How Do Students Perform and Perceive Parallel Corpus Use in Translation Tasks? Evidence from an Experimental Study

Kanglong Liu, Yanfang Su, and Dechao Li

1 Introduction

The compilation of corpora, utilisation of corpus tools, and application of corpus evidence for translational decisions are widely recognised as fundamental components of translation competence (Varantola 2003). Amongst various types of corpora, parallel corpora have emerged as the most valuable and effective resources, providing direct translation solutions for translators (Liu 2020). Extensive research has demonstrated the usefulness of parallel corpora for student translators, enabling them to extract desired terminology or concordances (Santos and Frankenberg-Garcia 2007), observe expert translators' approaches to translation problems (Monzó Nebot 2008), and explore potential information loss or supplementation during the translation process (Pearson 2003). Parallel corpora are believed to significantly enhance the competence and confidence of translation trainees (Zhu and Wang 2011). However, there is a lack of longitudinal and empirical research evaluating the effectiveness of corpus use in translator training (Frérot 2016). Previous studies have mainly focused on conceptual discussions, emphasising the advantages of corpus-assisted translation. Thus, further experimental research is necessary to evaluate the efficacy and limitations of employing parallel corpora in translation classrooms.

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2 Related Work

2.1 Types of Corpora in Corpus-Assisted Translation Teaching

Corpus-assisted translation teaching, an interdisciplinary approach situated at the intersection of corpus linguistics, translation studies, and educational theories (Bernardini 2004), encompasses the purposeful use of corpus tools and data to enhance translation instruction. This approach draws upon the methodology of corpus linguistics, employing a bottom-up approach wherein students systematically analyse and interpret corpus data to derive meaningful insights (Boulton and Cobb 2017). It also incorporates elements of descriptive translation studies, such as the examination of translation universals within the classroom setting (Laviosa 2008). The design of corpus-assisted translation training syllabi incorporates diverse educational approaches, including discovery learning, project learning (Bernardini 2016), and the task-based approach (Marco and Van Lawick 2009). The interdisciplinary nature of corpus-assisted translation teaching underlies its numerous merits, which have garnered significant scholarly attention over the past two decades (Biber et al. 1998). One of the key merits of corpus-assisted translation teaching lies in its inductive and student-centred approach to learning. By utilising corpora, translation students gain access to a vast collection of authentic texts (Bowker 2002) and are encouraged to actively engage as language researchers in their own learning process (Rodríguez-Inés 2009). Furthermore, the use of corpora in translation teaching offers a valuable translation toolkit. Scholars have highlighted that corpus-assisted translation teaching provides not only a reference tool but also prompts thought-provoking insights (Bernardini et al. 2003: 11).

The utilisation of different types of corpora offers distinct advantages, with monolingual corpora being particularly accessible and widely utilised. This type of corpus provides valuable insights into conventional language usage within specific contexts, empowering translators to produce more natural-sounding translations (Bernardini et al. 2003). By employing monolingual corpora of the target language, translators can search for potential translation equivalents, examine authentic language usage across diverse contexts, explore stylistic considerations, eliminate inappropriate word combinations or equivalents, and validate their intuitions (Bowker and Pearson 2002). Coffey (2002) highlights the usefulness of source-text monolingual corpora as a valuable resource for both translators and translation instructors. However, it is important to acknowledge the limitations of monolingual corpora. Whilst they can offer translations and usage examples within the same language, they do not directly provide information on how words or phrases are translated across languages. This means that translators relying solely on monolingual corpora may face challenges when searching for suitable equivalents in the target language. Moreover, monolingual corpora might not adequately address the cultural and contextual nuances that are crucial in translation. As a result, translators may need to consult additional

resources or rely on their own cultural and linguistic knowledge to ensure accurate and culturally appropriate translations.

Comparable corpora, particularly comparable bilingual corpora comprising native texts in both the source and target languages, play a crucial role in the field of translation and translation teaching (Liu 2020). These corpora offer a range of valuable benefits. They provide translators with access to authentic language usage in both the source and target languages, thus addressing the issue of "translationese" to some extent (McEnery and Xiao 2007: 4). Furthermore, comparable corpora not only enhance translation students' comprehension of the distinct linguistic features present in both the target and source languages (Zanettin 1998), but they also provide invaluable insights into the cultural nuances and specialised knowledge associated with specific contexts (Zanettin 2001). However, it is important to recognise that the effectiveness of comparable corpora relies heavily on the careful selection of representative and authentic texts (Kenning 2010). Nonetheless, it is worth noting that, similar to monolingual corpora, comparable corpora cannot fully capture the intricate complexities involved in the translation process of transforming one language into another (McEnery and Xiao 2007).

The third type of corpus, referred to as parallel corpora, serves a specific purpose in translation (Zanettin 2002). Parallel corpora offer distinct advantages beyond the general benefits provided by corpus tools, such as serving as references for lexical items, syntactic structures, and stylistic concerns. What sets parallel corpora apart is their ability to provide both "direct" and "indirect" translation equivalents to translators (Zanettin 2002: 11). Moreover, parallel corpora consist of an extensive collection of source texts and their corresponding translations, enabling students to analyse diverse translation strategies employed by expert translators across various contexts (Pearson 2003). Notably, scholars emphasise the particular usefulness of parallel corpora in specialised translation, allowing translators to search for equivalent technical terms, unmarked sentence structures, and stylistic conventions within particular subject-specific genres (Kübler et al. 2015). Nevertheless, parallel corpora are comparatively less utilised in corpus-assisted translation teaching compared to monolingual and comparable corpora, partly due to the challenges involved in collecting high-quality parallel texts (Liu 2020).

In addition to comparable and parallel corpora, ad hoc corpora and learner translation corpora are also frequently employed in translation teaching by researchers and educators. Ad hoc corpora, for instance, prove to be particularly valuable in addressing specific requirements in translation (Liu 2020). Through the construction of ad hoc corpora, students engage in the selection of reliable sources (Varantola 2003) and strive to gain a deeper understanding of the meaning within the source texts (Aston and Bertaccini 2001). Another area of growing interest is the compilation of learner translation corpora, which allows for the examination of common characteristics in learner translations (Granger and Lefer 2020). Notable examples of learner translation corpora include the UPF learner translation corpus (Espunya 2014) and the undergraduate learner translator corpus (ULTC) (Alfuraih 2020).

