A think-aloud method of investigating translanguaging strategies in learning Chinese characters

Abstract

Asian scripts that are significantly different from Roman-derived alphabets usually impose difficulties in learning. Translanguaging has therefore been explored as a pedagogical tool for the language classroom, including Chinese. While learning Chinese characters is thought to be one of the main challenges for students learning Chinese as a foreign language (CFL), there seems to be a paucity of up-to-date research into the strategies that adult students use to learn this logographic script. Situated in the translanguaging framework, this study employs the think-aloud method to investigate strategies utilised by a group of CFL beginner adult learners when learning characters. Drawing on the results of five think-aloud exercises with CFL learners over five weeks, as well as follow-up tests of their long-term memory of Chinese characters, this study shows that a variety of translanguaging strategies were utilised during the process of learning Chinese characters, and that overall three types of translanguaging strategies were observed: a) embodiment, b) translanguaging resemblance, and c) hybrid. The proposed typology of translanguaging strategies contributes to the further application of translanguaging as a methodology. It also sheds light on future learning strategy research across different linguistic systems.

Keywords

Translanguaging, trans-semiotising, learning strategies, Chinese character

1. Introduction

The pictographic origin and logographic features of Chinese script make it significantly different to European alphabetic languages and consequently pose a challenge to CFL (Chinese as a

foreign language) learners. There have been different proposals to tackle the difficulties of learning Chinese characters, ranging from single- or dual-track curriculum design (Kubler 2020) to synchronised or delayed character introduction (Knell and West 2017; Ye 2013). However, there seems to be a paucity of up-to-date research in strategies for learning Chinese characters (Grenfell and Harris 2015).

According to Jiang and Cohen (2012), only a handful of studies are primarily concerned with character learning strategies. Only 11 studies published outside China between 2005 and 2019 focus on learning strategies of Chinese as a second language, despite "a greater need to overcome challenges L2 learners face in alphabetic-language speaking environments" (Li 2020: 53). In addition, most CFL strategy research relies on the theories of SLA (Second Language Acquisition; Jiang and Cohen 2012). It is rare to see the examination of Chinese character learning strategies in a globalised, digital and multilingual context, especially using the translanguaging theory.

Situated in the translanguaging framework, this study aims to investigate the strategies employed by CFL beginner learners when learning Chinese characters. The paper first reviews literature on the translanguaging theory and translanguaging studies in CFL, followed by a discussion of its use in this study and a working definition for the translanguaging strategies. It then outlines previous language learning strategy (hereafter LS) research into Chinese character learning, highlighting the findings and the need for further research. With the employment of the think-aloud method, the study presents the findings of translanguaging strategies identified from five think-aloud activities, followed by an in-depth discussion of the proposal for a new typology of these strategies.

2. Translanguaging, trans-semiotising in Chinese teaching
Since the first use of the term 'translanguaging' in Welsh bilingual schools, the concept has been developed from a pedagogical practice – such as an integrated bi/multilingual process in language learning – to a mechanism for meaning making and understanding mediation. The translanguaging theory essentially moves away from the structuralist paradigm towards integrational linguistics (Canagarajah 2018; Pennycook 2017; Pennycook 2016). Instead of treating language as a separate, closed structure, it takes a holistic perspective to conceptualise the fluidity, hybridity and dynamics of multilingual practice (Zheng 2021b).

2.1 Translanguaging and trans-semiotising

Importantly, translanguaging considers human interaction as an organic whole in an ecological way (Canagarajah 2018; Lau 2020; Li 2018; Zheng 2021a), putting the speaker rather than the linguistic system in the spotlight (Blackledge and Creese 2017). As Canagarajah (2018: 7) suggests, the heterogeneity of communication can be found in "an assemblage of semiotic resources, artefacts, and environmental affordances in specific settings to facilitate communicative success". Therefore, taking the speaker or language user as a starting point allows us to see the equal importance of various semiotics in communication, such as the text and context – the former being the primary or sometimes only research focus (Canagarajah 2018).

