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Translanguaging in second language writing processes

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ABSTRACT

Little research explored how frequently and for what functions translanguaging occurs during second language (L2) writing processes. To fill this research gap, the study analysed translanguaging occurrences in 53 undergraduates' L2 writing processes. Translanguaging data were collected through think-aloud protocols, computer screen recordings, stimulated recall, and written drafts. Data analyses yielded four main findings: (1) on average, learners of varied L2 proficiency levels translanguaged frequently during their L2 writing processes; (2) reasoning was the least frequently performed translanguaging function, while repetition was the most frequently performed translanguaging function; (3) the lower-level L2 students performed translanguaging significantly more often than did their higher-level counterparts; (4) the higher-level L2 students translanguaged for monitoring significantly less often than did their lower-level counterparts. This study can contribute to the literature on translanguaging by exploring cognitively mediational roles of translanguaging and examining potential influences of L2 proficiency on the frequencies and functions of translanguaging.

1. Introduction

Second language (L2) writing is a cognitively demanding practice that encompasses various cognitive processes (Barkaoui, 2021; Révész et al., 2019). Evidence has shown that L2 writers' linguistic resources may be used as a cognitive tool for mediating this highly challenging activity (Lei, 2016; Wang & Wen, 2002). However, instead of being simply viewed as practices that entail L2 writers' use of linguistic repertoires (Lei, 2016; Wang & Wen, 2002), L2 writing activities have been increasingly regarded in recent years as meaning-making practices involving writers' multilingual, multimodal, and multi-semiotic resources (Pacheco et al., 2022). Generally, bilingual and multilingual individuals' practices of employing their multilingual, multimodal, and multi-semiotic repertoires are referred to as translanguaging (García & Li, 2014; Li, 2018). Therefore, L2 writing processes can be understood as translanguaging-embedded cognitive practices.

Despite growing research interests in the role of translanguaging in L2 writing practices (e.g., Chen et al., 2019), the following limitations still exist. First, some scholars (e.g., Kiramba, 2017) mainly focused on textual analysis of translanguaging-embedded written products. As translanguaging is a process of meaning construction (Baker, 2011; García, 2011; García & Li, 2014; Kuzu, 2023; Lewis et al., 2012a, 2012b), ignoring the analysis of actual translanguaging-embedded writing processes may fail to reflect the nature of translanguaging in L2 writing practices.

Second, few studies have explored the cognitively mediational roles of translanguaging by examining L2 writers' verbalisations of their ongoing cognitive processes. Existing research into translanguaging-embedded L2 writing processes (e.g., Zhang & Hadjioannou, 2022; Zheng & Drybrough, 2023) tends to collect data through post-writing retrospective interviews with participants. However, theories of translanguaging have been developed based on *languaging* (García & Li, 2014; Li, 2011, 2018). Defined as the process of utilising language for mediating cognitive functioning (Swain et al., 2009, 2013; Swain & Lapkin, 2013), languaging can involve "verbalization used to mediate the solution(s) to complex problems and tasks" (Swain et al., 2009, p. 5). Considering that languaging is closely related to cognitive processes (Swain et al., 2009, 2013; Swain & Lapkin, 2013), translanguaging can help bilingual and multilingual individuals to use their linguistic resources for mediating cognitive activities (Lewis et al., 2012a, 2012b). Therefore, exploring ongoing verbalised translanguaging instances can provide a more comprehensive picture of the cognitive aspects of

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translanguaging.

Third, little attention has been paid to how high-achieving L2 students may differ from their low-achieving counterparts in terms of frequencies and functions of translanguaging during L2 writing processes. While many studies (e.g., Wang & Wen, 2002) examined the differences in the extents and purposes of first language (L1) use between advanced and less proficient L2 students during L2 writing processes, few of them were conducted from a translanguaging perspective that takes into account writers' multilingual, multimodal, and multi-semiotic resources (García & Li, 2014; Li, 2018). Examinations of the differences between writers of varied L2 proficiency levels in the frequencies and functions of translanguaging will allow L2 writing instructors to understand the role of translanguaging in L2 writing processes and re-examine their instructional approaches for high- and low-achieving L2 students.

To fill the research gaps above, the present study aims to address the following research questions:

(1) What are the frequencies of overall translanguaging and translanguaging functions during the higher- and lower-level L2 students' writing processes?
(2) To what extent do the higher- and lower-level L2 students differ in the frequencies of overall translanguaging and translanguaging functions?

Through answering the research questions above, the present study makes significant contributions to the literature on translanguaging methodologically and empirically. First, a coding scheme of translanguaging functions that was developed for this study can enrich our understanding of cognitive and metacognitive functions of translanguaging. Second, by analysing translanguaging data that were collected through think-aloud protocols, computer screen recordings, stimulated recall, and written drafts, this study innovatively explored cognitively mediational roles of translanguaging in L2 writing processes. Third, the study can provide the lastest evidence of how frequently high- and low-achieving L2 students rely on translanguaging for completing L2 writing.

2. Literature review

2.1. Theoretical foundations for researching writing processes

To deeply explore L2 students' writing processes, this study is theoretically grounded in the cognitive process writing model of Flower and Hayes (1981). Writing processes are defined as "basic processes of **Planning, Translating and Reviewing**, which are under the control of a Monitor" (Flower & Hayes, 1981, p. 369). These recursive processes can occur at any time and can be performed concurrently (Flower & Hayes, 1981).

Flower and Hayes (1981) further delineate these processes based on the following parameters. According to Flower and Hayes, planning consists of idea generation, organising, and goal setting; translating involves converting already generated ideas into written language; reviewing entails evaluation and revision. A monitor is used by writers to track task progress and make decisions about subsequent steps (Flower & Hayes, 1981).

Flower and Hayes (1981) argue for the use of think-aloud protocols in analysing writing processes. Theoretically grounded in Flower and Hayes' (1981) writing model, a number of scholars (e.g., Bai, 2018) have explored ongoing writing processes by analysing think-aloud protocols. Therefore, Flower and Hayes' (1981) model lays the theoretical foundation for researching L2 writing processes in the present study.

The writing processes described in Flower and Hayes' (1981) writing model show many consistencies with the cognitive and metacognitive processes of self-regulation (Bai, 2018; Bai et al., 2020; Bai & Wang, 2021; Guo & Bai, 2022; Harris et al., 2011; Nückles et al., 2020; Risemberg, 1996; Zimmerman & Risemberg, 1997). Defined as "self--generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (Zimmerman, 2000, p. 14), self-regulation is required in the processes of producing a piece of successful writing (Ferrari et al., 1998; Guo & Bai, 2022; Harris et al., 2011; Nückles et al., 2020).

