S.I.E.D.U. to assess Chinese learners' ED strategies are imperative for several reasons. Firstly, while numerous studies have delved into ED use and reference skills (e.g. Campoy-Cubillo 2021; Klein 2008; Krajka 2015; Pastor and Alcina 2010), relatively few have examined ED strategies from learners' perspectives. Comparing the results of these studies with learners' perceptions of their lookup process poses a challenge. Learners may lack awareness of the strategies they employ or the strategies they need to improve their ED consultation practices. Therefore, understanding learners' perspectives on ED strategies is essential for enhancing their use of ED effectively. Secondly, the present study, focusing on the appropriate adaptation protocol, aims to optimize the reliability and validity of the S.I.E.D.U. in the Chinese context. Although the S.I.E.D.U. was initially tailored for Greek learners, this adaptation aims to assess the applicability of the S.I.E.D.U. in examining electronic dictionary use strategies (ED use strategies) not only among Greek learners but also for learners from other cultures, demonstrating its general utility. Additionally, it seeks to provide valuable insights for learners and educators, thereby enriching pedagogical lexicography in a broader context.

This study details the adaptation and validation of the S.I.E.D.U. questionnaire for use in the Chinese cultural context. By validating this adaptation, the study aims to not only demonstrate the utility of the questionnaire in effectively tapping into learners' strategies but also contribute to advancing understanding and research in ED use across different linguistic and cultural settings.

2. Literature review

As a language learning strategy, dictionary use, which falls into the category of self-regulation (e.g. O'Malley and Chamot 1990; Oxford 1990), is conducive to vocabulary acquisition (e.g. Fan 2003; Gu 2003; Li and Xu 2015). It is also a preferred strategy during the reading and writing process, with an impact on reading comprehension and writing proficiency (e.g. Cohen and Oxford 2002; Harvey and Yuill 1997).

Despite the considerable attention given to dictionary use as a strategy in various domains, there has been limited exploration of how strategic dictionary use activates appropriate skills in relevant contexts. Gavriilidou (2011, 2013) laid the groundwork for clarifying the concept of dictionary use strategies, connecting the descriptive notion of reference skills with the established theory of learning strategies (Oxford 1990). These strategies encompass the techniques employed by skilled dictionary users to conduct quick and effective searches. Dictionary use strategies are subsequently defined as "users' decisions and behaviors regarding the internal processes they adopt in order to perform suc-

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cessful dictionary searches, the significance of which is prominent in the case of vocabulary acquisition, reading comprehension, and writing" (Chadjipapa et al. 2020: 444). These strategies are viewed as integral components of broader learning strategies, indicating that users' strategic decisions and behaviors during dictionary look-up can enhance successful dictionary use for language learning.

The advent of EDs has revolutionized the landscape of language learning tools, offering learners a plethora of advanced functionalities to enhance their language learning. These functionalities include hyperlinks and cross-references between related words, which enable learners to explore interconnected vocabulary and deepen their understanding of semantic relationships. Moreover, the integration of multimedia features, such as images, videos, and interactive exercises, provides learners with a more engaging and immersive learning experience, catering to diverse learning styles and preferences. In order to fully capitalize on the capabilities of EDs, learners must develop new strategies to navigate the complex array of features effectively. This necessitates a shift from traditional approaches to ED use. Additionally, learners can personalize their settings to align with their individual learning preferences, optimizing the utility of the ED for their specific needs. The portability of EDs, with their compatibility on smartphones and computers, further enhances their accessibility and convenience for learners. Instant access to look-ups enables learners to streamline their language learning process, saving valuable time compared to manually flipping through pages. Accordingly, the utilization of EDs involves a multifaceted process, demanding proficient users to possess a repertoire of adaptable skills to streamline their searches efficiently (Elola et al. 2008; Fraser 1999; Gavriilidou 2013; Scholfield 1999). Successful dictionary use has been correlated with users' capacity to develop strategies aimed at enhancing the speed of their consultations and expanding the breadth of information obtained during searches (Gavriilidou 2014). Thus, examining the strategies learners employ during ED searches can offer valuable insights for both learners and educators, aiming to promote the adoption of strategies that enhance proficient dictionary use (Mavrommatidou et al. 2019).

Drawing on Chadjipapa et al. (2020: 447) that "dictionary use is a complex process which requires the development of particular types and combinations of dictionary use strategies in different learning and cultural situations", it is reasonable to posit that learners likewise require specific types and combinations of ED use strategies to effectively utilize EDs across various learning and cultural contexts. Due to the absence of reliable methods for evaluating users' skills, characteristics, and strategies in selecting and using EDs, Mavrommatidou et al. (2019) were motivated to create a questionnaire to investigate ED use strategies. This effort led to the development and validation of the S.I.E.D.U, specifically crafted to gauge the strategies of Greek users in conducting ED searches. However, the applicability of the S.I.E.D.U in other cultural contexts remains unknown.