Garcia and Li (2014: 22) maintain that a key feature of translanguaging is the linguistic repertoire that a person draws from in communicative practices that are already inter-related, discursive and "cannot be easily assigned to one or another traditional definition of a language". Indeed, multimodality is central to all human interactions (Kusters et al. 2017). Meaning making can be achieved through signs in any form or mode – visual, verbal or tactile; olfactory or gustatory (Lu 2020). Translanguaging views the co-construction and coordination of semiotic resources in different modes as a fluid, dynamic flow of meaning making (Lin 2019). Especially in multilingual communication, various kinds of linguistic signs are usually employed according to specific contexts, interlocutors or purposes (Li 2018). Translanguaging therefore embraces multimodality, as "successful multilingual interactions have always been aided by multimodalities – gestures, objects, visual cues, touch, tone, sounds and other modes of communication besides words" (Garcia and Li 2014: 28).

The overlap between translanguaging and multimodality was already pointed out in Halliday's talk (Lin 2015), which emphasised the intertwinement of different semiotic resources in human communicative acts. In this sense, monolingual speakers can also practise translanguaging through dynamic, continuous shifting and moving between a variety of linguistic (styles, registers, social languages) and non-linguistic (gestures, sound, imagery) signs in meaning making, despite having a smaller semiotic repertoire than that of multilinguals (Lin 2019). Therefore, translanguaging refers to "a trans-semiotic system" that can activate a person's semiotic repertoire, which primarily consists of linguistic signs as well as other modes of

meaning-making signs (Garcia and Li 2014: 42). Lin (2015; 2019) advances the translanguaging theory by highlighting its 'trans-semiotising' aspect, in order to capture the use of multiple kinds of semiotics.

2.2 Translanguaging research in CFL

A few pioneers have explored CFL classroom practice based on the translanguaging theory. Two studies (Wang 2016; Zhang et al. 2020) note the recent diversification of student profiles in CFL university classrooms in China, and with this more frequent instances of translanguaging among instructors and students. Despite the prevailing and long-supported monolingual approach, Wang (2016) observes the benefits of translanguaging in the CFL university classroom in terms of scaffolding learning and creating a strong rapport between instructors and students in enhancing their communication.

Despite instructors feeling a sense of guilt in steering away from the monolingual approach, pedagogical translanguaging has been used by instructors to introduce or explain a new item and for general classroom management (Zhang et al. 2020). Spontaneous translanguaging has been found to occur when instructors communicate with their students informally, and more often among students themselves (Zhang et al. 2020).

Moving to elementary Chinese immersion classrooms in the United States, Zheng (2021a) reports on an ethnographic study whereby translanguaging practices are actively encouraged. She finds that students benefit from planned instances of translanguaging, both in gaining a better understanding of the content and in general communication instances, supporting previous findings. She therefore advocates for strategic planning of translanguaging resources.

While previous studies report on the nature of various translanguaging practices in the CFL classroom, their primary focus is classroom interaction. There has not been any research into translanguaging practice in relation to LS development. Indeed, globalisation and the advancement of technology have significantly increased the average person's physical and virtual mobility. The consequence has been a large expansion of our semiotic repertoire, ranging between different languages and modalities (Li and Ho 2018). The linguistic landscape in the process of language learning is no longer static or monolingual (Lin 2019).

Even learning practice has become distributed and extended in the electronic world (Lu 2020). Learners' creative and critical use of – and mobilisation between – funds of multilingual

and multimodal knowledge indicate the transformative capacity of translanguaging in language learning (Li and Ho 2018). Therefore, an examination of translanguaging strategies in learning Chinese characters will allow us to examine the transformative capacity of translanguaging in language learning.