Cognitive and metacognitive practices are the core parts of self-regulation (Bai, 2018; Schraw, 2010; Teng & Zhang, 2018; Winne, 2011, 2018; Winne & Azevedo, 2022). Cognition refers to the processes by which information or knowledge is obtained, retrieved, processed, and utilised (Bayne et al., 2019), whilst metacognition is defined as individuals' understanding of their cognitive processes (Jacobs & Paris, 1987; Winne & Azevedo, 2022). Self-regulated writers typically employ various cognitive and metacognitive strategies during their writing processes (Bai, 2018; Harris et al., 2011; MacArthur et al., 2015; Nückles et al., 2009, 2020). Cognitive strategies are the strategies of using existing knowledge to obtain new information or complete a task (Akyol et al., 2010; Duffy et al., 2015; Vosniadou et al., 2021). Common cognitive strategies include idea generation, repetition, and reasoning (Duffy et al., 2015). Idea generation refers to generating new ideas related to completing a task (Bai et al., 2014; Duffy et al., 2015; Hosseinpur & Kazemi, 2022). Strategies of repetition entail verbatim repetition, translation, paraphrasing, and summarisation (Duffy et al., 2015; Song & Cho, 2021). Reasoning involves making inferences based on sophisticated thinking processes (Cheng et al., 2024; Duffy et al., 2015). Metacognitive strategies refer to the strategies of controlling and regulating cognitive processes (Akyol et al., 2010; Duffy et al., 2015; Hosseinpur & Kazemi, 2022; Ku & Ho, 2010). Common metacognitive strategies include goal setting, monitoring, and evaluation (Duffy et al., 2015; Jacobs & Paris, 1987; Ku & Ho, 2010; Schraw, 1998). Goal setting involves forming an action plan for subsequent tasks (Duffy et al., 2015; Ku & Ho, 2010). Monitoring refers to individuals' understanding of their task progress and task difficulty levels as well as awareness of known or unknown information (Ku & Ho, 2010; Schraw, 1998). Evaluation activities entail individuals' assessment of their task performance (Duffy et al., 2015; Schraw, 1998).

The following section reviews empirical research into how writing processes may be influenced by language abilities.

2.2. Empirical studies on potential influences of language abilities on writing processes

Writing abilities (e.g., Bai, 2018) and language proficiency (e.g., Chien, 2012) are frequently researched language-related factors that may influence writing processes.

Regarding how writing abilities may influence writing processes, Bai (2018) found that high-level English-as-a-second-language (ESL) writers were superior to their low-level counterparts in terms of their ability to use different cognitive and metacognitive writing strategies. However, as the data about writing processes were collected from a picture-composition task, his study did not reveal how ESL writers employ writing strategies in other types of writing tasks, especially in argumentative writing tasks that may require more advanced writing skills. Instead, by examining writing strategies used by English-as-a-foreign-language (EFL) writers for producing English argumentative texts, Chien (2012) found that high-level EFL writers used significantly more strategies related to position formulation, text

generation, text revision, and text editing than did their low-level counterparts.

Regarding how language proficiency may affect writing processes, a questionnaire survey by Bai et al. (2014) revealed that high-level ESL learners used planning, text generating, revising, monitoring, evaluating, and resourcing more frequently than did their low-level counterparts. Nevertheless, this questionnaire-based study (Bai et al., 2014) failed to capture the students' ongoing writing processes, and it therefore may not accurately reflect the writers' use of strategies.

Based on a review of the empirical studies above, more research needs to explore the differences among writers of varied language proficiency levels in the use of linguistic and semiotic resources, which is referred to as translanguaging (García & Li, 2014; Li, 2018), during writing processes. The following section discusses theoretical foundations for researching translanguaging.

2.3. Theoretical accounts of translanguaging

Before reviewing definitions of translanguaging, this section first provides an overview of theoretical discussions about the connections between languaging and cognition, because languaging – as a major part of translanguaging – is a mediator of cognitive processes (Swain, 2006), and translanguaging involves cognitive practices (Dumrukcic, 2022; García & Li, 2014; Han et al., 2023).

2.3.1. Connections between languaging and cognition

Language is not only a communication vehicle but also a cognitive tool (Swain, 2006; Swain et al., 2009; Swain & Lapkin, 2011; Vygotsky, 1978). Swain (2006) pointed out that "when a person is producing language, what he or she is engaging in is a cognitive activity; an activity of the mind. Individuals use language to mediate cognition (thinking)" (pp. 95–96). Based on sociocultural theories by Vygotsky (1978), Swain (2006) introduced the concept of languaging and defined it as "the process of making meaning and shaping knowledge and experience through language" (p. 98).

Languaging can be in the form of both speaking and writing (Ishikawa, 2013, 2015, 2018; Ishikawa & Suzuki, 2016, 2023; Swain, 2006). It can mediate cognitive activities by helping individuals organise and monitor their behaviours (Lapkin et al., 2010). Individuals may use oral languaging (e.g., private speech) when they encounter cognitively demanding problems (Brooks et al., 2010; Swain et al., 2009). Meanwhile, written languaging (e.g., written drafts, note taking) can "function as external memory" (Suzuki, 2012, p. 1112).

Discussions on languaging (e.g., Swain, 2006) provided the foundation for Li's (2011) idea about translanguaging, indicating the close connections between translanguaging and cognition. The following sub-section introduces how translanguaging has been defined from different perspectives in the scholarly literature.

2.3.2. Definitions of translanguaging

There have been three major types of translanguaging definitions to date (e.g., Lewis et al., 2012a, 2012b). The first type emphasises alternations of multiple languages in educational settings (e.g., Cenoz & Gorter, 2022), reflecting the original meaning of translanguaging (Williams, 1994, as cited in García & Li, 2014). Translanguaging was initially proposed as "a pedagogical practice where students are asked to alternate languages for the purposes of receptive or productive use" (Williams, 1994, as cited in García & Li, 2014, p. 20). To further develop translanguaging as a pedagogical strategy in various educational contexts, Cenoz-led research teams (Cenoz, 2017; Cenoz et al., 2021; Cenoz & Gorter, 2022) proposed the concept of *pedagogical translanguaging*, which means it is "planned by the teacher inside the classroom and can refer to the use of different languages for input and output or to other planned strategies based on the use of students' resources from the whole linguistic repertoire" (Cenoz, 2017, p. 194).

Although translanguaging is often regarded as a pedagogical practice (Cenoz & Gorter, 2022; Vaish & Subhan, 2015), the development of translanguaging theories is closely linked with cognition. For example, Williams (1996), the creator of the translanguaging concept, perceived translanguaging as both an educational practice and a cognitive process of using different languages. Furthermore, Li's (2011) idea about translanguaging was developed based on Swain's (2006) discussions on languaging. Considering the close relationship between translanguaging and cognition, the second type of translanguaging definitions focuses on cognitive processes (Baker, 2011; Lewis et al., 2012a, 2012b). Lewis et al. (2012b) provided a classic definition of this category, stating that translanguaging occurs when "both languages are used in a dynamically and functionally integrated manner to organise and mediate mental processes in understanding, speaking, literacy and not least learning" (p. 641). Therefore, translanguaging is related to cognitive practices (Lewis et al., 2012a, 2012b).