Examining Chinese learners' ED use strategies holds significant implications, as it enables researchers to conduct comparative analyses across cultural

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groups, elucidating potential reasons for discrepancies in ED usage. Understanding these strategies can assist educators in comprehending the constructs of ED use strategies, facilitating the creation of tailored teaching materials to address deficiencies in ED usage, thereby enhancing learners' awareness and proficiency in effective EDs utilization. For learners, comprehending their strategic EDs use allows them to assess their current skill set and identify areas for improvement, thus enhancing their ED use strategies over time. Due to significant cultural differences between China and Greece, it is expected that Chinese learners may exhibit distinct patterns in their ED usage. Moreover, the Chinese government's emphasis on digital literacy development in education since 2020 underscores the significance of EDs as learning tools. This commitment reflects the broader vision of cultivating a learning society and nation, advocating for lifelong learning opportunities. Though it does not necessarily mean that Chinese learners are already more accustomed to EDs as a digital resource, it highlights the relevance and timeliness of studying ED use strategies within the Chinese educational context, as there is an ongoing need to integrate these resources effectively into learners' habits and practices.

3. Methods

Participants were initially selected. Following this, the S.I.E.D.U. was introduced, and a translation procedure was conducted. Adaptations were made to ensure comprehensive understanding of the Chinese version of the S.I.E.D.U. Once the final version of the questionnaire was achieved, it was administered to participants.

3.1 Participants

Five hundred and eighteen English majors in their third year (seniors) from a university in South China participated in this study. All participants were native speakers of Mandarin Chinese, aged between 21 and 22. English majors were intentionally chosen due to their heavy reliance on English dictionaries throughout their English learning process. As seniors, they have been using electronic dictionaries for several years and have developed specific strategies. Their strategies in ED use can offer insights into the broader context in China. Excluding invalid questionnaire answers, 494 valid responses were collected, with 102 males and 392 females among the participants.

A larger sample size improves the accuracy and stability of factor loadings, ensures the factor solution is robust and replicable, and reduces sampling error. It meets the common guideline of having at least 5–10 participants per survey item, which strengthens the validity of the analysis. In the present study, there are 32 items in the questionnaire, meaning at least 320 participants are necessary to ensure the robustness of the study. Furthermore, a large and

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diverse sample increases the generalizability of the results to the broader population, ensuring that the identified factors are not specific to a small, potentially biased sample.

3.2 Introduction to the S.I.E.D.U.

The S.I.E.D.U. (Mavrommatidou et al. 2019), a self-reported instrument, consists of 32 items questionnaire designed to investigate the strategies and practices utilized by ED users. Response options are organized on a five-point Likert scale ranging from 1 = "never", to 5 = "always". Through factor analysis, researchers grouped ED use strategies included in the instrument into four distinct categories, i.e. familiarity with different types of electronic dictionaries and the conditions of their use, strategies for lemmatization and acquaintance with dictionary conventions, navigation skills, and look-up strategies in new electronic environments.

3.3 Translation of the S.I.E.D.U.

The English version of S.I.E.D.U. was originally developed in Greek (Mavrommatidou et al. 2019). In the Chinese context, we deemed it acceptable to translate the questionnaire from English to Chinese. To ensure precise translation, a group of six specialists, who are proficient in both English and Chinese, were invited. Following the translation protocol outlined by Gavriilidou (2014) and Moreira et al. (2022), the translation process of the S.I.E.D.U. into Chinese involved several meticulous steps.

Firstly, two bilingual specialists translated the questionnaire using the "decentering" method, ensuring a nuanced interpretation rather than a literal translation of each item. Cultural adaptation was also incorporated to enhance relevance to Chinese-speaking individuals. For instance, in Item 2 "I can find the dictionary I am looking for using a search engine (e.g. Google)", the Chinese version included Baidu, one of the most popular search engines in China, alongside Google, so as to enhance contextual relevance for Chinese learners. This adaptation aimed to accurately capture the intended meaning of the questionnaire items within the cultural context of the target audience. Additionally, two specialists in lexicography clarified the meanings of the content to provide well-informed recommendations for translation.

Secondly, a back translation into English was conducted by two experts to verify accuracy. Each item of the Chinese translation was back-translated into English, and the resulting English version was compared to ensure correspondence with the original English questionnaire.

Thirdly, the translated Chinese version underwent a thorough evaluation by the six specialists. This systematic approach ensures the reliability and validity of the translated S.I.E.D.U. questionnaire for Chinese-speaking populations,

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maintaining fidelity to the original while accounting for linguistic and cultural nuances.

3.4 Adaptation of the S.I.E.D.U.

To refine the Chinese version of the S.I.E.D.U., a pilot test was conducted with ten English majors to identify any unclear words, phrases, or sentences in the questionnaire. Eight students encountered a common issue, i.e. uncertainty regarding certain technical terms, such as "词条" (entry), "词域" (field), "通配符" (wildcards), and "布尔逻辑检索" (Boolean search). Additionally, six students expressed uncertainty about understanding the intention of specific items, such as Item 15 "To find a word in an online dictionary, I use the menu or select the first letter of a menu list using the mouse". They were unsure about the origin of the menu list mentioned in the item. In response to the feedback from the pilot study, the group of specialists decided to enhance clarity by providing explanations for these technical terms and even including screenshots of certain examples to offer further clarification. For example, we added an explanation of "当检索一个词时，只需在检索栏输入首字母，然后下拉框中会给出很多单词选项，我会看看这些选项中是否有我要查找的单词。如下图所示" to Item 15 (see Appendix for more information). Additionally, for items that remained unclear, the specialists incorporated examples to show how certain functions work. To ensure comprehensive understanding, five additional English majors were invited to review the content of the Chinese version and assess their comprehension of all items' meanings and intentions. After thorough review and confirmation, it was necessary to intentionally disrupt the order of all the items as well. Following this adjustment, the Chinese version of the S.I.E.D.U. was finalized. This proactive approach aimed to improve the comprehensibility and reliability of the questionnaire, ensuring accurate data collection in the subsequent phases of the study.

