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How do students engage with parallel corpora in translation? A multiple case study approach

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Abstract

While emerging research has contributed significantly to our understanding of the efficacy of parallel corpora in translation education, specifically concerning student performance and perception, however, there remains a noticeable gap in the literature regarding the examination of student engagement with parallel corpora during the translation process. To address this research gap, the present study seeks to comprehensively analyse the behavioural, cognitive, and affective engagement of three MA students when utilizing parallel corpora in Chinese–English translation tasks. A multiple case study design was implemented, drawing upon a diverse range of data sources, including screencasts capturing students' translation processes, the resultant translation outputs, corpus search logs, and in-depth interviews. The findings of this investigation reveal distinct engagement patterns exhibited by individual students and underscore the intricate interplay of these three dimensions of engagement. Furthermore, student engagement with the parallel corpus significantly influences their translation performance. This research also unveils various factors that impact student engagement patterns, including the perceived affordances of the parallel corpus, students' self-perception, and learning motivation.

KEYWORDS
parallel corpus, multiple case study, student engagement, translation process, translation teaching

摘要

近年来, 平行语料库在翻译教学中的应用引发了学界广泛关注, 现有研究主要聚焦于学生的翻译表现及其对这种创新教学方法的评价。然而, 对于学生在实际翻译过程中如何与平行语料库互动这一关键问题, 研究仍显不足。为填补这一研究空白, 本研究深入分析三名硕士生在进行汉英翻译任务时使用平行语料库的行为、认知和情感投入。采用多案例研究设计, 本研究收集并分析了包括记录学生翻译过程的屏幕录像、最终译文、语料库检索日志以及深度访谈等多种数据。研究结果揭示三名学生呈现出不同的投入模式, 并凸显了行为、认知和情感这三个投入维度之间的复杂交互关系。更为重要的是, 研究发现学生与平行语料库的互动方式对其翻译质量产生显著影响。本研究还探索了影响学生投入模式的多重因素, 包括学生对平行语料库功能的认知、自我感知以及学习动机等。

关键词

平行语料库, 多案例研究, 学生投入, 翻译过程, 翻译教学

1 | INTRODUCTION

Translation is a complex communicative activity that involves recasting the source texts of one language into the target text of another language (Catford, 1965). Parallel corpora have been proposed as a potential solution to boosting learner language competence and improving translation quality (Zanettin, 2002). Yet researchers express concerns about learner ability to benefit from parallel corpora. The success of corpus use in translation education largely depends on students' active engagement with the corpus during the translation process (Gough, 2019). This engagement requires students to notice, understand, and inductively identify useful language patterns or translation equivalences on their own (Boulton & Cobb, 2017). However, there are concerns that students might lack the critical analysis skills to sift potentially overwhelming amounts of information and to triangulate different data sources required for successful corpus interaction (Cook, 1998). The cognitive demands of these tasks can be considerable, adding further complexity to the learning process (Boulton, 2009). Moreover, even if students are able to identify direct translation equivalents provided by the parallel corpora, there is a risk that they may become overly dependent on these direct equivalents without sufficient analysis of their own translation contexts (Bernardini et al., 2003; Sycz-Opoń, 2019). Therefore, how students engage with the parallel corpora is critical to maximize the efficacy of parallel corpora as a learning tool (Gough, 2019).

While most existing studies have focused on how parallel corpora can benefit translation learning or analysing student translation products in corpus-assisted approaches (Frérot, 2016; Liu, 2020), little research has examined how students interact with parallel corpora to facilitate the translation process. A process approach to understanding how students consult, evaluate, and interpret corpus data to improve their translation quality would provide important insights into the factors that influence corpus-translation interaction, and the types of support students need in the process. To this end, this study examines student engagement with a parallel corpus during the translation process to highlight factors that facilitate or hinder learners' effective use of parallel corpus in translation.

2 | PARALLEL CORPORA IN TRANSLATION LEARNING: PEDAGOGICAL AFFORDANCES AND STUDENT ENGAGEMENT

2.1 | Pedagogical affordances and challenges of parallel corpora for translation

As a communicative activity, translation requires translators to simultaneously possess good language and translation skills. The demanding nature of translation exposes students to various problems in translation, such as choosing appropriate collocations (Sonbul et al., 2022), identifying translation problems, and employing appropriate strategies to make informed translation decisions (Tirkkonen-Condit, 2000). Therefore, learning to find the most suitable and trustworthy information needed in a translation task becomes another critical issue for students (Zanettin, 2002). A corpus, which contains a large collection of authentic language, is appealing to translation students as it provides linguistic, cultural, or specialised knowledge and strategic translation practices (Bowker, 2015).

Previous studies have explored the use of various types of corpora to enhance students' language proficiency and translation quality. Monolingual corpora, which consist of texts in a single language, are easily accessible and have been widely used in language teaching. These corpora have been found to be beneficial for learners' acquisition of vocabulary, collocation, and lexical–grammatical knowledge (Gilquin, 2021; Varley, 2009). Another type of corpora, comparable corpora, which are collections of texts in two or more languages that are similar in content and style, have proven effective in helping students recognize stylistic differences between languages (Laursen & Pellón, 2012), deepen their understanding of the linguistic features of both the source and target languages, and provide cultural or specialized knowledge relevant to specific contexts (Zanettin, 1998).

While monolingual and comparable corpora primarily enhance students' language knowledge, they fall short in directly facilitating the specific skills needed for translation (Aston, 1999; Liu, 2020). In comparison, parallel corpora are considered particularly valuable in the context of translation learning (Zanettin, 2002). Specifically, parallel corpora can be used as reference tools to help translators extract translation equivalence, terminology, collocation, and syntactic patterns in translation (Liu, 2020; Santos & Frankenberg-Garcia, 2007). Compared to other reference tools like bilingual dictionaries, parallel corpora can also offer insights about "indirect equivalence" in translation (Zanettin, 2002, p. 11), resolving genre or discursive issues (Kübler et al., 2015). By analysing how professionals deal with different translation problems, students can compare their own approaches with industry-standard strategies (Liu, 2020, Pearson, 2003). Thus, parallel corpora are valuable learning aids that enable learners to explore, discover, and reflect in the translation process (Bernardini, 2016).

However, various challenges have been revealed in using corpora for translation and translation teaching. The first challenge is related to student corpus consultation behaviours and cognitive processing of corpus data (Frérot, 2016; Sycz-Opoń, 2019). Researchers suggest that the efficacy of parallel corpora depends crucially on how students interact with the corpora in the translation process (Frérot, 2016; Sycz-Opoń, 2019), which accords with Tarp's (2007) proposal that translators' cognitive processes are key to successful consultation behaviours in translation. When students engage superficially with the corpus data, they might turn corpora into a simple lookup tool, and miss the opportunity to engage with the data in a thought-provoking manner that could improve their overall analytical and translation skills (Bernardini, 2016; Bernardini et al., 2003, p. 11). Another challenge concerns student attitudes. Although students reported positive attitudes towards using parallel corpora in translation (Liu, 2020; Liu, Su, & Li, 2023; Liu, Su, & Liu, 2023), some affective factors might also influence the adoption of parallel corpora in translation. According to Sycz-Opoń (2019), students' trust of the tool factored into their willingness to discover its affordances. These findings suggest that student attitudes towards and perceived usefulness of parallel corpus may influence whether and how they interact with the tool.