Recent years have witnessed growing research interests in the multimodal and multi-semiotic aspects of translanguaging (e.g., Jiang et al., 2022). The third type of translanguaging definitions is thus related to the multimodal and multi-semiotic nature of translanguaging (e.g., Lin, 2019). Multimodal resources refer to the use of "gestures, objects, visual cues, touch, tone, sounds and other modes of communication besides words" (Norris, 2004, as cited in García & Li, 2014, p. 28). As Li (2018) pointed out, translanguaging entails "transcending the traditional divides between linguistic and non-linguistic cognitive and semiotic systems" (p. 20). In other words, translanguaging means going between and beyond various languages and modes (García & Li, 2014; Li, 2018).

Despite some arguments (e.g., Goodman & Tastanbek, 2020) over the differences between translanguaging and other bilingualism-related terms (e.g., code-switching, translation, L1 use), translanguaging is still considered by many scholars (e.g., Nikula & Moore, 2019) as an umbrella term of bilingual and multilingual individuals' linguistic practices. For example, Cenoz et al. (2021) claimed that translanguaging is "an umbrella term that embraces a wide variety of theoretical and practical examples of the fluid use of languages" (p. 1). Mazak (2016) pointed out that translanguaging "is not limited to what is traditionally known as 'code-switching', but rather seeks to include any practices that draw on an individual's linguistic and semiotic repertoires" (p. 5). García (2011) mentioned that translanguaging "includes code-switching, the shift between two languages in context, and it also includes translation" (p. 147). Furthermore, empirical studies on translanguaging often reveal extensive insights about various bilingualism-related behaviours, such as code-switching (e.g., Zhou & Mann, 2021), L1 use (e.g., Kim & Chang, 2022), and translation (Han et al., 2023).

However, in comparison to other bilingualism-related terms (e.g., code-switching), translanguaging is multilingual, multimodal, and multi-semiotic (Li, 2018). Code-switching emphasises alternations of separate linguistic systems (Lin, 2020; Otheguy et al., 2015); code-meshing refers to the use of an integrated meaning-making repertoire in written discourses (Canagarajah, 2011); translanguaging can occur when individuals draw upon different languages, symbols, and modes from an integrated repertoire (García & Li, 2014; Li, 2018). Therefore, a major difference between translanguaging and other bilingualism-related terms is that translanguaging entails different semiotic meaning-making systems in various modes, enabling linguistic practices to be transformative across and beyond languages and modes (García & Li, 2014; Li, 2018).

The three types of definitions (e.g., Li, 2018) lay the foundation for the operationalisation of translanguaging in the present study. Based on the first type (e.g., Cenoz & Gorter, 2011) and the third type (e.g., Li, 2018), the present study considers translanguaging as an umbrella term of multilingual, multimodal, and multi-semiotic meaning-making practices. In this sense, during L2 writing processes, an instance of using full linguistic and semiotic repertoires can be identified as a translanguaging occurrence, such as the use of semiotic symbols in written drafts (e.g., note taking). The second type, which stresses the cognitive processes of translanguaging (Baker, 2011; Lewis et al., 2012a, 2012b), provides the theoretical basis for exploring translanguaging-embedded writing processes in the present study. Thus, this study refers to translanguaging as a cognitively mediating practice involving the use of an individual's existing linguistic, multimodal, and semiotic resources during a specific activity (e.g., García & Li, 2014).

2.4. Empirical foundations for researching roles of translanguaging in writing processes

Different types of data, such as think-aloud protocols (e.g., Song & Cho, 2021), have provided increasing evidence of translanguaging occurrences in literacy practices. For example, EFL students' ongoing reading processes were explored through think-aloud protocols to examine how bilingual learners' linguistic repertoires can be naturally activated to enhance meaning comprehension and construction (Kwon & Schallert, 2016; Song & Cho, 2021). Resulting think-aloud data revealed much evidence of the use of translanguaging strategies in the EFL reading processes, including the "cognitive and metacognitive strategies involved in locating, evaluating, and comprehending information and the sources in an online setting" (Song & Cho, 2021, p. 9). Such evidence of the functions of translanguaging during EFL reading processes empirically justified a claim that translanguaging is a self-regulated process entailing the use of cognitive and metacognitive strategies (Velasco & García, 2014).

Despite the use of think-aloud protocols in the examinations of translanguaging-embedded reading processes in recent years (e.g., Song & Cho, 2021), translanguaging instances underlying think-aloud writing activities remain under-researched. However, numerous empirical studies (e.g., Woodall, 2002) have provided the foundations for exploring roles of translanguaging in L2 writing processes.

First, L1 use or language switching in think-aloud L2 writing processes has been well examined in previous studies (e.g., Lei, 2016; Wang & Wen, 2002). These studies have provided two types of important evidence: (1) the purposes of L1 use or language switching are highly consistent with the main processes of cognitive writing models: planning, translating, monitoring, and reviewing (Flower & Hayes, 1981); (2) the use of different languages inevitably occurs and indeed may comprise a high percentage of L2 writing processes (e.g., Wang & Wen, 2002; Woodall, 2002). However, most studies on the use of L1 or language switching during L2 writing processes (e.g., Chang, 2020) tend to neglect writers' use of multimodal and multi-semiotic resources in L2 writing processes.

Second, an increasing number of studies (e.g., Jonsson & Blåsjö, 2020) revealed how semiotic aspects of translanguaging can be reflected in written discourses or writing processes. For example, through semi-structured interviews and text analysis, Zheng and Drybrough (2023) found that Chinese bilingual postgraduate students used mathematical symbols to speed up idea generation for their dissertation writing. However, the ongoing translanguaging-embedded verbalisations of writers' thoughts have been under-researched, and think-aloud protocols could be used to address such limitations.

The following methodology section will describe how the present study seeks to fill these research gaps.

3. Methodology

3.1. Participants and procedures of data collection

This study was conducted at a key university in southern China. The participants consisted of 53 first- and second-year adult undergraduates from different academic programmes. Before the data collection, they learned English for at least six years and passed the College English Test-Band 4 (CET-4). Informed consent for the data collection was obtained from each participant.

3.1.1. Assessment of the L2 proficiency

CET-4 scores were used in the present study for evaluating the participants' overall L2 proficiency levels. CET is a high-stakes English proficiency examination in Chinese mainland, which evaluates a test taker's overall English proficiency in listening, reading, translation, writing, and speaking (Bai, 2020). A test taker who receives a CET-4 score of above 550 can be regarded as a highly proficient English language learner (Xu & Liu, 2019). Therefore, the 53 participants were divided into 29 higher-level L2 students and 24 lower-level ones, according to their CET-4 scores. The higher-level L2 students ($M = 595.28$, $SD = 30.65$) significantly outperformed their lower-level counterparts ($M = 488.92$, $SD = 36.29$) in terms of CET-4 performance, $t\ (51) = 11.57$, $p < 0.05$, $d = 3.17$.