3.5 Procedure

To maintain clarity and confidentiality, the survey commenced with a concise statement outlining the study's objectives and a guarantee of data privacy. The Chinese version of the S.I.E.D.U. was integrated into the Questionnaire Star app, a popular tool used for creating and distributing surveys and questionnaires, providing accessibility to the target participants via a questionnaire link or QR code. This online questionnaire was disseminated directly to participants with the assistance of their teachers through WeChat, a social media app popular in China. Participants completed the questionnaire in a single class session, typically within a twenty-minute timeframe. Furthermore, ten out of the 494 participants were selected at random to participate in an interview, during which they shared their comprehension of the questionnaire and their strategies for using EDs.

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4. Data analysis

4.1 Factor analysis

To assess the internal structure of the Chinese version of the S.I.E.D.U., we performed an exploratory factor analysis (EFA) utilizing principal component factoring with Varimax rotation, employing IBM SPSS Statistics 26. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy yielded a value of .887, indicating that the data were suitable for factor analysis. Additionally, Bartlett's test of sphericity was highly significant (χ^2 = 7211.505, df = 496, p = .000), further supporting the factorability of the correlation matrix. Following common practice (Hair et al. 2010), we considered factor loadings above 0.3 as indicative of acceptable item retention. Consequently, the EFA revealed the extraction of seven factors, providing a coherent grouping of the 32 questionnaire items (see Table 1).

Table 1: Factor loadings of the Chinese version of the S.I.E.D.U.

Items	Factor Loading
F1_10: 我能够理解电子词典中一个词条的超链接是什么，并且通过点击这个超链接，我会得到什么样的相关信息。（如下图中鼠标处） I can understand which the hyperlinks of a lexicographical entry are and where they refer to.	.746
F1_23: 我通过使用超链接来查找词条的更多信息。 I use the hyperlinks to find more information about the lexicographical entry.	.677
F1_16: 在说话过程中，为了核对一个词或短语的发音，我使用电子词典中的合成语音（电子词典所提供的单词发音功能，比如百度词典发音是合成的语音）或录音发音应用。（如下图所示） To check the pronunciation of a word/phrase while speaking, I use the application of synthesized speech or recorded pronunciation of my electronic dictionary.	.652
F1_2: 我可以通过使用搜索引擎（如谷歌，百度）找到我需要的电子词典。 I can find the dictionary I am looking for using a search engine (e.g. Google, Baidu).	.646
F1_20: 我能够在电子词典的不同功能之间轻松浏览，检索相关信息（例如单词发音、单词的释义、单词的例句、近义词、反义词等，可在这些功能之间轻松查找信息）。 I navigate/browse easily between different parts of lexicographical data.	.628
F1_32: 我使用"历史记录"选项来查看我最近进行的搜索。（如下图所示） I use the option "History" to have access to the most recent searches I carried out.	.547

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F1_13: 为了更快速地检索一个单词，我在在线词典的搜索框中输入关键词，这些关键词和我要查找的词相关。 In order to search quickly for a word, I write down (in the search box of my online dictionary) keywords which are more relevant to the data of my research.	.540
F1_18: 当听到一个我不理解的单词时，我会利用电子词典中的 "Did-you-mean?" 功能进行查找，即使我不知道它的正确拼写。（例如我想搜索 nostalgia，但是在输入时输成了 nastalgia，此时搜索自动提示会问你是不是要搜索 nostalgia，即正确的词。如下图所示） When listening to a word I do not understand, I look it up even without knowing the proper spelling, utilizing the "Did-you-mean?" function of my electronic dictionary.	.524
F1_6: 我可以通过键入特定的网址来找到我需要的电子词典。 I can find the dictionary I am looking for by typing a specific URL.	.513
F2_25: 为了在在线词典中查找一个单词，我会尝试声音检索（即对着电子词典读出该单词，由电子词典自行检索该词）。 To find a word in an online dictionary, I attempt sound search.	.688
F2_4: 为了在在线词典中查找一个单词，我更喜欢使用布尔逻辑检索（即通过使用 AND, OR, NOT 等词）。 To search for a word in an online dictionary, I prefer a Boolean search (using AND, OR, NOT).	.667
F2_15: 为了在在线词典中查找一个单词，我会使用菜单或用鼠标选择菜单列表的首字母。（当检索一个词时，只需在检索栏输入首字母，然后下拉框中会给出很多单词选项，我会看看这些选项中是否有我要查找的单词。如下图所示） To find a word in an online dictionary, I use the menu or select the first letter of a menu list using the mouse.	.654
F2_22: 为了在在线词典中查找一个单词，我会使用通配符【例如问号（?），点（.），星号（*），加号（+），百分号（%）】。（例如查找like一词，我记不清词中间的字母是什么，我可以输入l??e来进行检索。如下图所示） To search for a word in an online dictionary, I use wildcards [e.g. question mark (?), dot (.), asterisk (*), plus (+), percent (%)].	.637
F2_7: 为了在在线词典中查找词组，我会尝试通过筛选进行搜索，例如按词性、词域（词属于哪个领域）、使用频率等。 To find groups of words in an online dictionary, I attempt filtered search e.g. by part of speech, field, frequency of use, etc.	.596
F2_29: 为了在在线词典中查找一个单词，我会尝试检索它的派生形式（如：happy, happily, happiness）。 To find a word in an online dictionary, I attempt inflected form search.	.515
F3_12: 在使用我的新电子词典之前，我会学习介绍词典和词条（由词目及其释义等构成的整体，是词典的基本查检单位）结构的信息。 Before using my new electronic dictionary, I study the information describing the structure of the dictionary and its entries.	.688