2.3 Translanguaging in this study

Discussion of translanguaging is flourishing, but it is not without its critics. An important criticism is that there is nothing new about it (Pennycook 2016; Singleton and Flynn 2021). For example, Pennycook (2016) points out a dilemma: while translanguaging emphasises fluidity and hybridity, the crossing of boundaries of language, these concepts by their nature are an acknowledgment of the boundaries of entities, potentially reinforcing the notion of separable languages. Rather than engage in criticism of translanguaging as 'old wine in new bottles', this section will investigate the appropriateness of using translanguaging in this study. It is also a response to the call of integrational linguistics (Pennycook 2016) and transnational literacies (Hornberger and Link 2012) for empirical work amidst the mushrooming of translanguaging discussion.

The 'languaging' embedded in the translanguaging theory refers to "the process of using language to gain knowledge, to make sense, to articulate one's thought and to communicate about using language" (Li and Zhu 2013: 519). It shifts away from the segregation of different linguistic systems or codes towards agentive participation in the communication process (Blackledge and Creese 2017). Even the first use of the term 'translanguaging' in a Welsh classroom depicted language alternation in the learning process. Therefore, the origin and the development of the translanguaging theory highlight its primary focus on learning *process*.

Indeed, the core of multilingualism or multimodality seems to be the emphasis on the *poly-* aspect of languages – namely, the existence of multiple linguistic systems or modes of signs. In contrast, translanguaging usually gives prominence to the process and puts the ongoing feature of multilingual practices in the foreground. The emphasis on *process* is in line with the conceptualisation of semiotic assemblages (Canagarajah 2018). As Pennycook (2017: 277) points out, the notion of assemblages "addresses the need to combine qualities of both stasis and change together in any understanding of the properties of a thing". Translanguaging is a useful

tool for LS research, as it concentrates on the language learning process rather than the static entity of languages.

While attention has been paid to 'languaging', the prefix 'trans' seems to be less discussed (Pennycook 2017). Li and Zhu (2013) outline three aspects: a) trans-system/structure/space, indicating the integration of different linguistic systems and structures; b) transforming existing structures and practices to create new ones; c) taking a transdisciplinary perspective to holistically examine multilingual practices (see also Pennycook 2017).

The first interpretation of 'trans' suggests being in-between and going beyond different modalities – namely trans-semiotising (Lin 2019), the main focus of this study. This use of trans-semiotising is indeed not new, since social semiotics theory and multiliteracies also challenge the segregational view of language (Lau 2020). Nonetheless, Chinese is considered to be dual modal, because learners need to transcend the dual modal processing of a new character – namely, grapheme-phoneme and grapheme-morpheme mappings in parallel – in order to be able to pronounce, recognise and use it (Lu 2020). In addition, Chinese characters originated in "drawing shapes and images of real-life and abstract objects" (Liu 2021: 34). It is a common practice for CFL beginner learners to compare characters to related drawings.

This dual-modal nature and pictographic origin connects Chinese script learning with the appreciation of visual images, the latter encompassing both the private and personal – such as pleasures or emotions – and one's social and political values and concerns (Lau 2020). Therefore, it is reasonable to assume that CFL beginners also integrate resources from this multimodal, multi-semiotic "personal, social, cultural matrix" (Lau 2020: 45) to develop their learning strategies. While the review here suggests the contribution of the first interpretation of 'trans' to the development of translanguaging strategies, the second and third meanings of 'trans' can be revealed from the translanguaging strategies identified in the later findings.

Situated in the translanguaging framework, this study scrutinises the translanguaging strategies in self-directed learning of Chinese characters when drawing on all available semiotic resources in learners' knowledge funds. A working definition for translanguaging strategies refers to those that demonstrate trans-semiotising features in the learning process of memorising the meaning and composition of Chinese characters. Through five think-aloud practices and follow-up quizzes, this study examines how CFL learners draw on knowledge from their multilingual repertoire to strategically learn Chinese characters.

3. Chinese character learning strategies

The need for LS in learning Chinese characters derives from the distinctive features of Chinese script which can be challenging for learners with a non-logographic L1 orthography background. Due to the lack of fixed and transparent grapheme-phoneme mapping in Chinese script, literacy in Chinese usually takes the route of grapheme-visualisation-meaning, with sound barely involved (Lu 2020). In order to learn all three aspects of a new character – shape, sound and meaning – CFL learners need to go through grapheme-phoneme and grapheme-morpheme mappings in parallel. This study, rather than examining the dual grapheme-phoneme and grapheme-morpheme mappings, emphasises the establishment of grapheme-morpheme correspondence. In this way, the LS employed for learning such a complex script can be scrutinised in a focused and manageable manner.