In summary, the corpus approach in translation teaching promotes an inductive learning method, requiring active student engagement to ensure its effectiveness. It

is essential to grasp the advantages and challenges of utilising corpora in translation from the students' perspective to optimise the learning process.

2.2 *Using Corpora in Translation Teaching: Issues to Consider*

Whilst many scholars have emphasised the benefits of using corpora in translation and have introduced various pedagogical designs for corpus-assisted translation teaching (Monzó Nebot 2008; Rodríguez-Inés 2009, 2011; Zanettin 1998, 2001, 2002), there is a relative dearth of empirical studies exploring students' performances and perceptions regarding the use of corpora in translation or translation learning. Amongst the few existing studies, Zhu and Wang (2011) developed ClinkNotes, a corpus-based tool for students' self-directed translation learning. In another study, Liu (2020) compared students' performance using parallel corpora and paper-based dictionaries in translation tasks. The findings revealed that the utilisation of parallel corpora significantly improved students' translation performance in both English-Chinese and Chinese-English translation tasks, with students also expressing a positive view of using parallel corpora in translation. However, with the growing importance of technological competence in the digital age (PACTE 2003), contemporary translators may increasingly rely on web-based resources rather than traditional paper-based dictionaries. Therefore, it is crucial to investigate the impact of parallel corpora on students' translation in more authentic and valid settings.

Despite the perceived benefits of using corpora in translation teaching, the cost-efficiency of this approach has been questioned by some researchers (Varantola 2003). Incorporating corpora into translation practice can be time-consuming as it requires training to effectively utilise corpora to meet translation needs. Moreover, successful corpus use in translation demands students' ability to critically analyse corpus data and extract relevant information from it (Bernardini 2016). The relatively low cost-efficiency of using corpora can be attributed, in part, to the limited availability of corpora specifically designed for translation teaching purposes. Accessing parallel texts, in particular, is more challenging compared to monolingual or comparable texts, resulting in the construction of small-scale parallel corpora (Zanettin 2002). In addition, many translation educators rely on existing parallel corpora primarily designed for research purposes in their teaching practices (Marco and Van Lawick 2009; Ruiz Yepes 2011). Given the challenges associated with using corpus tools in translation, there is a pressing need to design user-friendly corpora that resemble the tools familiar to translators. As Aston (2009) highlighted, the critical issue is to create corpora that can enhance translators' consultation efficiency without compromising the quality of the tool. Concerns have also been raised about students becoming overly reliant on corpus tools and potentially sacrificing the creativity of their translation output. This concern is particularly relevant for parallel corpora, which provide translation equivalents. Therefore, researchers have cautioned that

corpora should not be blindly followed as absolute authorities in translation training (Bernardini et al. 2003; Malmkjær 2003).

In summary, the practical challenges surrounding the use of corpora in translation teaching and the existing gaps in empirical evidence on student performance and perceptions highlight the importance of further research in this field. These investigations will yield valuable insights for the future design and implementation of corpora in translation teaching.

2.3 Rationale and Research Questions

As highlighted in the previous review, the parallel corpus is a valuable resource in corpus-assisted translation teaching. However, its potential remains largely unexplored for various reasons. With the advancements in technology and the prevalence of translation between Chinese and English, two major languages worldwide, it is imperative to further investigate the benefits of parallel corpora. To bridge this research gap, our study specifically focuses on examining the proactive role students must assume and the potential challenges they may encounter when utilising parallel corpora in translation tasks. Through gathering empirical evidence on students' performance and perception of using parallel corpora in translation, our study aims to address two key research questions:

- How does the use of parallel corpora enhance students' translation performance?
- What are the potential challenges that students may face when utilising parallel corpora?

3 Methods

3.1 Participants

A total of 38 students voluntarily participated in this study, all of whom were enrolled in an MA translation programme at a university in Hong Kong. Through random assignment, the students were divided into two groups: an experimental group consisting of 16 students and a control group consisting of 22 students. All participants were considered intermediate-advanced English learners, with IELTS scores ranging from 6.5 to 8. In addition, over 70% of the participants from both groups reported having no prior experience using corpora in translation or English learning.

Prior to the study, informed consent was obtained from both groups of students, and the control group received remedial training. To ensure a comprehensive analysis, four students from the experimental group were purposefully selected for follow-up interviews using the principle of maximum variation. The selection process took into

Table 1 Personal profiles of the focal participants

Name	Gender	Prior practical translation experience	Prior corpus use experience	Frequency of TR corpus use
Syuki	Female	Almost no experience in translation	Occasionally used BNC in translation	Average amongst the participants
Ume	Female	Limited experience in translation	No experience	Above-average amongst the participants
Yuzi	Female	Some experience in translation	Sometimes used COCA in learning English or translation	Below-average amongst the participants
Haru	Female	Rich experience in translation	No experience	Average amongst the participants

account factors such as their previous translation experience, corpus use experience, and engagement with the parallel corpus during the study. Through an examination of divergent cases, the researcher aimed to identify common effects of the parallel corpus on different types of students and explore the potential factors that influenced students' performance and perception of corpus use in translation. Table 1 provides an overview of the selected students' profiles, with pseudonyms used to protect their identities.

3.2 The Parallel Corpus Used in the Study

The parallel corpus utilised in this study was TR Corpus (http://www.tr-corpus.com), a web-based translator training corpus specifically designed for teaching purposes. TR Corpus is a large-scale corpus constructed by sampling and compiling high-quality bilingual texts from various bilingual websites. It consists of approximately 79.31 million English words and 171.44 million Chinese characters. One of the key strengths of TR Corpus is its wide range of text types, including news articles, annual reports, company profiles, features, financial documents, and legal documents, sourced from mainland China and Hong Kong. TR Corpus offers several distinctive features in its search function, results display, and interface design, all aimed at facilitating corpus use for translation teaching and learning. The corpus provides three major functions: Search, Collocate, and Compare. These functions enable students to search for occurrences and collocations of specific words, as well as compare the meanings and usage of two words. In addition, TR Corpus includes a built-in Translator's Workbench feature, allowing students to upload parallel texts for homework submission or future review. The design and functionality of TR Corpus make it a valuable resource for students engaging in translation tasks, providing them with a comprehensive platform for searching, analysing, and comparing bilingual texts.