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F3_17: 在使用我的电子词典之前，我会浏览网页（电子词典的这个网页）以了解其主要结构。 Before using my electronic dictionary, I browse the webpage to understand its main structure.	.675
F3_3: 在使用我的新电子词典之前，我会仔细学习缩略词列表（如果有的话）。 Before using my new electronic dictionary, I carefully study the list of abbreviations (if there are any).	.669
F3_28: 当电子词典提供的信息很少或可疑时，我会查找或使用纸质词典。 When the electronic dictionary has few or dubious information, I am looking for/I resort to a printed dictionary.	.568
F3_8: 我使用"帮助"选项来解决可能遇到的问题。 I use the option "Help" to solve questions and problems I may encounter.	.524
F4_11: 我使用DVD-ROM或CD-ROM上的电子词典。 I use an electronic dictionary in DVD-ROM or CD-ROM.	.759
F4_24: 我知道DVD-ROM或CD-ROM形式的电子词典是什么样子的。 I know what an electronic dictionary in DVD-ROM or CD-ROM form is.	.738
F4_31: 我知道如何将DVD-ROM中的电子词典安装到我的电脑上。 I know how to install an electronic dictionary in DVD-ROM into my computer.	.730
F5_14: 我在工作场所（学校、大学等）使用电子词典。 I use an electronic dictionary in my workplace (school, university etc.).	.753
F5_27: 我知道手机或平板电脑上的电子词典是什么。 I know what an electronic dictionary in a mobile phone or tablet is.	.741
F5_30: 我在家里使用电子词典。 I use an electronic dictionary at home.	.739
F5_1: 我知道什么是在线词典。 I know what an online dictionary is.	.678
F6_19:（和纸质词典相比），我使用电子词典更快地查找到我想要的信息。 I use an electronic dictionary to look for the desired information more quickly (compared to a print dictionary).	.704
F6_9:（和纸质词典相比），我使用电子词典更容易地查找我想要的信息。 I use an electronic dictionary to find more easily the information I want (compared to a print dictionary).	.679
F6_21: 我选择使用电子词典，因为它包含许多多媒体应用（音频，视频等），给人印象深刻。 I choose an electronic dictionary, because it contains many multimedia applications (video, audio, etc.) and is most impressive.	.632
F7_5: 我使用无需订阅的在线词典。 I use online dictionary available without subscription.	.826
F7_26: 我使用需要订阅的在线词典。 I use online dictionary available by subscription.	-.628

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The factors extracted from the Chinese version of the S.I.E.D.U. revealed a departure from the original questionnaire, necessitating careful scrutiny of each factor to ascertain its distinct characteristics. In sum, the identified seven factors collectively explain 60.98% of the total variance.

The first factor, comprising 26.663% of the total variance, encompasses nine items pertaining to users' familiarity with ED conventions and functions. Accordingly, it was labeled as "Familiarity with ED conventions and functions". The second factor, explaining 13.183% of the variance, encompasses six items focusing on users' proficiency in utilizing specific functions offered by EDs. This factor was designated as "Look-up strategies in EDs". The third factor, contributing 6.113% to the total variance, comprises five items related to users' preparation before utilizing an ED and their problem-solving approaches when encountering difficulties. This factor was labeled "Preparation and troubleshooting during ED use". The fourth factor, explaining 4.013% of the variance, consists of three items concerning the storage format of EDs, specifically whether it can be gained from DVD-ROM or CD-ROM. It was labeled "Storage format of EDs (DVD-ROM/CD-ROM)". The fifth factor, contributing 3.868% to the total variance, encompasses four items related to users' overall acceptance of EDs and the contexts in which they are utilized, earning the label "Acceptance and usage context of EDs". The sixth factor, explaining 3.709% of the variance, comprises three items focusing on the advantages that EDs offer over traditional paper dictionaries. This factor was designated "Advantages of ED over traditional methods". Lastly, the seventh factor, accounting for 3.431% of the variance, consists of two items associated with users' subscriptions to ED services. It was labeled "Subscription and access to EDs".

By meticulously delineating each factor and its constituent items, this analysis provides a nuanced understanding of the underlying dimensions of ED usage among the studied population group.

4.2 Internal consistency and reliability

Reliability in assessment is crucial as it ensures the consistency and stability of questionnaire data (Johnson and Christensen 2000). Cronbach's alpha, a widely utilized measure of internal consistency reliability, evaluates how closely related a set of items are as a group within a scale. This coefficient ranges from 0 to 1, with values of 0.9 and above indicating excellent reliability, 0.8 to 0.89 signifying good reliability, 0.7 to 0.79 suggesting acceptable reliability, 0.6 to 0.69 implying questionable reliability, 0.5 to 0.59 indicating poor reliability, and values below 0.5 considered unacceptable (Cronbach 1951). To assess the internal consistency and reliability of the Chinese version of the S.I.E.D.U., reliability testing was conducted for both the overall scale and each factor (see Table 2).