The challenges of using parallel corpora in translation indicate that their potential depends crucially on learner perception and appropriation of such tools in the translation process. Thus, it is important to examine students' behavioural, cognitive, and emotional engagement with a parallel corpus as a tool for translation and the factors that influence each kind of engagement.

2.2 | Construct and research of student engagement

Student engagement has an impressive history of research within education due to its close link with academic success (Lee, 2014). By definition, student engagement is the purposeful investment, active participation, effortful involvement, and positive attitudes in learning (Fredricks et al., 2004). It is characterised as encompassing three key elements: behavioural, emotional, and cognitive engagement (Fredricks et al., 2004). Behavioural engagement emphasises "participation," that is, doing what is asked or needed to achieve positive academic outcomes. Emotional engagement (also known as affective engagement) highlights "emotion," which is how students show interest, attitudes, beliefs, and feelings in specific learning activities. Finally, cognitive engagement focuses on "investment," which refers to the purposeful efforts made to comprehend sophisticated ideas and achieve better results (Finn & Zimmer, 2012). Research has revealed the interconnected nature of different types of engagement, with emotional and behavioural engagement having a reciprocal relationship and behavioural engagement influencing cognitive engagement (Li & Lerner, 2013). Many previous studies view engagement as an outcome rather than a process (Hiver et al., 2024), observing that students exhibit various profiles of engagement level in the same learning events (Fredricks et al., 2004; Koltovskaia, 2020). Such diverse engagement levels may stem from a mix of internal and external factors (Kahu, 2013), such as computer efficacy, task confidence, goal-setting, and learning beliefs, as evidenced by large-scale surveys or quantitative exam scores (He & Loewen, 2022; Liu, 2020; Liu et al., 2023). While previous investigations have been predominantly group-based analysis, a burgeoning trend is to undertake in-depth case studies of individual student engagement, which could offer a unique perspective on the complex dynamics of student engagement (Hiver et al., 2024; Kahu, 2013). Furthermore, few studies have investigated student behavioural engagement with technological tools during learning activities (He & Loewen, 2022; Roussannes & Jimoyiannis, 2013), without delving into cognitive and affective engagement, which are equally vital for the learning process (Koltovskaia, 2020).

In the context of translation learning, several studies have explored translators' behavioural engagement with various information sources and the factors influencing this engagement during the translation process. For instance, research by Sycz-Opoń (2019) and Zheng (2014) revealed that students rarely consulted parallel corpora but generally relied heavily on dictionaries during translation tasks. Building on this observation, Zheng (2014) further noted that translators exhibit varying consultation behaviours significantly influenced by their proficiency with different reference sources. Expanding on these studies, Sycz-Opoń (2021) analysed students' diverse information-seeking styles, including their preferences for resources, query frequency, types of information sought, search intensity, and overall satisfaction with their searches. Consistent with earlier research, she found that online dictionaries and websites were the primary resources used, with no reported use of corpora. She also noted that factors such as prior knowledge, cognitive skills, and personal characteristics likely influence these behaviours. Similarly, Onishi and Yamada (2020) compared the information-seeking behaviours of translation students with those of professional translators, focusing on the time spent, the content of queries, and the number of websites visited in one search. Aligning with observations from previous studies, their findings also indicated an absence of corpus use in both groups. While the aforementioned studies provided valuable insights into different translators' information-seeking behaviours, Raído and Cai (2023) conducted a longitudinal study investigating how translation students' web search behaviours evolved across four translation tasks. They found that query times remained consistent, but students shifted from using source language queries to mixed language queries. Moreover, their query strategies became more sophisticated as they progressed through the tasks. Collectively, previous studies on translators' information-seeking behaviours have primarily focused on the use of dictionaries and websites as information sources, with little attention given to corpus search behaviours.

Although corpora have been recognized as useful technological tools, insufficient attention has been given to their integration into translator training programmes (Frankenberg-Garcia, 2015). Furthermore, while existing research provides some insights into students' behavioural engagement by analysing translators' consultation behaviours, it has not sufficiently examined how they use the information obtained in their actual translations. Additionally, these studies have not comprehensively explored how translation students engage with parallel corpora from behavioural,

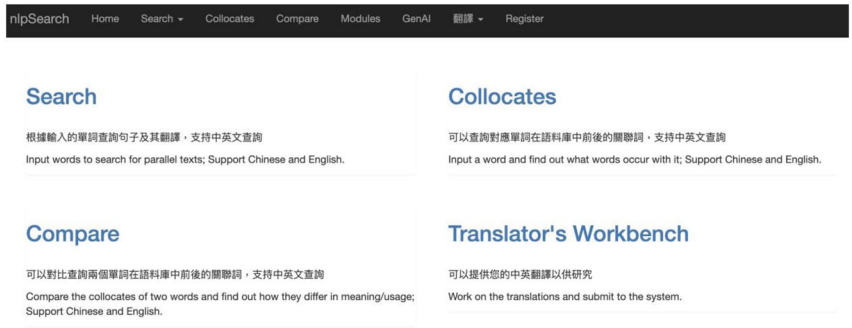

FIGURE 1 A screenshot of TR Corpus (Liu, 2024). [Color figure can be viewed at wileyonlinelibrary.com]

cognitive, and affective perspectives. This study aimed to address these gaps by adopting a multiple case study approach, focusing on three specific cases to explore how students interacted with a parallel corpus in translation. The research was guided by the following question:

> *How do three selected students, as individual cases, engage behaviourally, cognitively, and affectively with a parallel corpus in translation?*

3 | RESEARCH CONTEXT AND PROCEDURES

3.1 | The parallel corpus—TR Corpus

The bilingual parallel corpus used in this study was the TR Corpus (https://www.tr-corpus.com/Home.jsp). TR Corpus is a web-based parallel corpus specially designed for translator training purposes and is now accessible for free registration using educational institution emails (Figure 1).

The TR Corpus offers a user-friendly interface, facilitating quick adoption by students with limited or no prior corpus experience. Several features render it particularly suitable for translator training. First, the TR Corpus comprises six text types: news, annual reports, company profiles, feature articles, financial documents, and legal documents. Its large scale (79.31 million English words and 171.44 Chinese characters[1]) provides ample references or learning aids for translators. Second, the TR Corpus is bidirectional, incorporating texts translated both from Chinese into English and from English into Chinese, which can shed light on strategies for producing natural-sounding translations. Third, the parallel texts are of high quality from reliable and acknowledged sources. In addition, its multi-functionality enables students to search for parallel concordances, keyword co-occurrences, and compare the collocates, meanings, and usages of two terms in different text types. Users can also access the source websites via URLs for each example. The translator's workbench enables students to upload their parallel texts and share them with the teacher.