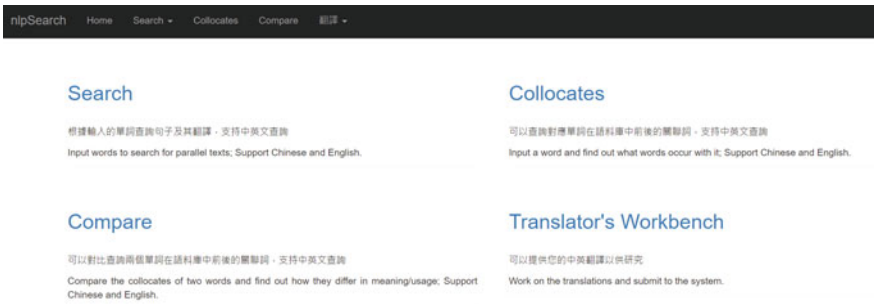


Fig. 1 Interface of TR Corpus

The search results in TR Corpus are displayed using a ranked searching mechanism, ensuring that the most relevant results appear at the top of the list. This feature significantly enhances students' translation efficiency by presenting them with the most pertinent information first. Furthermore, the search term(s) are highlighted in the search results, allowing students to quickly locate the specific instances they are interested in. To provide students with additional context, TR Corpus allows them to access the source websites of each parallel concordance. By clicking on the external link provided in the display page, students can directly visit the original source websites to obtain further information or gain a deeper understanding of the texts. In terms of interface design, TR Corpus offers a user-friendly interface with a clear navigation bar located at the top of the web page. This navigation bar enables easy access to various features and functionalities of the corpus. Below the navigation bar, there are 2×2 function columns, each column providing a brief introduction to the respective function it represents. This layout helps users quickly understand and familiarise themselves with the different components and functions of TR Corpus. For a visual representation of the interface design of TR Corpus, please refer to Fig. 1, which illustrates the layout and components of the corpus interface.

3.3 Procedure

A pre-test was conducted prior to the training to compare the translation performance of the experimental group and control group. The pre-test included an English-Chinese and a Chinese-English translation task, both of which involved short extracts from a company profile. During the pre-test, the students had the freedom to utilise any resources available to them.

Following the pre-test, the experimental group participated in weekly 90-min training sessions for four weeks, alongside their regular translation courses, to familiarise themselves with the use of TR Corpus in translation. In these sessions, the teacher introduced the fundamental concepts and functions of the parallel corpus.

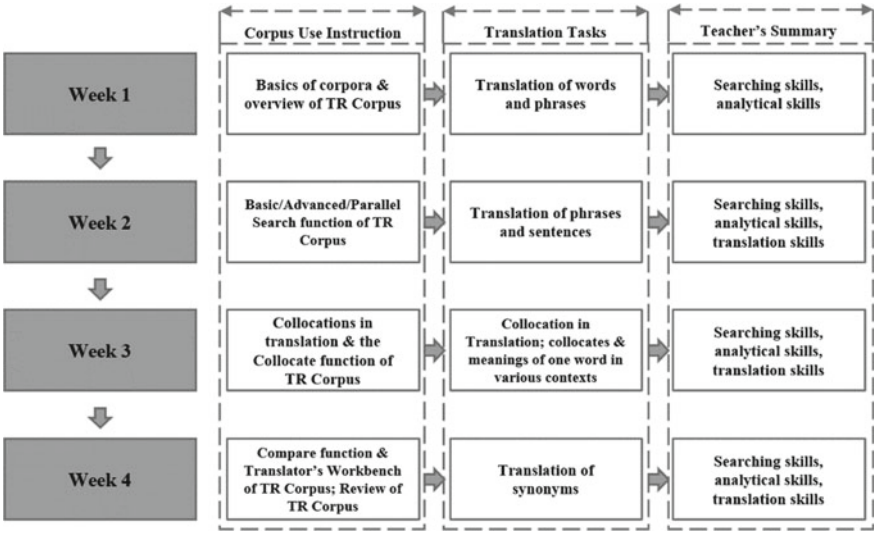


Fig. 2 Four-week parallel corpus training

Students were given dedicated time to explore the corpus, addressing linguistic issues and translation problems, and testing their intuitions using the parallel corpus. Once students became acquainted with the corpus functions, they were assigned translation tasks that encompassed various text types found in TR Corpus. These tasks aimed to encourage students' critical analysis of corpus data and the summarisation of relevant information. Students shared their findings with both their peers and the teacher. At the end of each training session, the teacher, assuming the role of a facilitator rather than an instructor, guided students in consolidating their search and data analysis skills, along with translation strategies relevant to the assigned tasks. The structure of the training sessions is outlined in Fig. 2. Meanwhile, the control group continued with their regular courses without any additional training.

Following the training, both groups of students underwent a post-test using the same text type, namely a company profile. In the post-test, the experimental group had access to the parallel corpus and specified dictionaries without machine translation functions, whilst the control group could utilise various online resources, reflecting typical translation scenarios. The majority of students completed the test within a two-hour timeframe. Subsequently, semi-structured interviews were conducted with the four focal students to gather their perceptions regarding the use of the parallel corpus in translation tasks. During the interviews, the participants were shown screencasts of their respective translation process and search history to aid their recollection and evaluation of their experiences with corpus use in translation. Each interview with a focal participant lasted approximately 40 min.

3.4 Data Collection and Analysis

The primary sources of data collected for this study comprised the pre-test and post-test translation products, transcriptions of interviews, and students' corpus search history. In addition, screencasts of the post-test translation process were gathered to provide further insights into the students' translation performance and their perceptions of utilising the parallel corpus in translation tasks.

The translation products of the students from both the pre-test and post-test were evaluated using a ten-point rating scheme adapted from Kiraly (1995: 83). To assess whether there were differences in translation performance between the experimental and control groups, an independent samples t-test was conducted to compare the pre-test results. Subsequently, to investigate the potential positive effects of using the parallel corpus on students' translation performance, another independent samples *t*-test was employed to compare the translation results of the post-test between the two groups. In addition, a quantitative textual analysis of the students' post-test translation products was conducted to further examine the disparities in translation quality between the experimental and control groups. This analysis incorporated common lexical and syntactic complexity measures frequently employed in translation studies, providing straightforward indicators of the translation strategies employed by students. The analysis involved some lexical and syntactic measures, including type/token ratio (TTR), number of sentences, and the average sentence length. However, since these simple measures may not fully capture the nuances of the translation products between the two groups, a qualitative analysis of the students' translation products was conducted. This qualitative analysis was supplemented by examining their search histories and screencasts. By combining quantitative and qualitative methods, the study aims to gain a more comprehensive understanding of the impact of using a parallel corpus on students' translation performance, as well as to discern the differences between the experimental and control groups.