3.1.2. Collection of the translanguaging data

To provide data in response to the research questions, an online think-aloud L2 argumentative writing task was organised in the present study. Frequently applied in prior studies (e.g., Song & Cho, 2021) for exploring ongoing cognitive processes, thinking aloud is an approach in which "the subject keeps on talking, speaks out loud whatever thoughts come to mind, while performing the task at hand" (van Someren et al., 1994, p. 26).

Training sessions were arranged to familiarise the participants with the procedures of thinking aloud. Before they started writing, they were informed of the following stipulations, which were very similar to the procedures in many previous think-aloud studies (e.g., Hosseinpur & Kazemi, 2022): (a) they were allowed to verbalise whatever came into their minds in the languages that appeared during their writing process; (b) they were allowed to pause for at most five seconds; (c) they would be reminded to verbalise their thoughts if they paused for more than five seconds.

Upon completion of the training sessions, the participants were invited to complete a 40-min computer-based think-aloud English argumentative writing task in response to a writing prompt about comparing effectiveness of online learning and traditional classroom learning. This writing prompt was adapted from writing prompts in writing sections of existing high-stakes English exams, such as CET-4. Fifty-three online meeting rooms were set up for the participants. Each participant needed to write the English essay of at least 300 words under think-aloud conditions in an online meeting room independently. During the test-like writing task, the participants were not allowed to access external resources, such as websites, dictionaries, and mobile phones. Their computer screens were shared for allowing the principal investigator to invigilate their writing processes. Their verbalisations and online writing behaviours (e.g., typing) were video-recorded by a screen capture tool. Although they needed to type the essay on computers and email a soft copy of the essay to the principal investigator, they were allowed to draft either on paper or on computers. Therefore, many participants chose to type their drafts on computers, whereas some participants drafted on paper before typing their final essay on computers. Both computer- and paper-based drafts were emailed to the principal investigator upon completion of the writing task.

Immediately after the writing task, the participants who provided paper-based drafts were invited for attending an individual stimulated recall interview, which lasted for around five to ten minutes. Stimulated

recall is a retrospective approach that retrieves people's reflections on what happened before (Révész et al., 2017). In the present study, since the screen capture tool could not video-record the ongoing processes of drafting on paper, stimulated recall could elicit the participants' explanations for their paper-based drafts. During the stimulated recall interviews, the principal investigator used the screen recordings and the drafts as stimuli, and the interviewees watched the screen recordings and verbalised details about their drafts, such as when and why they jotted down specific semiotic symbols.

3.2. Data analysis procedures

3.2.1. Development of the coding scheme of translanguaging functions

The development of the coding scheme of translanguaging functions (See Appendix A) was both literature- and data-based. This coding scheme was developed to identify two major types of translanguaging functions: cognitive functions and metacognitive functions. Cognitive translanguaging functions emphasise the use of translanguaging for cognitive activities (e.g., reasoning), whilst metacognitive translanguaging functions entail the use of translanguaging for metacognitive practices (e.g., goal setting).

The translanguaging functions are divided into cognitive and metacognitive functions for two reasons. Firstly, translanguaging involves self-regulation (Velasco & García, 2014; Zheng & Drybrough, 2023). Cognitive and metacognitive practices are the key components of self-regulation (Bai, 2018; Schraw, 2010; Teng & Zhang, 2018; Winne, 2011, 2018; Winne & Azevedo, 2022). Secondly, L2 writers' use of cognitive and metacognitive strategies can be reflected in their writing processes (Bai, 2018), so translanguaging may be embedded in the use of these strategies.

During the pilot stage of the present study, a preliminary version of the coding scheme was developed with reference to three areas of previous literature: (1) cognitive and metacognitive strategies (e.g., Bai, 2018; Duffy et al., 2015); (2) functions of L1 use (e.g., Wang & Wen, 2002), language switching (e.g., Wang, 2003; Woodall, 2002), and translanguaging (e.g., Velasco & García, 2014); (3) process-oriented cognitive writing models (e.g., Flower & Hayes, 1981).

In the preliminary coding scheme, cognitive translanguaging functions consist of idea generation, repetition, and reasoning, whilst metacognitive translanguaging functions include goal setting, monitoring, and evaluation. This is because these functions were frequently proposed or identified as common cognitive and metacognitive strategies in many previous studies (e.g., Duffy et al., 2015; Ku & Ho, 2010). For example, according to Flower and Hayes (1981), idea generation, which refers to generating new ideas, is one of the sub-processes of planning. Idea generation is also one of the most frequently researched cognitive strategies in prior research into writing strategies (e.g., Hosseinpur & Kazemi, 2022), cognitive processes (e.g., Duffy et al., 2015), and bi-/multilingual behaviours (e.g., Wang & Wen, 2002).

Then, this preliminary coding scheme was applied to code the translanguaging functions within the data that were collected during the pilot phase of this study. During the coding processes, specific indicators of the cognitive and metacognitive translanguaging functions, which emerged from the data, were added to the coding scheme. For example, claims or self-enquiries about language-related unknown or known information, which were identified from the coding processes, are one of the specific indicators of monitoring.

As displayed in Appendix A, the finalised coding scheme of translanguaging functions includes six translanguaging functions: idea generation, repetition, reasoning, goal setting, monitoring, and evaluation. Each function can be identified through specific indicators.

Table 1
Results of Normality Tests.

Measure	Shapiro-Wilk		
	Statistic	*df*	*p*
Overall translanguaging	.79	53	.00**
Translanguaging for idea generation	.98	53	.399
Translanguaging for repetition	.93	53	.006**
Translanguaging for reasoning	.92	53	.002**
Translanguaging for goal setting	.98	53	.415
Translanguaging for monitoring	.96	53	.091
Translanguaging for evaluation	.96	53	.074

Note. Statistical significance: ** $p < 0.01$; * $p < 0.05$

3.2.2. Analyses of translanguaging functions

Based on the coding scheme of translanguaging functions, the principal investigator, along with a Chinese-speaking coder, segmented the units of analysis and coded translanguaging functions within the verbal protocols and the drafts. As a full-time doctoral student at an English-medium university, the invited coder was a student helper in this study. He was qualified for helping with the coding because of his high proficiency in English and native proficiency in Chinese.

Before the coding processes, online training in the form of instructional videos was provided for the invited coder to familiarise himself with the coding of translanguaging. These videos taught the coder the following information: (a) units of analysis; (b) identification of translanguaging units; (c) translanguaging functions. The invited coder was reminded that each translanguaging unit may involve at least one translanguaging function.

A unit of analysis was identified and segmented on the basis of a more or less complete idea (Crookes, 1990; Ku & Ho, 2010) as well as with consideration of syntactic structures (Foster et al., 2000). Moreover, the present study did not consider special conditions caused by disfluency (e.g., false starts, repetitions, self-corrections) as separate units in the think-aloud protocols (Foster et al., 2000).