3.2 | Research context

The study was conducted with MA students who enrolled in a specialised translation course at a university in Hong Kong, China. The students were all native Chinese (L1) speakers and learners of English as a foreign language (EFL). Fifty-eight students voluntarily signed up for a 4-week, out-of-class training module on corpus-assisted learning. Each weekly session focused on a specific function of the parallel corpus. Building upon the pedagogical approach proposed by Yoon and Hirvela (2004), which integrates corpus components into language classrooms through a progression

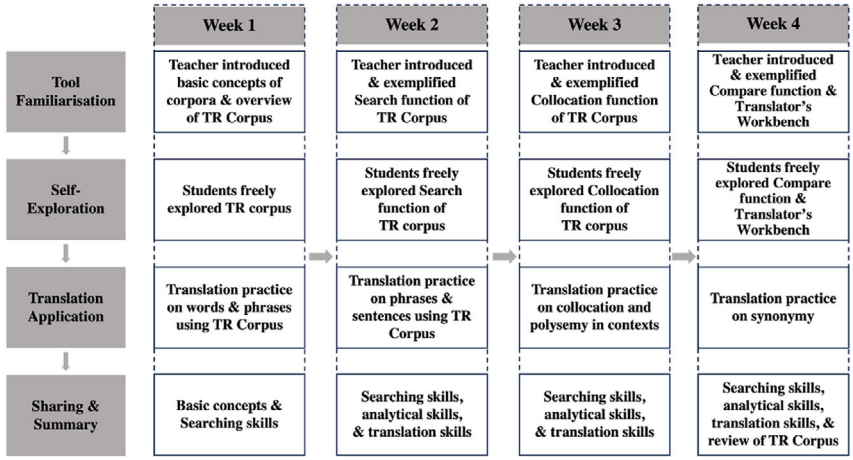

FIGURE 2 Pedagogical design of the corpus-assisted learning module (Liu et al., 2023). [Color figure can be viewed at wileyonlinelibrary.com]

from guided consultation to independent exploration and problem_solving, we developed a four-stage instructional framework for our training sessions. As shown in Figure 2, each session consisted of four phases: Familiarization, Exploration, Application, and Summarization. Each weekly 2-h training session was structured as follows:

1. Familiarization (45 min): The instructor introduced basic concepts and functions of the TR Corpus.
2. Exploration (15 min): Students independently explored the corpus functions.
3. Application (30 min): Students completed translation exercises designed to practice the newly learned skills.
4. Summarization (30 min): The instructor reviewed key searching, analytical, and translation techniques used in the exercises.

This structure allowed for a comprehensive learning experience, combining guided instruction, independent exploration, practical application, and reinforcement of key concepts.

Before beginning and after completing the training, students did a translation test in class on their computers with no time limits. Both pre-test and post-test consisted of one English–Chinese (E–C) translation task and one Chinese–English (C–E) translation task of a company profile.

Two experienced translation teachers selected and reviewed the test materials based on three specific criteria to ensure consistency and appropriateness for the students. First, the pre-test and post-test were of similar length, with the C–E source texts in both tests being approximately 300 words, and the E–C source texts about 250 words. Second, the difficulty level of both tests was matched and deemed appropriate for the students; each test included 25 items (words, phrases, or syntactic structures) that might require external reference to challenge the students. Third, both the pre-test and post-test were translated by translation students of the same level as the participants, but who did not take part in the experiments, to ensure that each test could be completed within 2 h, thereby minimizing the impact of fatigue on student engagement.

In the pre-training test, students were allowed to use any reference tools. In the post-training test, students were asked to refer to the TR Corpus and designated online dictionaries (without machine translation functionality). No other references were allowed during the test, with the aim of encouraging students to fully utilise the corpus. Two experienced translation teachers, each with at least 5 years of experience, rated students' translations using a holistic scale adapted from Kiraly (1995, p. 83). The average scores of the two assessors were calculated to determine the final score of each student's translation.

TABLE 1 Profiles of participants.

ID	Background (self-reported)	IELTS score (corresponding proficiency level*)	Scores for pre-training tasks		Scores for post-training tasks	
			C–E	E–C	C–E	E–C
S1	Some experience in corpus utilization but limited knowledge and experience in translation	6.5 (Competent)	8/10	7/10	7/10	7/10
S2	Limited knowledge and experience in translation and corpus utilisation	7 (Good)	8/10	7/10	8/10	9/10
S3	Relatively rich knowledge and experience in translation and corpus utilization with a bachelor's degree in translation	7 (Good)	7/10	8/10	5/10	5/10

*See https://ielts.org/organisations/ielts-for-organisations/ielts-scoring-in-detail for the overall band scores of IELTS.

3.3 | Participants

A multiple case study design was chosen due to its recognised ability to provide in-depth descriptions and explanations of students' learning processes (Duff, 2018). This approach has also been well-established in previous engagement research (Mystkowska-Wiertelak & Bielak, 2023; Zhang & Hyland, 2023). Only students who attended all training sessions were considered to ensure their competence in using the corpus for the post-training test. Based on a pre-training background survey and the pre-training and post-training tests (see Table 1), three focal participants were purposefully selected from the 58 students enrolled in the corpus-assisted learning modules (cf. Patton, 1989). The three participants came from diverse backgrounds, with initial performance on pre-training tests aligning closely with the class average. However, the post-training tests revealed a different picture. After completing the training sessions, these participants showed divergent performance outcomes, indicating that the training may have had varying effects on each individual despite their similar starting points. The present research targeted participants with average performance in the pre-training test to ensure the participants would engage in corpus consultation during the translation, which was the basis for addressing the research question. High performers might be able to complete the translation without consulting the corpus, while low-performing students may find the translation task too overwhelming and quit before completion. Participants with varying backgrounds and post-training performance are chosen to uncover patterns that emerged from heterogeneity and to identify influential factors. Informed consent was secured prior to the study.

3.4 | Data collection

Multiple data sources were collected, including screencasts of students' translation process, students' translation products, interviews, corpus search logs, and a pre-training background survey.

The pre-training background survey was administered prior to the training session to gain insights into students' profiles. Behavioural engagement was primarily assessed using two types of data: screencasts and corpus search logs. These data were then triangulated by student translation products and interviews. Specifically, in the post-training translation tasks immediately following the training session, screencasts were used as an unintrusive method to record students' entire translation process (Ehrensberger-Dow & Perrin, 2009). Students used EVCapture (https://www.ieway.cn/evcapture.html) and Filmage Screen (https://www.filmagepro.com/filmagescreen) to record the screen for Windows and Mac, respectively. The screencasts of the three participants lasted between 1½ and 2 h. In addition, the

participants' corpus search logs were extracted from the TR Corpus, specifying the time taken for each search, as well as the functions and search strings used.