All audio recordings of the interviews were transcribed verbatim. These transcriptions were then subjected to a typological analysis using three measures: usefulness, challenges, and suggestions. By conducting both quantitative and qualitative data analysis, the study aimed to infer and discuss the effectiveness and difficulties of using a parallel corpus in translation teaching.

4 Findings

4.1 Students' Translation Performances

4.1.1 Independent Samples *T*-Test

To assess the impact of utilising a parallel corpus on students' translation performance, the researchers initially conducted independent samples *t*-tests to compare the translation performance of the experimental group and the control group in the pre-test. The analysis encompassed both the Chinese-English translation task and the English-Chinese translation task. The results revealed no significant differences between the two groups in either task (Chinese-English translation: $p = 0.873$, English-Chinese translation: $p = 0.574$), indicating that both groups possessed similar translation competence prior to the experiment.

Subsequently, additional independent samples *t*-tests were conducted to compare the translation performance of the group using the parallel corpus with that of the group using regular consultation resources. In the Chinese-English translation task, although the mean score of the experimental group ($M = 7.19$, SD $= 0.75$) was slightly higher than that of the control group ($M = 6.77$, SD $= 0.92$), no significant differences were found between the two groups ($p = 0.397$). These findings suggest that the use of the parallel corpus did not have a notable impact on students' Chinese-English translation performance. Conversely, in the English-Chinese translation task, the mean score of the experimental group was 7.31 (SD $= 1.08$), whereas the mean score of the control group was 7.05 (SD $= 0.65$). Notably, the mean score of the experimental group was significantly higher than that of the control group ($p = 0.011$). This implies that employing the parallel corpus had a more beneficial effect on translation into the students' native language compared to translation out of the native language.

4.1.2 Analysis of Translation Products

To further investigate the differences in students' translation output, a textual analysis was carried out on their post-test translation products.

Chinese-English Translation

Table 2 presents the descriptive statistics of the Chinese-English translation products from the two groups. The experimental group had a slightly lower average number of tokens compared to the control group. However, their type-token ratios were similar, indicating that both groups exhibited comparable lexical variety. Although the experimental group used fewer types of words on average than the control group, individual students within the experimental group demonstrated a

more diverse word choice compared to the control group. For instance, when translating the phrase "秉承…精神" (literally uphold the spirit…), students in the experimental group showed a greater variety of word choices, such as "adhere to the spirit of…" (5 students), "uphold the spirit of…" (5 students), "…in the spirit of…" (2 students), and "with the spirit of…" (2 students). In contrast, most students in the control group translated it as "adhere to the spirit/principle of…" (16 students).

In order to gain a deeper understanding of the factors contributing to the consistent use of the phrase "adhere to the spirit" in the control group, an examination of the screencasts was conducted to provide additional insights. It was observed that a significant number of students in the control group heavily relied on machine translation systems, including the translation function of online dictionaries or platforms like Google Translate. These systems consistently generated the translation "adhere to the spirit" for the given phrase, leading to a lack of variation in the translation choices amongst the students in this group.

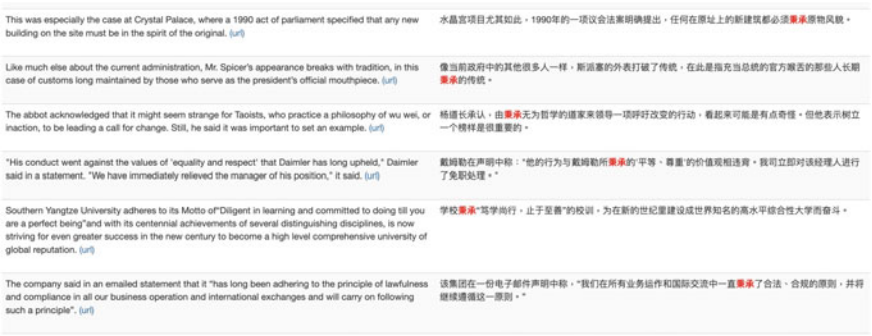
In contrast, students in the experimental group utilised the Basic search function to search for the keyword "秉承" (*Bingcheng*, literally: uphold), as depicted in Fig. 3; or the Advanced search function to search for the keywords "秉承…精神" (*Bingcheng…jingshen*, literally: uphold the spirit…), as shown in Fig. 4. Through these searches, TR Corpus provided them with multiple translations of the phrase in various contexts. As a result, students were able to select different translations based on their own judgement or specific needs, and in the process, they gained a deeper understanding of the corresponding sentence structures through the examples provided by the corpus.

Figure 4 reveals that the control group exhibited a wider variety of lexical terms and produced a greater number of words. In contrast, the experimental group employed a "splitting" translation strategy, breaking down lengthy Chinese sentences into shorter ones, resulting in shorter average sentence lengths. This strategy, learned from analysing the parallel corpus data, aimed to ensure natural-sounding translations. Notably, a student from the experimental group mentioned during an interview that the corpus results influenced her adoption of the "splitting" strategy.

> Initially, I was unsure how to handle the sentence's length. However, upon searching for "發揮優勢" (*Fahui youshi*, literally develop advantages) in the company profile subcorpus, I discovered numerous similar lengthy sentences. This experience helped me realise the need to divide this lengthy sentence into shorter ones.

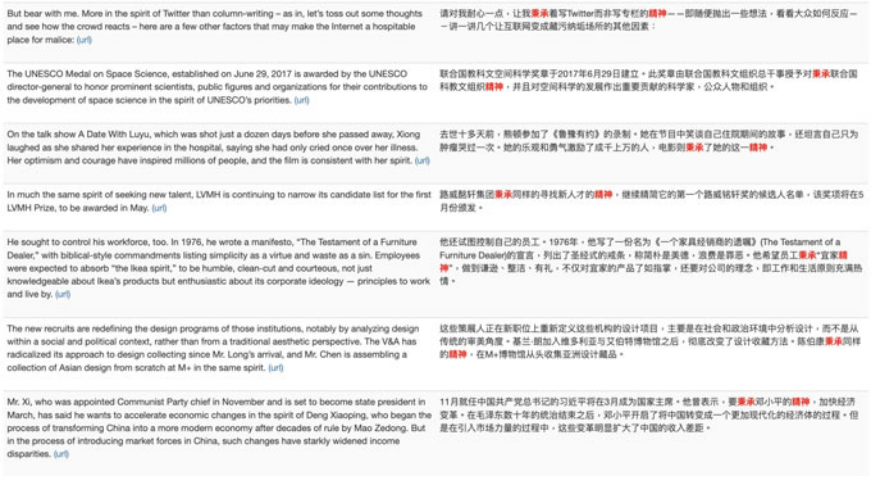
Table 2 Descriptive Statistics of Chinese-English translation