The think-aloud protocols and the stimulated recall interview responses were transcribed verbatim into texts, with the invited coder checking the accuracy of 15 randomly selected transcribed texts. Next, the transcribed interview responses and the paper-based written drafts were analysed in combination with the computer screen recordings, so the information in the drafts (e.g., semiotic symbols) can be merged into the think-aloud protocols. Then, the transcribed protocols were segmented into different units of analysis, on the basis of a more or less complete idea (Crookes, 1990; Ku & Ho, 2010) as well as with consideration of syntactic structures (Foster et al., 2000).

To analyse the functions of the semiotic signs shown in the screen recordings, the coders watched the screen capture videos and listened to the participants' think-aloud verbalisations simultaneously. For example, the function of the semiotic sign "√" could be coded as evaluation, if this symbol was used for showing the participants' positive evaluation of their own ideas or performance.

To determine the functions of the semiotic signs shown in the paper-based drafts, the coders referred to the stimulated recall interview transcripts. For example, the function of the semiotic sign "①" could be coded as goal setting, if a participant explained during the stimulated recall that this symbol was used for denoting the first goal.

Last, the frequencies of translanguaging were calculated through the following procedures: (1) calculating the number of units of analysis in the protocols; (2) identifying the translanguaging units; (3) coding the translanguaging functions; (4) counting the number of the translanguaging units; (5) determining the frequencies of translanguaging by calculating the percentage of the translanguaging units through the

following formula: the number of translanguaging units divided by the total number of units of analysis; (6) determining the frequencies of each translanguaging function through the following formula: the number of translanguaging units that involved a particular translanguaging function divided by the total number of units of analysis.

To guarantee high-level intra-coder reliability, the principal investigator coded the translanguaging instances in all the protocols twice. The intra-coder reliability was measured through Intraclass Coefficient Correlations (ICCs). The level of intra-coder agreement was very strong: ICC = 0.99. To ensure high levels of inter-rater reliability in the coding of translanguaging instances, the invited coder checked 20 % of the transcribed protocols. The level of inter-coder agreement was also very strong: ICC = 0.99. All disagreements over the coding results were resolved through discussions.

3.2.3. Normality tests

Shapiro–Wilk tests were run to assess whether the translanguaging data were normally distributed. Table 1 displays the results of these tests. As shown in this table, the distributions of the following data were not normally distributed: overall translanguaging, W (53) = 0.79, $p < 0.01$, translanguaging for repetition, W (53) = 0.93, $p < 0.01$, and translanguaging for reasoning, W (53) = 0.92, $p < 0.01$. Therefore, Mann-Whitney U tests were performed to examine if there were differences in the overall translanguaging, translanguaging for repetition, and translanguaging for reasoning between the higher- and lower-level L2 students. Moreover, independent samples t tests were run to examine differences in other translanguaging data (e.g., mean frequencies of translanguaging for monitoring) between the participants of different L2 proficiency levels.

Table 2
Mean Frequencies of Translanguaging (By L2 Proficiency).

Measure	Higher L2 level (n = 29)		Lower L2 level (n = 24)	
	M	*SD*	*M*	*SD*
Overall translanguaging	74.34 %	0.26	88.45 %	0.20
Translanguaging for idea generation	37.10 %	0.21	40.72 %	0.12
Translanguaging for repetition	65.89 %	0.23	74.52 %	0.20
Translanguaging for reasoning	10.47 %	0.08	15.76 %	0.12
Translanguaging for goal setting	42.70 %	0.22	52.86 %	0.22
Translanguaging for monitoring	19.44 %	0.12	32.76 %	0.20
Translanguaging for evaluation	20.79 %	0.14	25.48 %	0.17

4. Findings and discussion

4.1. The frequencies of overall translanguaging and translanguaging functions

Table 2 reports descriptive statistics for the mean frequencies of translanguaging. It shows that, on average, the translanguaging units generated by the participants (Higher L2 level: M = 74.34 %, SD = 0.26; Lower L2 level: M = 88.45 %, SD = 0.20) made up at least 70 % of the units of analysis during the L2 writing processes. Such a large proportion indicated that L2 writers, in general, performed translanguaging very frequently when writing their L2 essays. This finding is inconsistent with previous research evidence that highly proficient L2 learners may seldom use translanguaging (Carstens, 2016; Wang, 2019). In the present study, translanguaging instances identified from think-aloud protocols, computer screen recordings, and written drafts encompassed various forms of multilingual, multimodal, and multi-semiotic practices. For example, even if some higher-level L2 students seldom perform cross-linguistic practices during their L2 writing processes, they may use multimodal means for jotting down potential ideas in their drafts. Therefore, translanguaging can occur frequently during L2 writing processes.

Fig. 1 showcases a written draft by Participant A. As displayed in this figure, this participant intended to outline four reasons why he/she disagreed with the writing prompt, following the written numerals "①","②","③", and "④". He/she verbalised this outline, noting down the numerals and reasons simultaneously. Therefore, translanguaging occurred in this written draft.

Fig. 2 further explains how semiotic resources were employed in Participant A' s translanguaging-embedded writing processes. Besides using a written numeral (i.e., ②), this participant employed two other written signs (i.e., →, ↑). The use of "→" meant "lead to," and the use of "↑" denoted "improvement". Therefore, instead of directly writing Chinese characters or English words, Participant A used written signs, which can help save time and note down ideas conveniently.

As shown in Table 2, reasoning (Higher L2 level: M = 10.47 %, SD = 0.08; Lower L2 level: M = 15.76 %, SD = 0.12) was the least frequently performed translanguaging function, while repetition (Higher L2 level: M = 65.89 %, SD = 0.23; Lower L2 level: M = 74.52 %, SD = 0.20) was the most frequently performed translanguaging function.

The finding that translanguaging was mostly performed for repetition is similar to existing evidence about the high proportions of translating, summarising, and paraphrasing in the use of translanguaging strategies (Song & Cho, 2021). There are two possible reasons for this finding. First, translanguaging for repetition may have allowed the writers more time to evaluate whether what had been previously

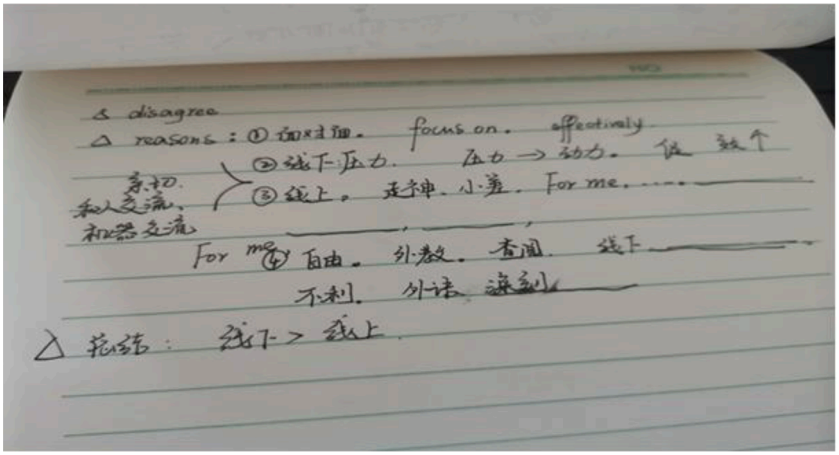

Fig. 1. Written draft of Participant A.