Student cognitive and affective engagement was measured primarily via interview data. Since it is difficult to observe internal thoughts or feelings directly (Gass & Mackey, 2017), three rounds of semi-structured interviews were conducted. The first interview, which was conducted within 1 week after the post-training translation tasks, enquired about participants' prior experiences with corpora for translation based on their responses to the pre-training background survey. The second interview was conducted within 1 week after the first interview (to offset information retrieval limitations) as a stimulated-recall procedure. This procedure included the display of the screencast and search histories to prompt participant recall (see Appendix for interview questions). To ensure comprehensive data collection and mitigate potential information loss due to participant fatigue, a two-part interview process was implemented. Following the extensive second interview, which exceeded 1 h, a third interview was conducted a week later. This follow-up session provided participants with an opportunity to offer additional insights into their cognitive and affective engagement with the parallel corpus. Participants also provided general evaluations and suggestions for corpus use in translation practice and education. The interview data comprises transcripts from 557 min of audio recordings, averaging 186 min per participant. All interviews were conducted in Chinese via ZOOM, audio recorded, and transcribed verbatim.

3.5 | Data analysis

The analysis of screencasts and corpus search logs focused on student behavioural engagement with the parallel corpus. Further analysis of the interview transcripts functioned to dig more deeply into behavioural engagement and explore cognitive and affective engagement.

3.5.1 | Analysis of screencasts and corpus search logs

To begin, student consultation behaviours, which refers to students' broader act of engaging with a reference source, were operationalised through systematic analysis of corpus search logs. This process involved identifying and assigning numerical codes to specific actions, with additional insights gleaned from participant interviews. The search logs documented individual lookups, each representing a discrete instance of searching for and retrieving information from the corpus. These lookups were subsequently categorized according to the types of translation problems addressed by participants. For this study, a translation problem is defined as a specific challenge encountered during the translation process that necessitates the use of reference materials. The coding scheme for these translation problems, adapted from Sycz-Opoń (2019), encompassed a range of issues, including single-word problems, phrases, sentence structures, collocations, and synonyms.

Figure 3 illustrates a sample coding of students' corpus consultation behaviours and translation operations. The search log shown depicts a participant conducting two separate lookups in different sub-corpora while addressing a single translation problem: the rendering of "validation facilities." This series of lookups was collectively categorized as one search effort associated with a specific translation problem, designated as problem No. 47.

The corpus search results shown in the screencasts were further coded based on whether the corpus results could be directly applied in translation. Results that offer precise matches or straightforward translations were labelled as "direct references." For example, as shown in Figure 3, when the student searched for "proximity" (translation problem No. 46), "毗邻/周边/临近" appeared in the corpus results as matching reference translations. Therefore, this lookup result is labelled as "direct references." On the other hand, results providing related but not explicitly matching information, which might necessitate further analysis to identify the translation reference, were designated as "indirect references." For instance, in translation problem No. 47, the student searched for "validation facilities" in two sub-corpora (see Figure 2). The two sub-corpora either offer parallel texts containing "validation" or texts

Search Log		Translation Problem Number	Translation problem	Directness of reference	Translation operation	Time spent (seconds)	Interview & Screencast notes
Corpus Function	Search String						
Compare	English:Word1:smart:Word2:intelligent; Type: ALLNN,Location1; Corpus: news	No.1	Synonyms	Indirect reference	Accept	40	no collocations with 'intelligent', so upon seeing that 'smart' had collocations with 'technology', I confirmed it."
…	…	…	…	…	…	…	…
Basic Search	Chinese:Word:我公司專注於; Corpus: introduction	No. 3	Sentence Structures	Direct reference	Accept	60	Several sentences used 'xx specialized in', so I also used this structure
Basic Search	Chinese:Word:我公司专注于; Corpus: news	No. 4	Sentence Structures	Indirect reference	Ignore	10	Did not carefully go through the results
Collocation	English:Word: technology; Type: ALLVV, Location-3; Corpus: news	No.23	Collocation	Indirect reference	Ignore	8	Adjusted the placement of the collocation, skimmed over it, but did not examine the details of the examples
Collocation	English:Word: technology; Type: ALLVV; Location-2;Corpus: news	No.23	Collocation	Indirect reference	Reject	22	Searched for collocating verbs for 'technology' but failed to find suitable options
Basic Search	Chinese:Word:务实; Corpus:news	No. 24	Single-Word Issues	Direct reference	Accept	50	Used the search results "pragmatic", also cross-checked using Lindict
…	…	…	…	…	…	…	…
Basic Search	Chinese:Word:推动转型; Corpus: news	No. 27	Phrases	Indirect reference	Substitute	27	The translation in the corpus example is "encourage shift", the student changed it into "promote the shift" in her translaion.
…	…	…	…	…	…	…	…
Basic Search	English:Word:proximity; Corpus: introduction	No.46	Single-Word Issues	Direct reference	Accept	12	seven references, including 毗邻/周边/邻近
Basic Search	English:Word:validation facilities; Corpus: introduction	No.47	Phrases	Indirect reference	Reject	18	most examples related to facilities
Basic Search	English:Word:validation facilities; Corpus: news	No.47	Phrases	Indirect reference	Reject	6	some examples related to validation

FIGURE 3 Sample coding of corpus consultation behaviours and translation operations.

containing "facilities" with no direct translation reference. The corpus results were therefore coded as "indirect references." When the corpus search yielded no results for a given search string, it was coded as "no reference."

The researcher then compared the result data against potential translation operations shown in the screencasts. The results were categorized based on the extent to which students utilized the corpus data in their translations: "accept" when the translation equivalents from the corpus results were fully adopted, "substitute" when the corpus-provided equivalents were partially used, "reject" when the corpus suggestions were entirely declined, and "ignore" when the corpus findings were ignored (see Figure 3 for a sample of this coding scheme).

Finally, the time students spent searching or analysing the corpus data was measured by analysing the search logs and the screencast, as this partly constituted behavioural engagement, in addition to screencast observations.

To mitigate the potential for misinterpretation of learner behaviour, the researcher cross-verified the codes through stimulated recall interviews with participants. Any discrepancies that emerged were subsequently resolved through confirmation with the participants.

3.5.2 | Analysis of interviews

In the second analysis phase, transcriptions of interviews were coded and analysed qualitatively using the framework adapted from the categories of learner engagement with feedback proposed by Han and Hyland (2015) (see Table 2). To ensure coding reliability, one coder was responsible for coding the entire dataset, while a second coder independently coded half of the data. The inter-coder agreement reached 89.5%, and subsequent discussion resolved all instances of disagreement.

4 | FINDINGS

The three students exhibited varying patterns of engagement with the parallel corpus. First, students' behavioural engagement varied in terms of corpus consultations (see Figure 4), translation operations (see Figure 5), and time

TABLE 2 Multidimensional framework of student engagement (adapted from Han & Hyland, 2015).