Description	Experimental group (mean)	Control group (mean)
Tokens	174.31	175.82
Types	96.69	99.55
Type/token ratio (TTR)	0.54	0.55
Sentences	5.81	5.45
Mean sentence length (in words)	31.59	34.11



This was especially the case at Crystal Palace, where a 1990 act of parliament specified that any new building on the site must be in the spirit of the original. (url)	水晶宫项目尤其如此，1990年的一项议会法案明确提出，任何在原址上的新建筑都必须秉承原物风貌。
Like much else about the current administration, Mr. Spicer's appearance breaks with tradition, in this case of customs long maintained by those who serve as the president's official mouthpiece. (url)	像当前政府中的其他很多人一样，斯派塞的外表打破了传统，在此是指充当总统的官方喉舌的那些人长期秉承的传统。
The abbot acknowledged that it might seem strange for Taoists, who practice a philosophy of wu wei, or inaction, to be leading a call for change. Still, he said it was important to set an example. (url)	杨道长承认，由秉承无为哲学的道家来领导一项呼吁改变的行动，看起来可能是有点奇怪。但他表示树立一个榜样是很重要的。
"His conduct went against the values of 'equality and respect' that Daimler has long upheld," Daimler said in a statement. "We have immediately relieved the manager of his position," it said. (url)	戴姆勒在声明中称："他的行为与戴姆勒所秉承的'平等、尊重'的价值观相违背。我司立即对该经理人进行了免职处理。"
Southern Yangtze University adheres to its Motto of"Diligent in learning and committed to doing till you are a perfect being"and with its centennial achievements of several distinguishing disciplines, is now striving for even greater success in the new century to become a high level comprehensive university of global reputation. (url)	学校秉承"笃学尚行，止于至善"的校训，为在新的世纪里建设成世界知名的高水平综合性大学而奋斗。
The company said in an emailed statement that it "has long been adhering to the principle of lawfulness and compliance in all our business operation and international exchanges and will carry on following such a principle". (url)	该集团在一份电子邮件声明中称，"我们在所有业务运作和国际交流中一直秉承了合法、合规的原则，并将继续遵循这一原则。"

Fig. 3 Screenshot of Basic Search Results for the Keyword "秉承 (*Bingcheng*)" in TR Corpus



But bear with me. More in the spirit of Twitter than column-writing – as in, let's toss out some thoughts and see how the crowd reacts – here are a few other factors that may make the Internet a hospitable place for malice: (url)	请对我耐心一点，让我秉着写Twitter而非写专栏的精神——即随便抛出一些想法，看看大众如何反应——讲一讲几个让互联网变成藏污纳垢场所的其他因素：
The UNESCO Medal on Space Science, established on June 29, 2017 is awarded by the UNESCO director-general to honor prominent scientists, public figures and organizations for their contributions to the development of space science in the spirit of UNESCO's priorities. (url)	联合国教科文空间科学奖章于2017年6月29日建立。此奖章由联合国教科文组织总干事授予对秉承联合国科教文组织精神，并且对空间科学的发展作出重要贡献的科学家，公众人物和组织。
On the talk show A Date With Luyu, which was shot just a dozen days before she passed away, Xiong laughed as she shared her experience in the hospital, saying she had only cried once over her illness. Her optimism and courage have inspired millions of people, and the film is consistent with her spirit. (url)	去世十多天前，熊顿参加了《鲁豫有约》的录制。她在节目中笑谈自己住院期间的故事，还坦言自己只为肿瘤哭过一次。她的乐观和勇气激励了成千上万的人，电影则秉承了她的这一精神。
In much the same spirit of seeking new talent, LVMH is continuing to narrow its candidate list for the first LVMH Prize, to be awarded in May. (url)	路威酩轩集团秉承同样的寻找新人才的精神，继续精简它的第一个路威酩轩奖的候选人名单，该奖项将在5月份颁发。
He sought to control his workforce, too. In 1976, he wrote a manifesto, "The Testament of a Furniture Dealer," with biblical-style commandments listing simplicity as a virtue and waste as a sin. Employees were expected to absorb "the Ikea spirit," to be humble, clean-cut and courteous, not just knowledgeable about Ikea's products but enthusiastic about its corporate ideology — principles to work and live by. (url)	他还试图控制自己的员工。1976年，他写了一份名为《一个家具经销商的遗嘱》(The Testament of a Furniture Dealer)的宣言，列出了圣经式的戒条，称简朴是美德，浪费是罪恶。他希望员工秉承"宜家精神"，做到谦逊、整洁、有礼，不仅对宜家的产品了如指掌，还要对公司的理念，即工作和生活原则充满热情。
The new recruits are redefining the design programs of those institutions, notably by analyzing design within a social and political context, rather than from a traditional aesthetic perspective. The V&A has radicalized its approach to design collecting since Mr. Long's arrival, and Mr. Chen is assembling a collection of Asian design from scratch at M+ in the same spirit. (url)	这些策展人正在新职位上重新定义这些机构的设计项目，主要是在社会和政治环境中分析设计，而不是从传统的审美角度。基兰·朗加入维多利亚与艾伯特博物馆之后，彻底改变了设计收藏方法。陈伯康秉承同样的精神，在M+博物馆从头收集亚洲设计藏品。
Mr. Xi, who was appointed Communist Party chief in November and is set to become state president in March, has said he wants to accelerate economic changes in the spirit of Deng Xiaoping, who began the process of transforming China into a more modern economy after decades of rule by Mao Zedong. But in the process of introducing market forces in China, such changes have starkly widened income disparities. (url)	11月就任中国共产党总书记的习近平将在3月成为国家主席。他曾表示，要秉承邓小平的精神，加快经济变革。在毛泽东数十年的统治结束之后，邓小平开启了将中国转变成一个更加现代化的经济体的过程。但是在引入市场力量的过程中，这些变革明显扩大了中国的收入差距。

Fig. 4 Screenshot of Advanced Search Results for the Keyword "秉承…精神(*Bingcheng…jingshen*)" in TR Corpus

Example 1 In the target text, one sentence from the source material has been divided into three distinct sentences.