Shen was one of the first to examine LS for learning Chinese characters, and her questionnaire – developed into the Character LS Inventory – has since been repeatedly used in later studies. Shen (2005) scrutinises the LS adopted by 95 CFL learners from beginner through to advanced levels. Eight strategy patterns are extracted, using factor analysis to group learning strategies with underlying connections. Factors 1 and 2 – orthographic-knowledge-based strategies and metacognitive strategies – are found to be more useful as learning levels advance (Shen 2005). Factor 1 is related to the use of orthographic knowledge, such as the sound, shape and meaning of radicals, as a cue to encode characters (Shen 2013). Shen and Ke (2007) indicate that excellent radical knowledge can contribute to applying this knowledge to learning new characters – namely, forming metacognitive strategies.

Factor 2 identified in Shen's study mainly refers to "previewing new characters before class and reviewing newly learned characters in a timely and frequent manner after class" (Shen 2005: 57). The study of Sung and Wu (2011), which employed the same questionnaire as Shen (2005), finds that similar mechanical techniques were used more often by female heritage learners, with male heritage learners more likely to use strategies of paying attention to the characters (Sung and Wu 2011).

Six types of strategy were identified and again further grouped according to Oxford's taxonomy of LS (1990; see Table 1). Despite being named differently, the findings of Sung and Wu (2011) are broadly consistent with those of Shen (2005; see also Shen 2013). An important

implication of these two studies is that the application of orthographic knowledge in the encoding of Chinese characters is very likely to be a translanguaging and trans-semiotising process, e.g., from the visual mode of a radical to the aural mode.

Table 1. LS identified in the study of Sung and Wu (2011) against Oxford's LS typology

Oxford (1990) LS typology	Sung and Wu (2011) LS	Details
Cognitive strategies	Practising naturalistically	Using the target language in an authentic way for listening, speaking, reading and writing.
Memory strategies	Associating	Associating new information with familiar concepts already in memory.
	Using mechanical technique	Using flashcards to preview, practise and review characters.
	Grouping	Classifying characters into different groups according to their meaning, sound, shape and whether or not they were newly learned.
Metacognitive strategies	Paying attention to the characters	Paying attention to specific aspects of characters, such as stroke order, shape and pronunciation.
	Paying attention to the pronunciation	

Building upon Shen's (2005) questionnaire, Wang, Jinghui, Spencer and Xing (2009) further examine the correlation between metacognitive beliefs and strategies and CFL learners' language achievement, with metacognitive strategies found to play an important role in achievement results. Indeed, metacognitive strategies encourage learners to reflect on the learning process and consequently plan, select and evaluate their strategies in order to further manage and guide their learning (Wang, Spencer and Xing 2009). They also offer opportunities to enhance learner autonomy, which is essential to successful language learning (O'Malley and Chamot 1990;

Oxford 1990). The importance of constant reflection and autonomy enhancement in language learning is a valuable insight into the choice of the think-aloud method in this study, as shown in the next section.

The study of Kan et al. (2018) analyses the changing LS when character learning is assisted by mobile technology and dominated by typing. However, the sample size – between 2 and 13 in different tasks – is rather small, which restricts the generalisation of its findings. Importantly, the survey is still based on findings from previous literature, which leads to an issue of leaving out previously undetected LS later identified from qualitative data (Kan, Owen and Bax 2018). Besides, an investigation of mobile-assisted Chinese character learning involves diverse facets of technology use, making it difficult to pinpoint the novelty of LS changes in the digital era.