Construct	Sub-construct	Definition	Data sources	Example
Behavioural engagement	Consultation behaviours	Consultations made to search for solutions to translation problems	Corpus search logs, screencasts (verified in the interviews)	Searching for single words or phrases; time spent on corpus consultations
	Translation operations	The ways students dealt with the corpus results in their own translation	Corpus search logs, screencasts (verified in the interviews)	Accepting, substituting, rejecting, ignoring corpus results
	Observable strategies	Strategies noted when refining consultation results and/or enhancing translation performance	Corpus search logs, screencasts (verified in the interviews)	Changing search strings, checking dictionaries
Cognitive engagement	Depth of processing (noticing)	The student notices useful information in the corpus results	Interview transcripts, screencasts	"I saw in many examples, '智能' was translated into 'intelligent' or 'smart'."
	Depth of processing (understanding)	The student understands and interprets useful information in the corpus results	Interview transcripts, screencasts	"I found from the examples that the word 'data' was used to describe something more concrete, like users' data."
	Cognitive strategies	Cognitive strategies and skills used to conduct consultations, process the corpus data, and translate	Interview transcripts, screencasts	Reasoning: "This is used in the example of Alibaba and the example of Google. The two companies are reliable. So, I think their naming is appropriate."
	Metacognitive strategies	Strategies and skills used to regulate cognition, behaviour, emotions	Interview transcripts, screencasts	Regulating behaviours: "I think searching for similar sentences is very difficult, so I did not try to do that."
Affective engagement	Emotional reactions	Emotions or feelings expressed on receiving results, emotional reactions during and after translation	Interview transcripts, screencasts	Delighted, anxious, surprised
	Attitudinal responses	Student overall judgment or attitudes towards corpus results as revealed throughout the translation process	Interview transcripts	Positive, disappointed, useful

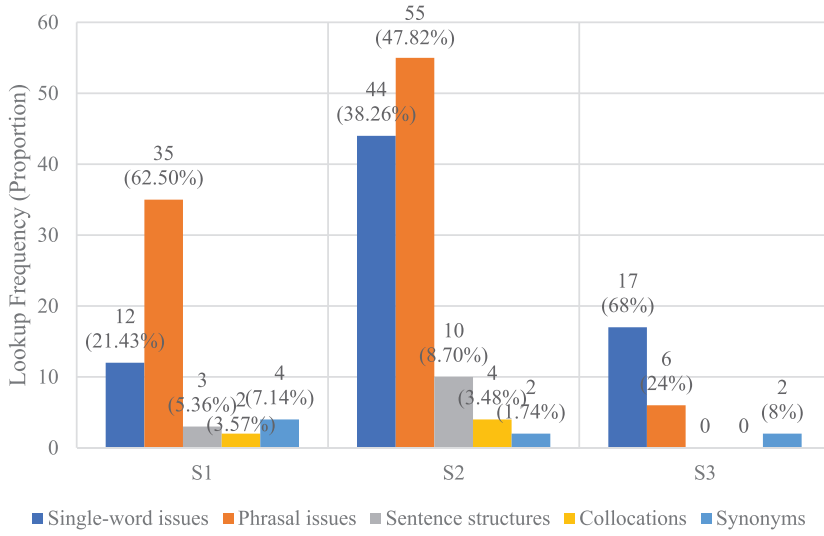

FIGURE 4 Student corpus consultation of different translation issues. [Color figure can be viewed at wileyonlinelibrary.com]

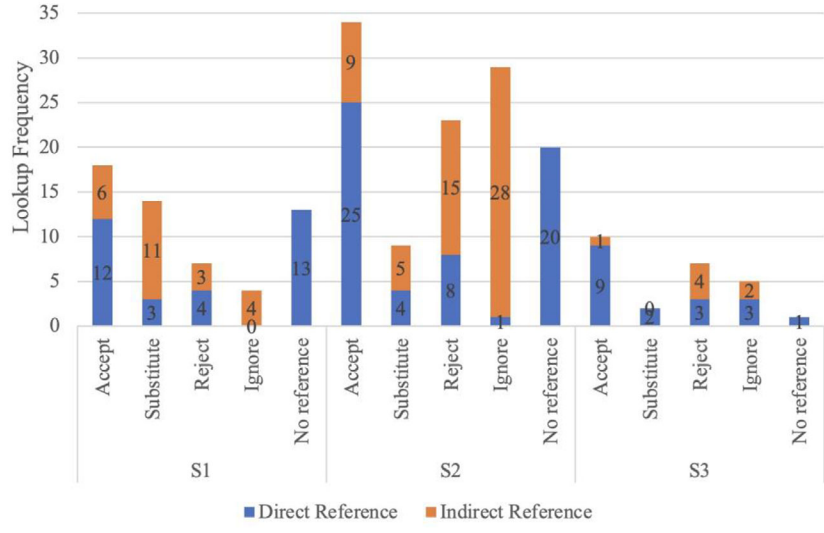

FIGURE 5 Student translation operations for direct and indirect corpus references. [Color figure can be viewed at wileyonlinelibrary.com]

spent on corpus lookups (see Table 3). Analysis of interview transcripts revealed distinct cognitive and affective engagement patterns among the students. Detailed profiles of each student's engagement with the parallel corpus are provided below.

4.1 | Student 1: Non-confident learner, deep engagement

Student 1 (S1) majored in English in her BA study and had very limited knowledge of translation. She had worked as a business executive for 2 years after graduation, and her MA major was bilingual communication rather

TABLE 3 Distribution of time spent on corpus lookups (in seconds).

	Mean time	Median time	Min time	Max time	SD (time)	Total number of lookup	Total number of searches	Total time
S1	33.5	19.5	1	183	33.8	56	38	1875
S2	16.5	11	2	85	15.9	115	54	1894
S3	27.5	20	2	82	21.2	25	18	687

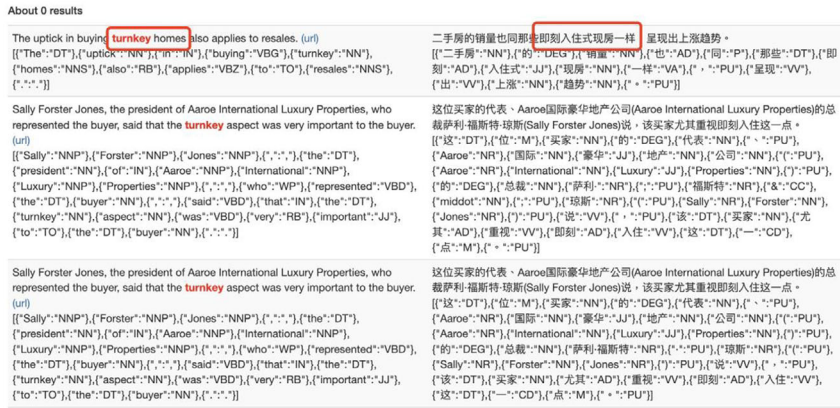

FIGURE 6 An example of "messy codes" in searching "turkey solutions." [Color figure can be viewed at wileyonlinelibrary.com]

than translation. Although this background left her with little confidence in her translation competence, she performed among the class average in the pre-training tasks. As for her corpus experience, she had sometimes used the British National Corpus (BNC) in translation and wanted to learn more corpus knowledge and skills. S1 expressed in the interview that she was motivated to use the corpus to compensate for inadequate translation ability.

She found the parallel corpus to be valuable, dependable, and user-friendly, particularly as a novice translator. She noted that the news sub-corpus as highly versatile for translating various text types during the interview. In the post-training translation phase, S1 encountered and searched for solutions to 38 translation problems, conducting a total of 56 lookups. Her behavioural engagement with the corpus was closely aligned with her perception of its affordances, as all her searches were conducted within the news sub-corpus.