It is imperative to note that the value of factor 7 is negative, stemming from a negative average covariance among items. This deviation violates the assumption of the reliability model. The reasons for this anomaly are discussed in the

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following section. It is recommended to remove the items included in factor 7 from the questionnaire. Upon deletion of Factor 7, a higher Cronbach's alpha value is obtained, thereby enhancing the overall reliability of the scale.

Table 2: Internal consistency reliability for the overall scale and each factor

Scales	Cronbach's alpha
Total scale	.902
Total scale after deleting Factor 7	.905
Factor 1: Familiarity with ED conventions and functions	.849
Factor 2: Look-up strategies in EDs	.831
Factor 3: Preparation and troubleshooting during ED use	.822
Factor 4: Storage format of EDs (DVD-ROM/CD-ROM)	.756
Factor 5: Acceptance and usage context of EDs	.786
Factor 6: Advantages of ED over traditional methods	.695
Factor 7: Subscription and access to EDs	-1.003

5. Discussion

In contrast to the four factors identified in the S.I.E.D.U., the Chinese version revealed seven distinct factors. Within these seven factors, both commonalities and differences emerged when comparing the findings of the two versions (see Table 3). It was noted that the four factors derived from the original study exhibit some degree of overlap. Specifically, factors 1 and 2 pertain to ED conventions, while factors 3 and 4 delve into learners' reference skills and strategies employed during ED consultations.

Table 3: Comparison of the factors extracted from the Chinese version of the S.I.E.D.U. and its original counterpart

Factors of the Chinese version of the S.I.E.D.U.	Factors of the S.I.E.D.U.
Factor 1: Familiarity with ED conventions and functions	Factor 1: Familiarity with different types of electronic dictionaries and the conditions of their use
Factor 2: Look-up strategies in EDs	Factor 2: Strategies for lemmatization and acquaintance with dictionary conventions
Factor 3: Preparation and troubleshooting during ED use	Factor 3: Navigation skills
Factor 4: Storage format of EDs (DVD-ROM/ CD-ROM)	Factor 4: Look-up strategies in new electronic environments

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Factor 5: Acceptance and usage context of EDs
Factor 6: Advantages of ED over traditional methods
Factor 7: Subscription and access to EDs

In our survey, factors 1 and 2 exhibit congruent meanings with those identified in the prior study, highlighting the critical importance of familiarity with ED conventions and adept look-up strategies. These two factors are foundational pillars that underpin effective ED searches. Familiarity with ED conventions involves grasping their structure, functionalities, and features, as well as how entries are organized, abbreviations utilized, available search options, and more. Mastery of these conventions empowers users to navigate ED interfaces with ease, maximizing efficiency and accuracy in retrieving desired information. Similarly, proficiency in look-up strategies involves employing systematic approaches to identify and locate information within an ED efficiently. This includes selecting appropriate search terms, utilizing advanced search features, and interpreting search results effectively. Together, factors 1 and 2 constitute a substantial portion of the total variance, amounting to 39.846%. This underscores the pivotal role that familiarity with ED conventions and adept look-up strategies play in facilitating successful ED searches. As foundational competencies, they equip learners with the essential skills and knowledge needed to harness the full potential of EDs, enhancing their effectiveness and utility in various academic and practical contexts.

However, the present study unveils more nuanced and intriguing findings. Factor 3 emerged to capture learners' behaviors prior to utilizing a new ED and their approaches to troubleshooting when encountering difficulties. Interestingly, preparations before ED usage are often overlooked by learners. As mentioned by Interviewee 4, "I seldom do anything before using a new electronic dictionary; I thought dictionaries are generally the same". It is acknowledged that a grasp of the ED's structure, entry display, abbreviations, and other features can expedite the consultation process and facilitate obtaining desired information for the learners themselves. The challenges encountered during searches can partly be attributed to learners' lack of fundamental knowledge about EDs. This result is consistent with previous research, which calls for dictionary use training. Despite not being as prominent as the preceding factors, Factor 3 still contributes significantly to the overall variance.

Factor 4 in the current study addresses the storage format of electronic dictionaries, specifically in DVD-ROM or CD-ROM formats. Notably, during the interviews, eight out of the ten participants expressed views on the declining relevance of DVD-ROMs and CD-ROMs in today's context. A significant observation was the absence of drivers for these formats on their computers or laptops, indicating a lack of usage or even possession of such physical media among many interviewees. Some even viewed DVD-ROMs and CD-ROMs as cumber-

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some and outdated. This trend is multifaceted. Firstly, the limited accessibility of physical media-based dictionaries poses significant inconvenience, requiring specific devices like computers or DVD/CD drives for access. In an age where learners prioritize convenience and portability, the need for specialized hardware can deter usage. Additionally, technological advancements have rendered DVD-ROMs and CD-ROMs obsolete, with modern learners favoring web-based platforms and mobile apps for their flexibility and compatibility across devices. Moreover, physical media-based dictionaries lack the interactive features and real-time updates offered by digital alternatives, failing to meet the expectations of today's tech-savvy learners. Cost considerations also play a role, as physical media entail upfront expenses and additional shipping costs, making them less attractive compared to online alternatives. In brief, the declining popularity of DVD-ROM or CD-ROM electronic dictionaries can be attributed to a combination of technological advancements, changing user preferences, and the availability of more convenient digital options.