Source Text:

科大國創源自中國科學技術大學，擁有一支高水平的研發團隊，秉承"務實、創新"的精神，肩負"軟件興企報國，創新引領未來"的偉大使命，發揮多年積累的軟件與大數據技術和深厚的行業經驗優勢，抓住人工智能發展契機，積極開展數據智能技術的研發和應用，構建領先的數據智能核心技術，賦能各行業領域客戶專屬的數據智能能力，推動國家以數據為驅動的數智化轉型。

Translation Example from the Experimental Group (5 sentences):

We are originally from The University of Science and Technology of China and have thus benefitted with a high-level R&D team. // In the spirit of pragmatism and innovation, our mission is to reward the country via future innovation in software

excellence. // We make the best of our great experience in the industry and our technology in software and big data amid the golden era for AI development. // We not only proactively engage in R&D and the application of digital intelligence, but also pioneer the development of cutting-edge core technology for digital intelligence. // By doing so, we strive to assist customers across industries with digital intelligence capacities and promote digital intelligence transformation, driven by big data.

Translation Example from the Control Group (2 sentences):

Guochuang Software originated from the University of Science and Technology of China, with a high-level R&D team, adhering to the spirit of "pragmatism and innovation", shouldering the great mission of "software for the enterprise to serve the country, and innovation leading the future". // With big data technology and profound industry experience advantages, the company catches up the opportunity of artificial intelligence development, actively carries out research and development and the application of data intelligence technology, builds up leading data intelligence core technology, empowers customers in various industries and fields and promotes the country in the transformation to digital intelligence driven by data usage.

English-Chinese Translation

Table 3 presents the descriptive statistics of the English-Chinese translation products from the two groups. The control group demonstrated a higher average use of characters and words in their English-Chinese translation compared to the experimental group. However, the experimental group exhibited a relatively higher Type-Token Ratio (TTR), indicating greater lexical variation in their translation products. Upon comparing the English-Chinese translation products of the two groups, it was observed that some students in the experimental group employed an "omission" strategy to enhance text cohesion. For instance, in Example 2, a student from the experimental group used this strategy to translate the proper noun "In-Tech" in the source text. The student rendered it as "誠科" (*Chengke*, literally "In-Tech") in the first sentence, omitted it in the second sentence, and translated it as "我們" (*Women*, literally "We") in the third sentence. In contrast, a student from the control group strictly adhered to the source text's sentence structure and translated three sentences with an identical subject "本公司" (*Ben gongsi*, literally "Our company").

Table 3 Descriptive statistics of English-Chinese translation

Description	Experimental group (mean)	Control group (mean)
Characters	418.38	434.95
Tokens in text	227.63	234.14
Types	144.56	145.52
Type/token ratio (TTR)	0.64	0.62
Sentences	12.8	12.71
Mean sentence length (in characters)	33.7	33.75

Example 2
Source Text:

In-Tech offers turnkey solutions for new projects, as well as supplying electronic assemblies and completed products. In addition, **In-Tech** also uses its workshop in Hong Kong to provide quick turn repairs, refurbishment and order fulfilment services. **In-Tech**'s quality management is accredited to serve aerospace, automotive and medical customers.

Translation Example from the Experimental Group:

誠科不僅為新項目提供一站式解決方案及電子產品，亦透過香港廠房提供產品維修、翻新及訂單履行服務。我們針對航天、汽車及醫療行業的質量管理已獲得相關認證。

(Back translation in English: **Chengke** not only provides one-stop solutions and electronic products for new projects, but also provides product repair, refurbishment and order fulfillment services through its Hong Kong factory. **We** have obtained relevant certifications for our quality management in the aerospace, automotive and medical industries.)

Translation Example from the Control Group:

本公司为新项目提供一站式解决方案，并提供电子组件和成品。此外，本公司亦利用其在香港的工作坊，提供快速维修、翻新及订单履行服务。本公司质量管理已经认可，可为航空航天、汽车和医疗客户服务。

(Back translation in English: **Our company** provides one-stop solutions for new projects and provides electronic components and finished products. In addition, **our company** also uses its workshops in Hong Kong to provide rapid repair, refurbishment and order fulfilment services. **Our company's** quality management is accredited and serves aerospace, automotive and medical customers.)

Both the experimental group and the control group exhibited a similar average number of sentences in their English-Chinese translations, indicating that students from both groups made intentional adjustments to the sentence structures. As a result, the translation outcomes were rather comparable between the two groups.

4.2 Perceptions of Students

In general, students expressed a positive attitude towards utilising the parallel corpus in their translation work, regardless of their varying levels of experience in translation and corpus use. However, they also acknowledged encountering certain challenges during the process. The students also provided valuable suggestions for enhancing the design of the parallel corpus, aiming to further improve its effectiveness and usability in translation practice.

4.2.1 Advantages of Using the Parallel Corpus in Translation

Ease of Use and Reliability

One prominent advantage of the parallel corpus, as highlighted by the participants, is its user-friendly design. Syuki, in particular, praised the ease of use of the TR Corpus, noting its suitability for students with limited experience in utilising translation technology tools. She expressed her appreciation for the user-friendliness of the parallel corpus to such an extent that she voiced concerns about potential challenges if the corpus functions were to become more complex in the future.

> I'm sure TR Corpus will get better and add more parallel data in the future. I hope it becomes more professional, but at the same time, I'm a bit worried that it might become too complicated for me to use.

Yuzi, who had some proficiency in using corpora, also agreed that the corpus was user-friendly and mentioned that she might be able to use it without additional training. All four participants acknowledged that the corpus results were more reliable compared to other online resources. Ume specifically mentioned that the corpus data were more trustworthy than search engines like Baidu or Google, which could potentially provide numerous low-quality translations.

> If you're using a search engine like Google, you might come across translations uploaded by unknown netizens… But with TR Corpus, the results are more reliable, especially when it comes to professional terms.

Haru compared the reliability of corpus results with Google Translate, noting that machine translation can often misinterpret the meaning or context of the source text, resulting in inaccurate word-by-word translations. In contrast, when she searched for something on TR Corpus, she found highly reliable references accompanied by abundant examples in various contexts.

Providing Translation References

The participants generally held a positive attitude towards the extensive collection of translation references provided by the parallel corpus. Depending on their prior experience with corpus use, they employed translation equivalents to varying degrees. Ume, in particular, who lacked confidence in her translation abilities, heavily relied on translation equivalents extracted from the parallel corpus. By examining multiple versions of translation equivalents, she could compare their usage in different contexts and select the most suitable one, leading to a successful performance in the post-test. Furthermore, Ume emphasised the significant role played by the parallel corpus in addressing her long-standing concerns regarding collocation in translation. Through the corpus, she discovered valuable solutions to her collocation issues, resulting in significant improvements in the quality of her translations.