S1 would not feel frustrated if she could not find direct translation answers from the corpus (see Figure 6 for an illustration of "messy codes" that occurred when the search string did not find an exact match in the corpus):

> "It is those messy codes and the texts in which keywords are not highlighted that prompted me to read and analyse the whole sentence or paragraph… They leave some room for my improvement."

As mentioned in the interview, she firmly believed in the affordances of the corpus for decoding meaning within context and asserted that all the results contained meaningful information. These attitudes were reflected in her consultation behaviours and translation operations. Her corpus searches yielded numerous indirect references accompanied by unwanted codes. From these search results, she successfully leveraged over two thirds, specifically 17 out of 24 instances, by extracting translation equivalents through in-depth analysis or partially integrating the

corpus findings into her translation. This proportion ranked highest in terms of the degree of indirect reference utilization among the three.

S1 sought help from the corpus to solve all five types of issues (see Figure 4), among which phrasal issues were most frequently consulted, and single-word issues ranked second. However, she seldom searched sentence-level structures. S1 conducted lookups three times more frequently when doing her Chinese–English translation than for the opposite direction (English–Chinese), which mimicked her attitudes towards the usefulness of the parallel corpus for translating in each direction:

> "In Chinese-English translation, the corpus is like a wheelchair. I can't walk without a wheelchair. In English-Chinese translation, the corpus is like a scooter. It helps me to run faster."

Such a statement mapped S1's self-perception of translation incompetence. S1 said that she was not confident in Chinese–English translation, so she needed more external help from the corpus. But when translating from English into Chinese, as long as she understood the meaning of the source text, she believed she could produce an acceptable translation. This student marked 7 out of 10 in the post-training translation tasks for both translation directions.

During the process, S1 conducted multiple lookups for 7 out of the 38 translation problems, accounting for 18.4% of the total. She employed some simple strategies to refine her consultation, such as changing keywords (eight times) or switching corpus functions (seven times). However, she preferred to analyse messy results carefully instead of repeatedly searching to reach clean results. Such behaviours of S1 also demonstrated her cognitive engagement by utilizing linguistic awareness skills. As she reported, any TR Corpus search results were a finding in themselves and hence useful. She also frequently deployed cognitive operations to analyse and understand why some expressions were translated or organised in specific ways in different contexts. For example, when she searched for the word "turnkey," S1 did not get a direct translation equivalent in the context of a company introduction, but she surmised that:

> "By analysing the examples, I found that "turnkey home" referred to the houses that you could move in right away, so I think maybe "turnkey" means something that is all-ready."

She also showed cognitive engagement with results by cross-referencing dictionary and corpus findings (seven times) when uncertain. For instance, when she found in one example that "拥有" [have] was translated into "boast," a novel word for her, she searched for "boast" in the corpus again for common usage and meanings. This utilised the bidirectionality of the corpus data to ensure that the translation was appropriate and natural. Moreover, S1 analysed the source texts and split complex sentences into segments to identify keywords or structural implications. These strategies indicated her meticulous cognitive engagement with the corpus results.

In making translation decisions, S1 would analyse the reliability or compare the frequency of different versions. She also frequently exhibited creative incorporation of the corpus data with her own translation, evidencing a detailed analysis and deep engagement with the corpus. Cognitive engagement with the parallel corpus is also reflected in the time spent per lookup, which was relatively high at 33.5 s (see Table 3). In total, S1 spent about one-third of the time (31.25 min) she used to finish the translation searching for and analysing the corpus data.

S1 generally had positive affective engagement with the corpus, which enabled her overall patient engagement with the corpus behaviourally and cognitively. She would feel empowered when the corpus results were clear and helpful, and she also remained composed throughout, revealing her metacognitive emotion regulation strategies. For instance, when facing messy results, she deliberately told herself that the messy results were only a matter of "poor user experience" and she was "capable enough" to utilise the results so as not to get frustrated easily. Her determination to fully engage with the corpus might be traced to her self-positioning as a layman translator. However, some of her metacognitive operations failed to work sometimes. This includes giving up a search or "resigning them to fate" when secondary results were unhelpful, or search strategies were ineffective.

To sum up, S1 embraced a learning approach to using the corpus. Her deep and patient engagement with the parallel corpus compensated for her inexperience in translation to some extent. However, not all her translation problems were solved, particularly in the English–Chinese translation, which she mentioned as her strength. This could partially be attributed to her overconfidence in this translation direction.

4.2 | Student 2: Extensive and patterned engagement

Student 2 (S2) had been an English teacher in her hometown for 12 years. Translation for her was a logical move from language teaching and a challenging step towards her ideal work in bilingual communication. Before the training, she had little experience in translation and had never used corpora for translation. Nevertheless, she valued the opportunity to become a translation student, particularly to learn technology-enhanced translation.

In general, she believed that the corpus could solve lexical and syntactic translation problems. Her attitude towards the parallel corpus influenced her behavioural engagement. She consulted the corpus to solve all five types of translation problems. Over 80% of her lookups were conducted to solve phrasal and single-word issues, and 8.7% were directly related to sentence structure (see Figure 4). She mentioned in the interview that she also referred to the sentence structure of the corpus examples when she was searching for lexical items.

S2 expressed awareness of her inexperience and slow pace in doing translation. Her aim to ensure the fluency and faithfulness of translation prompted her to pay attention to almost every detail, as evidenced by her 115 lookups within 54 searches during the translation. Her lookups ranked first for frequency among all the trainees. S2 agreed that using the TR Corpus improved her translation efficiency and quality in both translation directions. She noted that the TR Corpus might be more useful in Chinese–English translation. Besides its translation affordances, S2 thought that corpus analysis improved her vocabulary and keyword comprehension.

S2's engagement with the corpus was not only extensive but also patterned. She employed a variety of search strategies to make multiple lookups for a single translation issue, aiming at direct translation reference rather than in-depth analysis. Unlike S1, S2 adeptly employed various search strategies, such as employing different search strings, adjusting the part of speech or forms of the keywords (20 times), changing corpus functions or sub-corpora (41 times), and referring to dictionaries (4 times). As soon as she encountered results that were not satisfying, she would come up with solutions to refine her search, rather than analysing messy codes in detail. Consequently, half of her searches (27 out of 54) were performed with multiple lookups, particularly for longer phrases, and her translation operations showed a high rate of rejection of the corpus data (see Figure 5). This variety of search strategies testifies strong cognitive engagement with the parallel corpus in translation. In the interview, S2 explained that her frequent multiple lookups in one search were related to her perceived affordances of the parallel corpus to assist translation:

> "I hope I could get some "off the shelf" translation answers. So, when I could not get the answer, I would delete the unimportant parts of my search string and only search for the core keywords."

Although S2 applied a greater number of strategies and searches than her peers, she spent only 31.57 min with the parallel corpus. This was about one-fourth of the time taken to complete her translation, which was similar to the amount of time spent by S1. This discrepancy can be accounted for as a lower average time spent by S2 on lookups (16.5 s), which might be attributed to her proficient employment of search strategies and automated processing of corpus data, a result of "frequent practicing the corpus in daily life" (see Table 3).