第二点是{②}，我认为，线下的学习，线下，线下的学习，它是，可以有，压力方面，有了压力，才会有 {→} 动力，可以让老师的压力转化为动力，更有效地促进，学习效率的提高{↑}.

The second reason is[1] {②}[2], ***I think, offline learning, offline, offline learning, it is, it can involve, pressure, involving pressure, can lead to*** {→} ***motivation, can convert teacher-generated pressure to motivation, more effectively stimulate, learning efficiency improvement*** {↑}.

Fig. 2. Translanguaging practices of Participant A.
[1]***Bold italics in English***: Utterances translated from Chinese to English;
[2]{}: Written texts or written signs.

mentioned or generated was appropriate and then to plan their next steps. Second, translanguaging for repetition may have helped the participants write their argumentative essay with less anxiety. Due to heavy cognitive loads involved in argumentative writing processes (Shehab & Nussbaum, 2015), it would have been difficult for the participants to generate new content-related ideas all the time or do deeper-level processing of information throughout the writing processes. By reducing their cognitive loads, translanguaging for repetition may have allowed the participants "to clarify meanings, access deeper meanings, and strengthen their understanding" (Song & Cho, 2021, p. 587).

Table 2 reveals that goal setting (Higher L2 level: $M = 42.70$ %, $SD = 0.22$; Lower L2 level: $M = 52.86$ %, $SD = 0.22$) and idea generation (Higher L2 level: $M = 37.10$ %, $SD = 0.21$; Lower L2 level: $M = 40.72$ %, $SD = 0.12$) were ranked second and third respectively among the translanguaging functions in terms of mean frequencies. Table 2 further displays that, on average, translanguaging for monitoring (Higher L2 level: $M = 19.44$ %, $SD = 0.12$; Lower L2 level: $M = 32.76$ %, $SD = 0.20$) and for evaluation (Higher L2 level: $M = 20.79$ %, $SD = 0.14$; Lower L2 level: $M = 25.48$ %, $SD = 0.17$) made up less than 40 % of the units of analysis.

The findings above indicate that the L2 writers translanguaged more often for lower-order (meta)cognitive functions (i.e., repetition, idea generation, goal setting) than for higher-order ones (i.e., monitoring, evaluation, reasoning) (See Duffy et al., 2015 for the classification). The first possible reason for this finding is that the participants may have developed a belief that essay length contributes greatly to essay scores (Barkaoui, 2016; Porte, 1996) due to long-term washback effects of high-stakes English language examinations (Li & Huang, 2022). For instance, failure to meet the minimum word count in the CET-4 writing section will result in deduction of marks (Li & Huang, 2022). Since the participants in this study had passed the CET-4 before the data collection, they may have kept in mind that they need to fulfil the essay length requirement of the writing task. In this sense, under time pressure, they may have prioritised meeting the essay length requirement by devoting more attention to planning what to do next, generating new content, and translating newly generated ideas to L2 texts than to monitoring, evaluation, and reasoning. These higher- and lower-order (meta)cognitive activities were performed mostly through translanguaging, according to the statistical finding that translanguaging made up large proportions of the L2 writing processes (Higher L2 level: $M = 74.34$ %; Lower L2 level: $M = 88.45$ %). Take Participant B as an example. In Fig. 3, Unit 05, which involves translanguaging for goal setting, repetition, and idea generation, shows that Participant B hoped to generate the third reason for supporting his/her position. However, the third reason does not involve in-depth logical reasoning, because this participant worried that thinking deeply about the third reason may prevent him/her from meeting the essay length requirement within time limits. As shown in Units 06 and 07 that entail translanguaging for monitoring, idea generation, and repetition, he/she abandoned generating ideas for the third reason and began writing the main text. Therefore, an awareness of meeting the word count requirement made Participant B perform translanguaging less frequently for higher-order (meta)cognitive functions.

The second possible reason for why the L2 writers translanguaged less often for higher-order (meta)cognitive functions than for lower-order ones is that fewer working memories and less attention are required for lower-order (meta)cognitive processes, whereas more cognitive demands are involved in higher-order processes (Duffy et al., 2015). Hence, individuals may perform lower-order (meta)cognitive activities more easily and/or more frequently than higher-order ones (Duffy et al., 2015). Consequently, the L2 writing processes may be mainly comprised of setting goals, generating ideas, and translating content (Guo & Huang, 2020). For example, Participant C produced 18 units of analysis during his/her L2 writing process. Thirteen units entailed setting goals; nine units involved generating new ideas; fourteen units involved translating content; five units entailed monitoring; one unit involved evaluation. All these units were generated with the help of translanguaging. Since exclusive use of an L2 can pose significant linguistic and cognitive challenges for L2 students (Bruen & Kelly, 2017; Colina & Mayo, 2009), they may rely heavily on translanguaging that can provide cognitive and linguistic scaffolds during the processes of setting goals, generating ideas, and translating content.

05[1]**:** {3}第三个就是，在，教室里的话，在教室的话，在家的话，在教室的话就可能，线上的教学，好像也没有什么啊，传统的教学，一个是，传统教学，现在线上的已经，还挺多的，线上教学

{3} ***The third one is, in, classrooms, in classrooms, at home, in classrooms possibly, online teaching, seemingly involves nothing, traditional teaching, one is, traditional teaching, now online has been, many, online teaching***

06: 哎我现在开始写吧，写不满了都，哎呀

Eh I need to start writing now, I may not meet the essay length requirement, eh

07: 随着，互联网的发展, with the (3)[1] development…

With, internet development, with the (3) development…

Fig. 3. Translanguaging practices of Participant B.
[1]**Number:** Sequence of a unit of analysis;
[1](Numerical digit): The number of seconds of a pause that lasts for at least 2 seconds.

The finding that reasoning was the least frequently performed translanguaging function may be because many high-stakes L2 writing tasks, which normally evaluate test takers' linguistic skills (Zhao & Huang, 2020; Zou et al., 2024), do not explicitly encourage L2 writers to demonstrate much higher-order thinking (e.g., reasoning) in their writing. For example, the criteria for the CET-4 writing assessment consist of language appropriateness, discourse coherence and cohesion, as well as idea development (Zhao & Huang, 2020). Therefore, the participants, who may have been heavily influenced by the CET-4 writing criteria, may pay little attention to reasoning. In this sense, the units of analysis generated from the L2 writing processes may not involve much reasoning, thus reducing the possibility of translanguaging for reasoning.