Factor 5 explores the acceptance and usage contexts of EDs, revealing a widespread embrace of these tools by learners. This factor suggests a prevailing trend wherein learners increasingly rely on EDs to fulfill their linguistic needs. For instance, Interviewee 9's statement, "I don't have a paper dictionary in my college life, all I use is Internet and electronic dictionaries", vividly illustrates this preference for digital resources. Similarly, Interviewee 5's remark, "As an English major, I have to use dictionaries frequently, but all I use is an electronic dictionary because it's faster and more convenient", echoes this sentiment, highlighting the collective shift towards the convenience and accessibility offered by EDs. This trend aligns with Sharpe's (1995: 49) observation that "the familiarity of today's young people with electronic devices will eventually relegate the printed notion of 'dictionary' to a secondary sense". Furthermore, the adaptability of EDs is evident through their versatility across various contexts, transcending the boundaries of academia and seamlessly integrating into learners' daily lives. Whether utilized in the workplace, school, university, or at home as mentioned in Items 14 and 30, for purposes ranging from language study to everyday communication, EDs have become indispensable tools, readily accessible whenever and wherever needed. This pervasive integration underscores the transformative impact of EDs, reshaping the landscape of language learning and usage in contemporary society.

Factor 6 comprises three out of four items containing the phrase "compared to a printed dictionary", while the last item, although lacking this comparison, also outlines the reasons why learners prefer EDs. For example, Item 19 highlights that learners can search for desired information more quickly, Item 9 emphasizes the ease of finding information, and Item 21 underscores the presence of multimedia applications in EDs. Overall, these four items effectively underline the advantages of EDs over their printed counterparts, showcasing their superiority in terms of speed, ease of use, and multimedia functionality. Alamri and Hakami's (2022) research supports this, showing that EFL learners prefer EDs

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over printed dictionaries due to quicker information access, time efficiency, and accurate language translation. Through this factor, valuable insights into the reasons behind learners' acceptance of EDs and their widespread popularity across various usage contexts can be gleaned.

Factor 7 comprises two items related to ED subscriptions, with factor loadings for Item 5 and Item 26 indicated in Table 1. It is noteworthy that Item 26 presents the opposite statement to Item 5, which explains why the factor loading of Item 26 yields a negative value. Given that both items essentially explore the same aspect, the presence of positive and negative statements inevitably contributes to result inconsistency, necessitating their removal. Nevertheless, this observation highlights a significant trend that participants generally prefer not to subscribe to EDs. In the dynamic landscape of contemporary learning environments, learners are increasingly eschewing ED subscriptions for various reasons. Firstly, the proliferation of free alternatives, including online dictionaries and translation tools, provides learners with readily accessible resources without the encumbrance of subscription fees. Furthermore, lingering doubts regarding the quality and comprehensiveness of subscription-based EDs compared to their free counterparts may weigh heavily on learners' decision-making processes. Economic considerations also wield significant influence, with learners conscientiously managing their educational expenditures and favoring free resources over subscription-based options. Moreover, the ever-expanding array of information sources beyond traditional dictionaries, such as language learning apps and educational websites, serves to dilute the perceived indispensability of subscription-based EDs. This shifting landscape is further propelled by technological preferences, with learners gravitating towards mobile apps and web-based platforms for their unparalleled convenience and ubiquitous accessibility. Consequently, the perceived value proposition of subscription-based EDs may fail to resonate with the diverse needs and preferences of modern learners, compelling them to explore and adopt alternative language tools and resources that better align with their evolving learning paradigms. In light of this perspective, exploring learners' views on subscribing to EDs becomes meaningless. Therefore, it is recommended to remove Item 5 and Item 26 from the questionnaire.

Compared to the four factors identified in the S.I.E.D.U., the seven factors revealed in the present study offer more nuanced and insightful findings. In addition to factors correlated to ED conventions, functions, and strategic skills, our study identified additional factors including learners' preparation and troubleshooting, acceptance and usage context, storage format and advantages of EDs, and ED subscription. Together, these factors provide a comprehensive understanding of ED use strategies from the Chinese learners' perspective, benefiting not only learners but also educators.

6. Conclusion

The motivation behind adapting and validating the S.I.E.D.U. was to assess its

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applicability not only in the Greek context but also in the Chinese setting. As part of this process, two items related to the subscription of EDs are recommended for removal based on our factor analysis results. The decision to exclude these items in the Chinese context reflects the diverse needs and preferences of modern learners. Despite this adjustment, the majority of the items confirmed the S.I.E.D.U. as a reliable and valid instrument for evaluating the ED use strategies in Chinese culture. The present study yielded more nuanced results, offering insightful views on Chinese learners' ED use strategies. The effective utilization of EDs requires users to develop proficiency not only in navigating the interface but also in discerning relevant information and integrating it into their language learning endeavors. Accordingly, these findings provide valuable pedagogical implications that can inform educational practices and interventions in the realm of language learning. Recommendations for using the Chinese version in China include adopting it to diverse educational settings to optimize its effectiveness. Moreover, adapting the original version for use in other linguistic and cultural contexts would require additional validation and modifications to ensure the accuracy and applicability of the S.I.E.D.U. across different cultural backgrounds. Future research endeavors could further investigate its adaptability across various linguistic and cultural settings.