S2 also deployed different cognitive operations to analyse corpus data and make translation decisions. When lacking a preconceived translation idea, she would search the corpus to explore possible options, evaluating translation equivalence based on contextual compatibility, synonymous meanings, or similar sentence structures. When she had a particular translation in mind, she was more likely to accept corpus data that aligned with her intuition.

S2 acknowledged that these validation-focused operations stemmed from her self-perception as an unskilled translator who needed corpus confirmation for her work.

S2 also differed from the other two participants in her use of a wide variety of metacognitive operations. S2 planned her consultations at the beginning of the translation by browsing parallel texts for "key sentences." She similarly used metacognitive strategies to regulate her mental status and behaviours when the corpus presented messy codes:

> "I expect that it could not always provide useful information. Then what I need to do next is to change my keywords or reduce the number of my keywords."

The extensive behavioural and cognitive engagement also supported S2 to obtain very satisfactory results in the post-training test, that is, 8 out of 10 in Chinese–English translation, and 9 in the English–Chinese translation.

S2's emotional reactions towards the corpus data changed over the translation process. Initially, she "trusted the corpus very much" and appeared unfazed when the corpus failed to produce results. However, as time passed, she described her emotional reactions with adjectives like "dizzy," "tired," and "stressful" when she received results with messy codes. She explained that her negative reactions were primarily due to "the pressure of finishing the translation" and her "disappointment with her translation incompetence." She "felt great" again when she did get useful information from the parallel corpus and claimed to feel calm upon finishing the translation. Unlike S1, it seems the change of emotional state did not have much impact on her habitual behaviour of conducting multiple searches to refine the corpus results.

To recap, S2 engaged extensively with the parallel corpus and formed a diversity of strategies to resolve most of her translation problems, to the extent that she produced a better translation than the other two participants.

4.3 | Student 3: Experienced but underengaged

Student 3 (S3) is the only participant who majored in translation in her Bachelor's and Master's programs. S3 attended the training as the bilingual parallel corpora was a novel approach, and she anticipated high affordances for translation.

S3 preferred to use the parallel corpus to find translation equivalence for single words and terminologies. However, she expressed that text types in the corpus were limited, and online dictionaries might be more convenient. Therefore, her translations were produced almost independently and without parallel corpus reliance. She sometimes referred to different online dictionaries (four times) and did not expect the parallel corpus to improve her translation competence. Among all three participants, S3 made the most mistakes in the post-training translation tasks for both translation directions.

Compared with the other two participants, S3's relatively low evaluation of the corpus also influenced her engagement with the corpus. She consulted the parallel corpus for the least amount of time: 11.45 min, which was only 10% of her total translation time (see Table 3). In translating the two paragraphs, she conducted 25 lookups to solve 18 translation problems. Only three types of translation problems have been investigated as shown in her search logs (see Figure 4). Her lookups were mainly conducted in the sub-corpus of company introductions, which are representative of a relatively small set compared with the sub-corpus of news, reflecting her perceived affordances of the parallel corpus. As for her translation operations, she seldom utilised corpus data results to create her translation (see Figure 5). These indicate underengagement by S3 with the corpus during the translation.

S3 performed multiple lookups in five of her searches, changing search strings on the TR Corpus four times, using the Compare function once and incorporating dictionary lookup for cross-checking the Chinese item, "智能技术 [intelligent technology]." Though limited, these strategies still evidence S3's cognitive engagement with the parallel corpus. She efficiently detected and understood critical information, quickly accepting and rejecting corpus results. However, she rarely used cognitive or metacognitive strategies to analyse the corpus data for improving her translation.

Since S3 positioned the corpus more like a reference resource to confirm or disconfirm her hypotheses, she often compared the corpus data to her own translation versions or prior knowledge, without in-depth cognitive processing. For example:

> "(In translating '股票代码' [ticker symbol]) I decided to use the phrase 'ticker symbol' because I remembered that I had learned it sometime in class. I was not very sure, so I checked it and made the decision."

S3's limited cognitive engagement might also be related to her negative reactions to messy code results. This, in turn, led to her frequent use of dictionaries, including Oxford Learner's Dictionaries and Lin Yutang's Chinese–English Dictionary of Modern Usage. As she once explained corpus search avoidance:

> "Before I searched for this phrase, I encountered messy codes several times or I could only get very few examples. So, I think it might be difficult to find the word '整体'[whole] on the corpus."

S3 expressed confusion and desperation on returning messy codes from the corpus. This is in stark contrast to S1, who patiently sifted through the messy codes to extract some useful information. As S3 put it in the interview: "I feel desperate. What the hell it is! …So, I just gave it up and let it go." Such a reaction might be attributed to an overall negative evaluation of the parallel corpus. Consequently, this attitude affected her behavioural and cognitive engagement.

Overall, S3's perceived affordances of the parallel corpus influenced her engagement with it. Her underengagement may also have resulted in disappointing search results, exacerbating her disengagement with the corpus. As a result, S3 only got 5 out of 10 in the post-training tests in both translation directions.

5 | DISCUSSION

5.1 | Complexity of student engagement with the parallel corpus in translation

This case study revealed the complexity of student engagement with the parallel corpus in translation, corroborating previous research on learner engagement with technological tools (Koltovskaia, 2020; Roussinos & Jimoyiannis, 2013). Although corpora are regarded as cognitive provoking in language learning activities (Kennedy & Miceli, 2001), distinct engagement patterns emerged. S1 adopted a learning approach to the corpus characterised by strong cognitive and affective engagement. This enabled her to exploit useful information from whatever consultation results, although she did not conduct as many consultations as S2. In comparison, S2 took a pragmatic approach. Her behavioural engagement with the parallel corpus and the various cognitive and metacognitive strategies employed effected successful translation problem_solving. The extensive engagement of S2 also echoes findings in L2 learning research (Bridle, 2019), where students who took a pragmatic attitude were more willing to engage with corpus in language learning. Although S2 expressed more negative emotions when using the corpus in translation than S1, her overall attitude towards the corpus was positive. S3 was comparatively underengaged both behaviourally and cognitively, and she also reported more frequent negative emotional and attitudinal responses than her two counterparts.

The differing learner engagement patterns also impacted their translation performance: S1 and S2 showed better performance, whereas S3's translation performance was unsatisfactory. This finding aligns with previous research that student engagement correlates with academic performance (Lee, 2014), and that prior translation knowledge does not guarantee success in translation (Jääskeläinen, 1996). Notably, high engagement does not always result in immediate learning gains, as exemplified by S1, who, despite adopting a learning-oriented approach, performed worse than S2, who took a more pragmatic approach. This could be because the direct information-seeking method aiding

translation efficiency, supporting Jääskeläinen's (1996) view that diligent information seeking can enhance translation quality. However, since this study only examined the participants' immediate performance, it is possible that S1's learning approach towards using corpus might be beneficial in the long term.