4.2. The differences between the higher- and lower-level L2 students in frequencies of overall translanguaging and translanguaging functions

Table 3 displays that the higher-level L2 students (Mdn = 88.46 %) performed translanguaging significantly less often than did their lower-level counterparts (Mdn = 100 %) (U = 210, Z = -2.53, $p < 0.05$, r = 0.35). However, no significant differences were shown between the higher-level L2 students and the lower-level ones in the frequencies of translanguaging for repetition (U = 270, Z = –1.39, p = 0.16, r = 0.19) and for reasoning (U = 255, Z = –1.66, p = 0.10, r = 0.23).

The finding that the lower-level L2 students performed translanguaging significantly more often than did their higher-level counterparts echoes prior evidence (e.g., Wang & Wen, 2002) that low-achieving L2 students showed more tendencies to use L1, language switching, or other types of translanguaging during their L2 writing processes than did high-achieving L2 students. Proficient L2 students tend to use less translanguaging for two main reasons: (1) they may want to avoid the interference of their L1 or other non-L2 languages (e.g., Wang, 2019); (2) they may be equipped with sufficient L2 knowledge that allows them to rely less on non-L2 linguistic resources (Liao, 2006).

Table 4 reveals that the higher-level L2 students performed translanguaging for monitoring significantly less often than did the lower-level L2 students, t (36.27) = –2.86, $p < 0.01$, d = 0.80, 95 % CI [–0.23, –0.04]. No significant differences existed among the participants of varied L2 proficiency in the mean frequencies of translanguaging for idea generation, t (45.90) = –0.78, $p > 0.05$, d = 0.21, 95 % CI [–0.13, 0.06], for goal setting, t (51) = –1.69, $p > 0.05$, d = 0.47, 95 % CI [–0.22, 0.02], and for evaluation, t (51) = –1.13, $p > 0.05$, d = 0.31, 95 % CI [–0.13, 0.04].

Table 5 shows that the low proficiency L2 students performed translanguaging for monitoring language-related issues significantly more frequently than did their high proficiency counterparts, U = 232.5, Z = –2.08, p = 0.04, r = 0.29. In the present study, monitoring-

Table 3
Results of Mann-Whitney U Tests (By L2 Proficiency).

Measure	Higher L2 level (n = 29)	Lower L2 level (n = 24)	Mann-Whitney U tests			
	Mdn	*Mdn*	*U*	*Z*	*p*	*r*
Overall translanguaging	88.46 %	100 %	210	–2.53	.01*	0.35
Translanguaging for repetition	68.42 %	78.97 %	270	–1.39	.16	0.19
Translanguaging for reasoning	10.53 %	15 %	255	–1.66	.10	0.23

Note. Statistical significance: ** $p < 0.01$; * $p < 0.05$

Table 4
Results of Independent Samples T-Tests (By L2 Proficiency).

Measure	Independent samples *t*-tests				
	t	*df*	*p*	*d*	*95 % CI*
Translanguaging for idea generation	–0.78	45.90	0.44	0.21	[–0.13, 0.06]
Translanguaging for goal setting	–1.69	51	0.10	0.47	[–0.22, 0.02]
Translanguaging for monitoring	–2.86	36.27	0.004**	0.80	[–0.23, –0.04]
Translanguaging for evaluation	–1.13	51	0.27	0.31	[–0.13, 0.04]

Note. Statistical significance: ** $p < 0.01$; * $p < 0.05$

embedded translanguaging instances for language-related issues are mostly about unfamiliarity with specific words/vocabulary.

Fig. 4 shows how Participant D, a low-achieving L2 student, translanguaged for monitoring language-related issues for two reasons: (1) He/she wanted to come up with alternatives to "so"; (2) he/she acknowledged the difficulty in spelling the word "waste". Such translanguaging instances were frequently shown in many low-achieving L2 students' writing processes, probably because their limited L2 linguistic knowledge reduced their vocabulary sizes for L2 writing.

Table 5 also reveals that the high-achieving L2 students translanguaged for monitoring task progress significantly less often than did their low-achieving counterparts, $U = 236, Z = -2.02, p = 0.04, r = 0.28$. Most of the instances of translanguaging for monitoring task progress were related to self-enquiries or claims about how many words had been written.

In sum, translanguaging for monitoring occurred significantly less

Table 5
Results of Mann-Whitney U Tests (By L2 proficiency).

Measure	Higher L2 level (n = 29)		Lower L2 level (n = 24)		Mann-Whitney U tests			
	M	*Mdn*	*M*	*Mdn*	*U*	*Z*	*p*	*r*
Translanguaging for monitoring (language-related)	8.12 %	8.33 %	15.43 %	16.96 %	232.5	–2.08	.04*	0.29
Translanguaging for monitoring (organisation-related)	0.27 %	0	1.60 %	0	285	–1.81	.07	0.25
Translanguaging for monitoring (content-related)	8.61 %	5.26 %	10.82 %	8.20 %	304	–0.79	.43	0.11
Translanguaging for monitoring (task progress)	5.47 %	4.76 %	12.69 %	7.55 %	236	–2.02	.04*	0.28
Translanguaging for monitoring (task comprehension)	0.43 %	0	0.96 %	0	316	–1.04	.30	0.14

Note. Statistical significance: ** $p < 0.01$; * $p < 0.05$

…so (2) 所以 (2) "所以", 还有什么别的讲法? therefore, 对, {therefore} (3) {they} (2) waste (2) "waste"怎么拼? 忘了…

…so (2) ***so*** (2) "***so***", ***are there any alternatives to it***? therefore, ***correct,*** {therefore} (3) {they} (2) waste (2) "waste" ***how to spell***? ***I forget it***…

Fig. 4. Translanguaging for monitoring language-related issues by Participant D.

often during the writing processes of the higher-level L2 students than during those of the lower-level L2 students. Specifically, the low-achieving L2 students performed translanguaging for monitoring language-related issues and task progress more frequently than did their high-achieving counterparts. Such findings may be due to the limited L2 proficiency levels of low-level L2 students. For one thing, the low-level L2 students' limited vocabulary size may make them feel it difficult to achieve linguistic accuracy in their L2 writing, so they were more likely to translanguage to verbalise their unfamiliarity with certain words/phrases during their writing processes than their higher-level counterparts. For another thing, the low-level L2 students' lack of L2 linguistic knowledge may make them struggle with finishing the L2 writing in time, so they showed more tendencies to translanguage for monitoring task progress during their writing processes.

5. Conclusion

5.1. Contributions of the study

As one of the few studies that explored cognitively mediational roles of translanguaging in writing processes, the present study examined how often and for what functions students of varied L2 proficiency levels performed translanguaging during their L2 writing processes. By analysing translanguaging occurrences in think-aloud protocols, computer screen recordings, stimulated recall, and written drafts, this methodologically innovative study provides the updated evidence that translanguaging as a multilingual, multimodal, and multi-semiotic practice occurs for various cognitive and metacogntive functions during L2 writing processes and contributes to the literature about potential influences of L2 proficiency on the frequencies of overall translanguaging and translanguaging functions.