Despite Syuki's prior experience using the BNC in translation, she did not specifically refine her search strings to extract direct translation equivalents from the corpus. Instead, she discovered that analysing the language use in diverse contexts provided her with a deeper understanding of the meaning and usage of words or phrases in

the source texts. This approach proved beneficial in generating more appropriate translations. In contrast, Haru shared that her approach to using the corpus varied depending on the type of text she was translating. For familiar texts such as news or company introductions, her focus was on comprehending the meaning and usage of phrases. However, when tackling legal translations with distinct lexical, syntactic, and stylistic features, she shifted her attention to sentence patterns that might not be readily accessible through conventional consultation resources.

In contrast to the other three students who found the Search function valuable for obtaining reference translations, Yuxi had a preference for using the Compare and Collocate functions of TR Corpus to explore translation equivalents. When faced with uncertainty about which word was more suitable for translation, she would compare the meanings and usage of two words using the Compare function. In addition, Yuxi frequently relied on the Collocates function to search for collocations, aiming to ensure that her translations sounded more natural in the target language.

Besides utilising the parallel corpus to address lexical translation challenges, the students also highlighted the advantages of using it to tackle textual or stylistic issues. Ume, for example, mentioned that,

> Sometimes, when I'm not sure about my translation, I search for keywords and find a bunch of sentences as references. I learn from the sentence patterns in the examples to make sure that my translation style is appropriate.

Yuzi also emphasised how the corpus helped her become more familiar with different text types. In her own words:

> When I searched for keywords, I came across numerous parallel texts (of the same text type). I would click on the links to read the source websites and get a better grasp of the text type.

All four participants agreed that the parallel corpus was especially valuable for translating specialised text types, particularly in the field of legal translation. Syuki specifically noted that "certain industry jargon may be challenging to locate through other means".

Improving Translation Efficiency

All four participants acknowledged that the corpus yielded more reliable results compared to search engines such as Baidu or Google. This advantage of the corpus design further enhanced translation efficiency. Syuki and Yuzi attributed their increased efficiency to the trustworthy nature of the parallel corpus data, as they no longer needed to spend time verifying the credibility of the data sources. Haru, who was adept at utilising various translation search techniques, noted that she could avoid getting overwhelmed by excessive data and instead quickly identify the relevant information from the corpus results.

Enhancing Translation Confidence

All four participants expressed that the corpus had contributed to an increased sense of confidence in their translation abilities. Syuki and Ume, who had less experience and confidence, appreciated the opportunity to learn and utilise the new tool in their translation work. In addition to acquiring new knowledge and skills, their

growing confidence could be attributed to the parallel corpus serving as a means to validate and confirm their translation choices. Ume specifically mentioned feeling more assured when her translation intuitions aligned with the corpus data. Syuki also highlighted the corpus's role in boosting her confidence, particularly in the domain of Chinese-English translation:

> It's more challenging for me to do Chinese-English translation. I didn't believe in myself, but I trust TR Corpus. With TR Corpus, I can look at the translation examples done by expert translators.

Yuzi and Haru, who have greater translation experience compared to the other participants, expressed a similar viewpoint regarding the important role of the parallel corpus in validating their translation intuitions. In situations where uncertainties or gaps in their memory arise during the translation process, both Yuzi and Haru turn to the parallel corpus to validate their understanding and improve the accuracy of their translations. Yuzi specifically highlighted the role of the parallel corpus as a dependable resource when she finds herself "unsure of her memory".

4.2.2 Challenges and Suggestions

Limitation of Corpus Design

Although the parallel corpus offers a vast amount of data and operates in a user-friendly manner, students acknowledged that there were instances when they couldn't locate the desired information within TR Corpus. The primary reason cited for this limitation was the restricted availability of text types in the corpus. With only six text types currently included, students found it less advantageous when translating texts outside of those categories, such as literary translations. In addition, occasional server capacity issues caused the corpus to fail in loading results, particularly during peak usage periods when the entire class attempted to access it simultaneously. As a result, students experienced delays and reduced performance as the corpus response time slowed down.

During the interview, Haru expressed her frustration with the intermittent connectivity and lag issues she encountered whilst using the platform for searching. She speculated that it could be due to her usage of incorrect search strings, but regardless of the cause, she found it exasperating to repeatedly face this problem:

> The platform kept disconnecting and lagging continuously while I was searching. I'm not sure if it's because I used the wrong search terms, but it really frustrates me when I come across this issue multiple times.

Ume also got frustrated when she couldn't retrieve the corpus results she needed. On the other hand, Yuzi opted to rely on alternative tools for assistance when the corpus failed to load or provided unusual outcomes.

Apart from the technical issues with the corpus, participants occasionally encountered difficulties in finding translation equivalents for specific keywords and found it time-consuming to analyse corpus examples with excessively long sentences. This

challenge could be attributed to the design of the parallel corpus, particularly in terms of text segmentation and alignment. As Syuki pointed out:

> It's like, sometimes the alignment of sentences in the corpus doesn't really match up, you know? In real translation work, we often have to reconstruct the text using different translation strategies. So maybe instead of aligning the texts based on sentence structure, they could align them based on the meaning, you know what I mean?

Inadequate Search Skills

One challenge that emerged was the students' insufficient search skills when using the corpus. In particular, the messy results they encountered can be attributed, at least in part, to their inappropriate selection of search words. The focal participants primarily relied on the corpus to find lexical references that would assist them in their translations. Although the teacher emphasised the importance of selecting appropriate search words to maximise the corpus's effectiveness, the students appeared to struggle in this aspect. For instance, Syuki, who had less experience, faced difficulties in identifying sentence patterns from the examples in her own translation work. Consequently, she primarily utilised the corpus to access the meanings and usage of specific lexical items. In contrast, Ume demonstrated greater proficiency in adapting search string combinations to locate desired translation equivalents and sentence patterns. Notably, Ume paid attention to sentence patterns alongside search keywords and phrases in the parallel translation occurrences.