These unique patterns of student engagement might result from the intertwinement of the three dimensions of engagement (Furrer & Skinner 2003). Concurring with previous research findings (Li & Lerner, 2013), greater behavioural engagement on corpus implied learners' cognitive engagement. For example, the longer time spent in analysing the corpus data by S1 indicated high cognitive engagement. S2 frequently made multiple lookups to solve one translation problem, suggesting various cognitive strategies (Benito Cox & Montgomery, 2019). Cognitive engagement influenced translation operations: the participants who critically analysed the corpus data often devised their own translation, while the participants who did not, directly accepted or rejected the corpus results arrived there by intuition. Furthermore, consistent with the findings of Cho (2019), affective engagement was related to student cognitive and behavioural engagement. Both S1 and S2 utilized metacognitive strategies to manage their emotions, and their positive affective engagement played a role in sustaining their patience and determination when consulting the corpus and employing cognitive strategies, even in the face of setbacks. In comparison, S3 was influenced by her frequent negative emotional reactions towards the corpus results and employed limited cognitive strategies and used dictionaries as a substitute for the corpus.

5.2 | Factors influencing student engagement

The study further revealed that the participants' perceived affordances of the corpus influenced how they engaged with the corpus during translation behaviourally, cognitively, and affectively. All three participants consistently utilized the corpus primarily for lexical searches, aligning with their perception of its usefulness for addressing lexis-related translation issues.

As Barr (2013) noted, knowing the "practicality" of technologies is a precondition for students to engage with those technologies. The findings of this study align with L2 learning research where students' perceptions towards the corpus influenced their reactions to the corpus results (Bridle, 2019; Mueller & Jacobsen, 2016; Yoon & Hirvela, 2004). Unlike in L2 research, where students often find analysing corpus results difficult and frustrating (Kennedy & Miceli, 2001; Mueller & Jacobsen, 2016), the use of the corpus was cognitively engaging for S1 and S2. This engagement was influenced by their perceptions of the corpus. S1, believing even messy codes were beneficial, devoted significant effort to analysing corpus data. In contrast, S2, expecting translation equivalents from the parallel corpus, employed multiple cognitive strategies for searching but spent less time analysing results than S1. Moreover, their views on the corpus's affordances in translation shaped their use of alternative references, that is, online dictionaries: S3 used dictionaries as a substitute for the corpus to resolve translation issues, whereas S1 and S2 mainly used dictionaries to confirm meanings of translation equivalents found in the corpus. The perceived affordances of the parallel corpus also influenced the participants' affective engagement during translation. For instance, S2's positive view of the corpus helped counterbalance her negative emotions, preventing her from quickly abandoning it. Comparatively, S3's negative opinion of the corpus made her more susceptible to disengagement when experiencing negative emotions.

In addition to students' perceptions of the corpus, learner factors, such as student self-image of translation competence and motivation for learning the corpus use, together with their perceptions of the corpus affordances, might have a compounding influence on their engagement. This corroborates research on corpus use in L2 learning context which found that learner style is an important factor influencing corpus use (Bridle, 2019). Unlike previous findings that a higher level of self-evaluation of learning abilities is related to greater engagement and better outcomes (Chen & Pajares, 2010; Lee et al., 2020), the low self-rated translation competence and learning motivation expressed by S1 and S2 prompted them to place a high value on the parallel corpus, which also acted as a motivator for their engagement with the parallel corpus in compensation. This accords with previous research that motivation is essential to facilitate student engagement (Mystkowska-Wiertelak & Bielak, 2023; Zare et al., 2024). In comparison, S3,

who was less motivated to use the corpus, did not appreciate the affordances of the corpus as S1 and S2 did. One explanation is that even without the corpus, S3 could refer to her prior knowledge or dictionaries as a replacement. In turn, the results caused by disengagement further deteriorated S3's motivation to learn and use the corpus. In brief, the findings agreed with Reeve's (2012) proposition that motivation both influences and is influenced by student engagement.

5.3 | Implications for translation training

The findings of the present study have important pedagogical implications for parallel corpus-assisted translation teaching. The students' diverse engagement patterns and their translation outcomes refute the notion that using parallel corpora definitively facilitates the translation learning process. Problems in performing consultations effectively or making wise translation decisions persisted for the participants. Therefore, teachers should offer more instruction to facilitate students' effective behavioural engagement with the corpus, including identifying specific search needs, determining the information needed, and employing appropriate search strategies, sub-corpus, and search strings (Chambers, 2005). To foster in-depth cognitive engagement with the parallel corpus, teachers should guide students through a process of critical analysing the corpus data to address their translation challenges. This process should involve observing and categorizing the corpus data, verifying the meaning and usages of the corpus examples to align with their own context, and making informed translation decisions (Kennedy & Miceli, 2001). As argued by Benito Cox and Montgomery (2019), critical thinking and problem solving serve as catalysts for cognitive engagement. Introducing a range of translation technologies and resources may also help students cross-reference and boost their translation creativity (Mikhailov, 2022).

This study also revealed that how individuals' perceived affordances of the parallel corpus shaped their profiles of engagement with the corpus (Li & Lerner, 2013). Consequently, instructors should provide comprehensive instruction on corpus affordances and guidance across a spectrum of translation problem-solving scenarios. It is advisable for educators to solicit student evaluations of the corpus and identify challenges in its use, enabling them to tailor corpus-assisted translation learning activities to students' needs. This approach may foster a positive feedback loop between student perceptions and engagement with the parallel corpus. Furthermore, given the varied ways students engage with the corpus and the diverse challenges they encounter in consultation and analysis, providing specific, individualised feedback is crucial. The diversity in engagement patterns and student perceptions indicates that incorporating peer interactions into the corpus-assisted translation learning process could be beneficial, as it would allow students to share skills and insights with one another (Marcos Miguel, 2021).

6 | CONCLUSIONS

This study explored how students engaged with the parallel corpus behaviourally, cognitively, and affectively in translation learning. The present study reveals that students exhibited different engagement patterns, which led to varying outcomes in translation performance. By examining the unique interactions of these engagement types among the three students, the present study offers valuable insights into the complexities of student engagement with the parallel corpus in their translation learning and the possible factors that influence student engagement with the parallel corpus in translation.

Some limitations of this study should also be acknowledged. First of all, while the multiple case study complements previous quantitative research on students' perceptions and performances of using a parallel corpus in translation by offering an in-depth analysis of how students engage with the parallel corpus during the translation process, caution should be exercised when generalizing the results to other contexts due to the inherent limitations of case studies. Second, the data only included immediate student translation performance, whereas a longitudinal study could

assess attitude changes in translator trainees with growing expertise and engagement of parallel corpus as translators enter at different stages of competence. Furthermore, while some students may frequently consult dictionaries during translation, the interplay between parallel corpus usage and other reference resources has not been thoroughly examined. Future research could explore how students integrate various reference materials and how this integration affects overall translation quality. Such studies could inform best practices for supporting learners in developing robust, flexible, and efficient translation strategies.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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ENDNOTE

[1] In Chinese corpora, the basic units of analysis can be either characters or words. Chinese words are typically composed of one or more characters, and there are no spaces between words in written Chinese. As a result, word segmentation is a necessary step in Chinese corpus processing. The size of Chinese corpora is often reported in terms of the number of characters, as it provides a more stable and consistent measure across different segmentation schemes. However, some Chinese corpora also provide information on word tokens after performing word segmentation using specific algorithms or tools.

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