To optimize strategies in ED usage, Chinese learners and educators must familiarize themselves with ED conventions. During the adaptation process of the questionnaire, it was noted that learners were unfamiliar with some technical terms and certain functions of EDs. This lack of familiarity resulted in uncertainty regarding the intended meaning of specific items in the translated questionnaire. This unfamiliarity reflects Chinese learners' limited knowledge about ED conventions, which potentially impedes their effective utilization of EDs. To address this issue, Chinese learners must dedicate time to understanding the conventions and functionalities of EDs, including search options, entry organization, abbreviations, and more. By doing so, learners can enhance their efficiency in utilizing these digital resources, thereby optimizing their overall experience with EDs. Additionally, learners can develop effective look-up strategies by practicing systematic approaches, including selecting appropriate search terms and utilizing advanced search features. This will streamline the search process and improve the accuracy of information retrieval. Furthermore, learners can explore various ED platforms and leverage their multimedia functionalities for a richer learning experience. Lastly, learners should recognize the versatility of EDs and employ them across various contexts, integrating them into their daily routines beyond academic research or language study. This broader usage will allow learners to maximize the utility and effectiveness of EDs across diverse learning endeavors.

To support learners' proficiency in utilizing EDs, educators can integrate ED training into language learning curricula. Hadebe (2004) emphasizes the importance of teacher training in dictionary skills as the fundamental prerequisite to provide learners with personalized instruction tailored to their individ-

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ual needs. In a similar vein, Bogaards (2003) stresses the critical importance of dictionary use training, highlighting the significant gap between the lack of progress in training programs and the advancement in dictionary quality. Gavriilidou et al. (2024) endorse the teachability of dictionary use strategies and skills, proposing that well-designed dictionary awareness programs can enhance awareness and foster a culture of dictionary use. These observations highlight the imperative for educators to include ED training in their curricula. Additionally, educators can promote critical thinking skills by encouraging learners to evaluate the quality and reliability of information retrieved from EDs. Improving the existing textbooks to better meet learners' needs for dictionary skills training is also essential (Law 2024). By teaching learners to discern credible sources, verify information, and cross-reference multiple resources, educators can enhance learners' ED use strategies. Furthermore, providing access to a diverse range of ED platforms exposes learners to different functionalities and features. Familiarizing learners with web-based, mobile app, and software-based EDs accommodates diverse learning preferences and needs. Last but not least, educators can foster collaborative learning environments where learners share tips, strategies, and resources related to ED usage. Encouraging peer-to-peer support and interaction can also promote active engagement and knowledge exchange among learners. Through these pedagogical approaches, both learners and educators can harness the full potential of EDs to enhance language learning and teaching outcomes.

Undoubtedly, this study has limitations inherent to the nature of the research tool. The Chinese version of the S.I.E.D.U. relies on self-reported responses, raising questions about the extent to which participants' answers truly reflect their real and objective perceptions (Chamot 2004). Participants might provide answers that they perceive as socially desirable or that align with their expectations of the study's goals, rather than their genuine experiences or behaviors. Future studies could consider combining self-reported data with observational or qualitative methods to explore learners' ED use strategies. Such instruments could provide a clearer and more accurate understanding of learners' behaviors and perceptions in this domain, thereby enhancing the credibility and rigor of research findings.

Acknowledgements

We are grateful to Prof. Elsabé Taljard, and two anonymous reviewers for their insightful comments and suggestions. Remaining errors are our own. Correspondence should be addressed to Hui Wang.

This study was supported by Guangdong Philosophy and Social Sciences Foundation Project (Grant No. GD23WZXC01-02), 2023 Higher Education Teaching Reform Project of Guangdong Province (Entitled "Innovative Practice of Ideological and Political Education in International Literacy English Courses Based on Output-Oriented Approach", and "Reform and Practice of AI-powered

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Teaching Model for College English in the Context of Excellent Engineers"), and Dongguan University of Technology's Teaching Reform Project of Higher Education (Grant No. 202202025).

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Appendix: The Chinese version of the adapted S.I.E.D.U.

本问卷旨在调查中国英语学习者的电子词典使用情况，内容包含两部分：第一部分为个人信息，请按照提示要求如实用汉语或数字填写；第二部分为 32 项情况描述，每个描述项下方有5个选项（①不符合；②基本不符合；③一般；④大多数情况下符合；⑤ 完全符合），请依据自身情况，选择符合自身情况的描述项。请填写人认真如实填写问卷内容，您的真实数据对我们的研究结果非常重要。我们承诺，本问卷所搜集数据将严格保密，仅用于科学研究需要，在研究结果分析与汇报中也将充分保护填写人的个人隐私。

姓名
性别
年龄
学校
专业

1. 我能够理解电子词典中一个词条的超链接是什么，并且通过点击这个超链接，我会得到什么样的相关信息。（如下图中鼠标处）

2. 我通过使用超链接来查找词条的更多信息。

3. 在说话过程中，为了核对一个词或短语的发音，我使用电子词典中的合成语音（电子词典所提供的单词发音功能，比如百度词典发音是合成的语音）或录音发音应用。（如下图所示）

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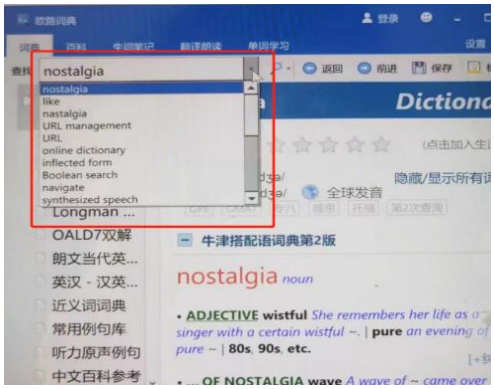
4. 我可以通过使用搜索引擎（如谷歌，百度）找到我需要的电子词典。