Lack of Critical Analysis

Apart from the challenge of lacking effective search skills, students also faced difficulties in critically analysing the corpus data. Whilst they acknowledged the value of the parallel corpus in providing direct reference translations that demonstrate how certain terms and expressions are translated in context, they struggled when asked about their selection criteria for specific translation versions. The students often relied on high-frequency translation versions in the corpus or simply chose a single translation equivalent for their search keywords without engaging in deeper critical analysis. Through interviews and screencasts that captured their decision-making processes, it became evident that further training in the critical evaluation of corpus translation examples is necessary to enhance students' translation awareness and foster their critical thinking skills.

5 Discussion

This study employed an experimental design to investigate students' performances and perceptions of using the parallel corpus in translation tasks. The results of the independent samples t-test revealed that the use of the parallel corpus did not have a significant impact on students' translation performance in Chinese-English translation, but it did in English-Chinese translation. These findings differ from those of Liu (2020), who reported that the use of a parallel corpus significantly improved students' translation performance in both English-Chinese and Chinese-English translation.

The disparities in the findings may be attributed to differences in the research designs employed in the two studies and variations in the English proficiency levels of the students. In Liu's (2020) study, the control group was limited to using paper-based dictionaries, whereas in the present study, the control group had access to various online and offline consultation resources except for TR Corpus. It is important to note that the experimental group in this study could only access TR Corpus and designated dictionaries. This discrepancy in resource availability between the two groups might explain the relatively similar performance observed in Chinese-English translation tasks, as the experimental group was restricted from consulting other online resources such as machine translation tools and search engines. However, in the English-Chinese translation tasks, the experimental group achieved significantly higher scores than the control group. This discrepancy in performance suggests that the translation direction could be an influential variable affecting the effectiveness of corpus use in translation tasks.

Although the statistical analysis of the translation post-test did not reveal significant differences between the two groups in indicators such as type-token ratio and sentence length, a qualitative analysis of the translation products highlighted substantial variations in both tasks. Specifically, in Chinese-English translation, students in the experimental group exhibited more distinctive word choices compared to the control group. This finding contradicts the notion that corpus use may promote conservatism in translation and impede students' creativity, as suggested by Malmkjær (2003). The availability of a parallel corpus provides students with a range of translation equivalents and reference translations, thereby offering them a broader array of choices that can be selected based on their understanding of the context. Furthermore, the analysis of the translation products from both translation tasks revealed that the experimental group employed diverse translation strategies, including sentence splitting and omission. This observation supports the perceived advantages of using a parallel corpus in enabling student translators to acquire translation strategies from the work of professional translators (Pearson 2003).

The use of a parallel corpus has proven effective in enhancing students' translation skills, particularly in terms of word choice and the acquisition of translation strategies. Interviews conducted as part of this study further validate the benefits of incorporating a parallel corpus into translation teaching and learning. Previous research based on surveys has highlighted the challenges students face when learning to use corpus tools (Zhu and Wang 2011). However, the students in our study expressed appreciation for the user-friendly nature of the corpus platform, which plays a crucial role in influencing their willingness to adopt the tool in their learning process (Charles 2014). The corpus design also takes into account the cost-efficiency issues associated with learning corpus tools, as noted by Varantola (2003).

Furthermore, our study indicates that students' prior knowledge and experience influence their utilisation of the corpus tool. Despite their individual focuses, all participants in the experimental group recognised the benefits of the parallel corpus in addressing lexical translation challenges. This finding aligns with the results reported by Liu (2020), who found that the parallel corpus is more effective in resolving micro language issues rather than macro ones in translation. Whilst the experimental results

demonstrated that the parallel corpus was more effective in assisting students with English-Chinese translation compared to the reverse direction, students' perceptions expressed during the interviews were mixed. The influence of translation direction as a significant variable (Campbell 1998) on the efficacy of the corpus becomes evident. The students' favourable assessment of the parallel corpus in Chinese-English translation can be attributed to their reliance on the corpus for support when translating into a foreign language. Furthermore, students' perceptions may be directly shaped by the corpus design, which comprises a greater number of Chinese-English texts compared to English-Chinese texts. To address these considerations, future studies should incorporate translation direction as a factor in parallel corpus compilation.

Despite the overall positive attitude of students towards using the parallel corpus in translation, they also faced certain challenges. These challenges pertained to the design of the corpus and a lack of effective search and analytical skills for critically evaluating corpus data. Consequently, it is essential for teachers to offer further guidance to students regarding proficient corpus searching techniques and the critical analysis of corpus data (Bernardini 2016). In addition, considering the varying perspectives of students in this study regarding the benefits of the parallel corpus in translation, teachers can foster a collaborative learning community where students can exchange their experiences and insights on corpus usage with one another. This platform would enable students to learn from each other's approaches and enhance their understanding and utilisation of the corpus in translation tasks.

6 Conclusion

The present study aimed to investigate the advantages and challenges associated with using a parallel corpus in translation by analysing students' performance and perceptions in an experimental study. The findings from both students' performance and their perceptions indicate that, overall, the parallel corpus is considered a valuable tool in translation. Its use has resulted in increased awareness of translation problems and enhanced resourcefulness amongst students.

However, the study does have certain limitations that need to be acknowledged. Firstly, the pre-training and post-training tests were conducted at different difficulty levels, which hindered the ability to determine whether students' performance significantly improved after receiving corpus training. Secondly, the analysis of translation products only considered a limited set of lexical and syntactic indices. In future research, it would be beneficial to incorporate a wider range of indices to thoroughly assess the lexical and syntactic complexity of students' translations. In addition, it is worth noting that the corpus training in this study was conducted as an extracurricular activity and lasted for only four weeks, which may not have been sufficient to fully equip students with proficient corpus skills. Future studies could employ a longitudinal design, integrating the parallel corpus into regular translation courses, in order to track the progress and conceptual development of students over an extended period of time.

Despite the aforementioned limitations, the current study provides practical implications for corpus-assisted translation teaching in terms of corpus compilation and pedagogical design. Firstly, with regard to corpus design, it is recommended to include a wider range of text types whilst considering the directionality of the corpus data. Moreover, to enhance the user experience of the parallel corpus, it is advisable to increase server capacity to accommodate simultaneous access by students in real teaching settings. Secondly, in corpus-assisted translation teaching, it is important to maintain a balance between translation knowledge and corpus knowledge. Placing too much emphasis on corpus skills may lead to an uncritical reliance on the corpus without proper evaluation of the appropriateness of translations in different contexts. Finally, when applying the parallel corpus to English-Chinese and Chinese-English translation, teachers should be attentive to the differences that may arise between the two directions.

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