5.2. Key findings and implications

This study revealed high mean frequencies of translanguaging in L2 writing processes and reflected significantly higher frequencies of both overall translanguaging and translanguaging for monitoring in low-achieving L2 students' writing processes than in high-achieving ones' writing processes. Such findings can challenge current monolingualism-oriented policies in L2 education (Cenoz & Gorter, 2020; Liu & Fang, 2020), motivating L2 educational practitioners to make full use of their students' linguistic and semiotic repertoires during L2 educational practices. For example, teacher–student writing conferences, which refer to "a private conversation between teacher and student about the student's writing or writing processes" (Sperling, 1991, p. 132), can be arranged for L2 learners, during which they are allowed to verbalise whatever comes into their minds and note down any possible ideas through translanguaging. If the writers feel it challenging to translate translanguaging-embedded ideas to L2 written discourses, teachers can offer help in overcoming the students' linguistic difficulties. Potential writing problems (e.g., irrelevant topic sentences) reflected in the translanguaging-embedded verbal protocols or written drafts can be carefully checked and corrected by instructors. Moreover, writing instructors can consider identifying low-achieving L2 students' challenges of L2 writing through analysing these students' translanguaging-embedded monitoring instances of L2 writing processes, since occurrences of monitoring can reflect their task progress and difficulties in writing (e.g., Bai et al., 2014).

The study found that, in general, translanguaging was performed more often for lower-order (meta)cognitive functions (i.e., repetition, idea generation, and goal setting) than for higher-order ones (i.e., reasoning, monitoring, and evaluation). Considering existing research findings (e.g., Bai, 2018) that high frequencies of monitoring and evaluation are more linked with satisfactory writing performance, relevant training can be provided for students to develop their awareness of translanguaging for such higher-order (meta)cognitive activities.

5.3. Limitations and directions for future research

This study involves only one language-related independent variable (i.e., L2 proficiency). Considering strong connections between L1 and L2 writing skills (Pae, 2019), future research could explore potential effects of L1 writing proficiency on how frequently and for what functions translanguaging occurs in L2 writing processes and compare differences between the L1 writing processes and L2 writing processes in the frequencies and functions of translanguaging.

Furthermore, due to ethical considerations, the participants' facial expressions, gestures, and other body movements were not video-recorded in the present study. Given that translanguaging entails various multimodal resources (Lin, 2019), future studies could explore paralinguistic aspects of translanguaging in L2 writing processes.

Although the study has reported frequencies of different translanguaging functions, it did not examine which translanguaging functions could positively contribute to L2 writing scores in the long run. In future studies, researchers could consider developing translanguaging-embedded L2 writing instruction to explore which translanguaging functions could significantly improve students' L2 writing competence.

CRediT authorship contribution statement

Sheng Tan: Writing – original draft, Validation, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

None

Data availability

The data that has been used is confidential.

Appendix A. Coding Scheme of Translanguaging Functions (Examples from Participants)

Types of translanguaging functions	Translanguaging functions	Specific indicators and examples
Cognitive function	Idea generation	**1.** Generating content-related new ideas or triggering content-related new ideas through self-enquiries **Example:** 首先{1}[1], 线, traditional classes, 有不可取代的优势, 不可取代的优势就是, 可以, 实时面对面交流, 这样会给, 学生更多的压迫感, 学习的压迫感. ***Firstly***[2] {1}, ***line***, traditional classes, ***have irreplaceable advantages***, ***irreplaceable advantages are***, ***can, real-time face-to-face communications, this can give, students more sense of pressure, learning pressure***.
Cognitive function	Repetition	**1.** Repeating already mentioned content verbatim **Example:** 列了哪个? 哪个? ***List what? What?*** **2.** Paraphrasing/summarising already mentioned content **Example:** Since the, tech, tech, online, techniques, are just, 正在发展, 刚刚起步…我就说大概就是刚兴起… Since the, tech, tech, online, techniques, are just, ***are developing, just started…I will say probably they just emerged***… **3.** Translating what has been mentioned from one language to another language **Example:** …资料 (3)[3] 想不下去, all kinds of learning sources…

[1] { }: Written texts or written signs;
[2] ***Bold italics in English***: Utterances translated from Chinese to English;
[3] (Numerical digit): The number of seconds of a pause that lasts for at least 2 seconds

(*continued on next page*)

(*continued*)

		…***sources*** (3) ***I have no other ideas***, all kinds of learning sources… **4.** Converting what has been mentioned from one semiotic way to another semiotic way **Example:** 首先，这个论点，I agree, online, 大于，{>}, tradition. ***First, this claim***, I agree, online, ***more than***, {>}, tradition.
Cognitive function	Reasoning	**1.** Making inferences or drawing conclusions based on existing information or knowledge **Example:** {1}首先，学生，在学校里面会，{far away from home}，那他们离家远，他们就难受啊{sickness}，他们，心情就不好{in blue}，所以就会，影响他们的学习{affect their study}… {1} ***Firstly, students, on campus will be***, {far away from home}, ***they are far away from home, they would feel disgusted*** {sickness}, ***they, feel bad*** {in blue}, ***so this will, affect their study*** {affect their study}…
Metacognitive function	Goal setting	**1.** Forming an action plan or doing self-enquiries about subsequent steps **Example:** 先写一下三点原因，等一下，三点原因. ***First write down three reasons, wait, three reasons.***
Metacognitive function	Monitoring	**1.** Claims or self-enquiries about language-related unknown or known information **Example:** …眼神交流，教师，与学生的，交流吧，眼神交流，不会说，交流. ***…eye contact, teachers, with students, contact, eye contact, unable to spell, contact.*** **2.** Claims or self-enquiries about organisation-related unknown or

(*continued on next page*)

(*continued*)

		known information **Example:** ...第一段提的是面对面方面的，在线下的，想一下该怎么组织. …***The first paragraph discusses face to face teaching, off-line teaching, so let me think about how to organise this paragraph.*** **3.** Claims or self-enquiries about content-related unknown or known information **Example:** …I (2) {t, h, i, n, k,} I think (3) the (3) the, on, line, 能说啥？em, online, education. …I (2) {t, h, i, n, k,} I think (3) the (3) the, on, line, ***how can I discuss it?*** em, online, education. **4.** Comments on or self-enquiries about task progress **Example:** 第一点，就是，应该有 headline 吧，那就，headline，还没想好. ***The first point, is, should involve*** headline ***hah***, ***so***, headline, ***I have not come up with it yet***. **5.** Claims or self-enquiries about task comprehension **Example:** …这好难啊… …***This task is very difficult***…
Metacognitive function	Evaluation	**1.** Positive, negative, or interrogative evaluations of the writer's ideas or outputs **Example:** 三是{3}，课堂氛围，课堂氛围，不浓，em, em, em，教学效果，效果，不一定. ***The third is*** {3}, ***classroom atmosphere***, ***classroom atmosphere***, ***not intense***, em, em, em, teaching effectiveness, effectiveness, ***maybe not***.

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