5. 我能够在电子词典的不同功能之间轻松浏览，检索相关信息（例如单词发音，单词的释义，单词的例句，近义词，反义词等，可在这些功能之间轻松查找信息）。

6. 我使用"历史记录"选项来查看我最近进行的搜索。（如下图所示）



7. 为了更快速地检索一个单词，我在在线词典的搜索框中输入关键词，这些关键词和我要查找的词相关。

8. 当听到一个我不理解的单词时，我会利用电子词典中的 "Did-you-mean?" 功能进行查找，即使我不知道它的正确拼写。（例如我想搜索 nostalgia，但是在输入时输成了 nastalgia，此时搜索自动提示会问你是不是要搜索 nostalgia，即正确的词。如下图所示）

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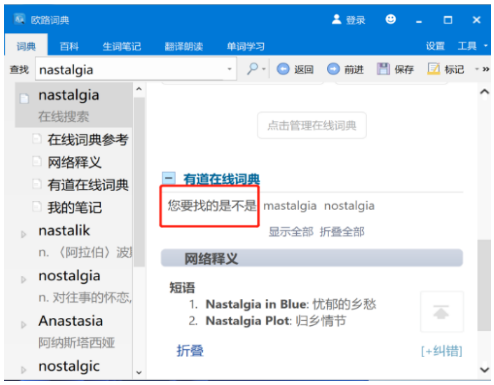
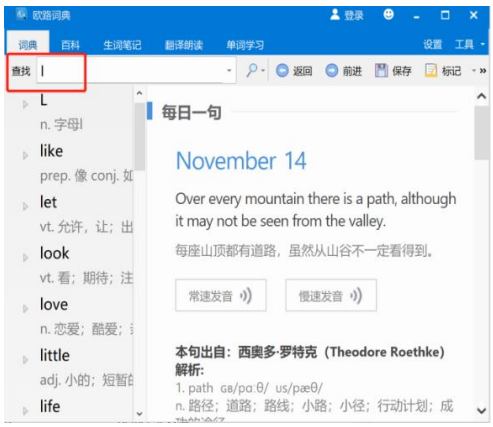


9. 我可以通过键入特定的网址来找到我需要的电子词典。

10. 为了在在线词典中查找一个单词，我会尝试声音检索（即对着电子词典读出该单词，由电子词典自行检索该词）。

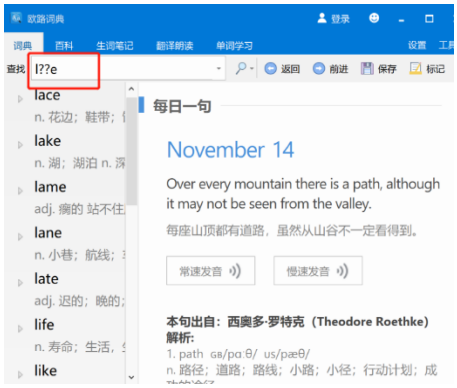
11. 为了在在线词典中查找一个单词，我更喜欢使用布尔逻辑检索（即通过使用 AND, OR, NOT 等词）。

12. 为了在在线词典中查找一个单词，我会使用菜单或用鼠标选择菜单列表的首字母。（当检索一个词时，只需在检索栏输入首字母，然后下拉框中会给出很多单词选项，我会看看这些选项中是否有我要查找的单词。如下图所示）



13. 为了在在线词典中查找一个单词，我会使用通配符【例如问号（?），点（.），星号（*），加号（+），百分号（%）】。（例如查找like一词，我记不清词中间的字母是什么，我可以输入l??e来进行检索。如下图所示）

http://lexikos.journals.ac.za; https://doi.org/10.5788/34-1-1914 (Article)



14. 为了在在线词典中查找词组，我会尝试通过筛选进行搜索，例如按词性、词域（词属于哪个领域）、使用频率等。

15. 为了在在线词典中查找一个单词，我会尝试检索它的派生形式（如：happy, happily, happiness）。

16. 在使用我的新电子词典之前，我会学习介绍词典和词条（由词目及其释义等构成的整体，是词典的基本查检单位）结构的信息。

17. 在使用我的电子词典之前，我会浏览网页（电子词典的这个网页）以了解其主要结构。

18. 在使用我的新电子词典之前，我会仔细学习缩略词列表（如果有的话）。

19. 当电子词典提供的信息很少或可疑时，我会查找或使用纸质词典。

20. 我使用"帮助"选项来解决可能遇到的问题。

21. 我使用DVD-ROM或CD-ROM上的电子词典。

22. 我知道DVD-ROM或CD-ROM形式的电子词典是什么样子的。

23. 我知道如何将DVD-ROM中的电子词典安装到我的电脑上。

24. 我在工作场所（学校、大学等）使用电子词典。

25. 我知道手机或平板电脑上的电子词典是什么。

26. 我在家里使用电子词典。

27. 我知道什么是在线词典。

28.（和纸质词典相比），我使用电子词典更快地查找到我想要的信息。

29.（和纸质词典相比），我使用电子词典更容易地查找我想要的信息。

30. 我选择使用电子词典，因为它包含许多多媒体应用（音频、视频等），给人印象深刻。