Most previous studies have employed the self-reporting method to identify the strategies adopted in learning Chinese characters. In particular, the Character LS Inventory developed from Shen's research (2005), as well as Oxford's (1990) typology of LS, have been repeatedly used. The Character LS Inventory is indeed a useful tool for examining LS in depth. The repeated use of a similar LS inventory provides empirical data for comparison, including comparisons across language levels, nations and time, to observe conditions of variations. However, Shen's (2005) study has been criticised for its overly broad strategy classifications, grouping many of the 30 most commonly used strategies under the 'cognitive strategies' label (Kan, Owen and Bax 2018).

Oxford's typology was initially designed for Roman scripts rather than Chinese or Asian scripts (Grenfell and Harris 2015). Grenfell and Harris (2015) went beyond the Oxford LS typology. They first employed a think-aloud activity to construct a list of statements reporting the common strategies used for memorising the meaning and form of written Chinese characters. A follow-up questionnaire based on these statements asked 190 students to rate the strategies on a 5-point Likert scale. The study found 34 strategies specifically for character memorisation which heavily rely on the physical appearance of a character. Despite efforts to deviate from the Oxford LS typology, the study of Grenfell and Harris (2015) also mainly relies on a quantitative perspective through a self-reporting questionnaire.

Indeed, the language situation in the places where CFL learners live can be significantly different from decades ago. Globalisation and the rapid development of digital technology have

oriented most of the world towards multilingualism. This study adopts a translanguaging perspective to investigate the character LS used by the multilingual generation.

4. Research design

As reviewed above, previous LS research is not situated in the translanguaging framework, though findings indicate possible trans-semiotising features (e.g., Shen 2005; Sung and Wu 2011). The LS are usually categorised according to Oxford's language LS typology. To date, no research has specifically focused on a new or refined LS typology, especially from a translanguaging perspective. It is unfeasible to adopt or adapt the existing self-reporting survey, which usually contains a number of statements illustrating all possible LS, since it does not use translanguaging as a parameter. In addition, previous self-reporting questionnaires have tended to draw an overall picture of LS for the study of all three aspects of Chinese characters – shape, pronunciation and meaning – whereas this study examines the LS adopted when studying just two – shape and meaning.

Therefore, this study began by employing the think-aloud technique to collect all possible strategies developed in the process of learning Chinese characters. The substantial amount of descriptive data gathered thus allowed us to pinpoint the translanguaging strategies which consist of trans-semiotising features. In addition, a novel translanguaging strategy typology could later be derived and developed from these findings. We also conducted follow-up quizzes, providing supplementary data suggesting the potential impact of the translanguaging strategies on the retention of these characters in long-term memory.

4.1 The think-aloud method

Originating in psychology, the think-aloud method is widely used to measure cognitive process (de Jong 2005). It is based on the assumption that only information heeded in short-term memory can be accessed and verbalised, and that this information is processed in short-term memory during ongoing cognition (Eccles and Arsal 2017). While cognitive processes are not altered by thought verbalisation, Ericsson and Simon (1993: 16) claim that "task-directed cognitive processes determine what information is heeded and verbalised".

The think-aloud method is therefore a concurrent verbal protocol that involves participants articulating their thoughts when completing an assigned task (Cotton and Gresty

2006). However, if the internal information in a person's thought is not originally in a verbal form, it has to be verbally encoded in order to be vocalised (Cotton and Gresty 2006). The method itself demonstrates a transformative capacity of translanguaging. The employment of think-aloud entails an in-depth analysis of the learning process – one of the primary focuses of this study, as detailed earlier.

In addition, the think-aloud method asks participants to verbally articulate their thoughts while practising each character ten times. Since participants need to repeatedly write these characters outside the classroom, the think-aloud method also encourages the autonomy of learners to reflect on the characters through their thoughts articulation. This reflection, and the learner autonomy in learning Chinese characters highlighted in previous studies (Shen 2013; Wang, Spencer and Xing 2009), are therefore both involved in the think-aloud method.

4.2 Participants

The study participants – two females and two males, all aged 19-20 – were adult beginner CFL learners taking ab initio Mandarin Chinese as a compulsory course as part of their full-time undergraduate study at a university in the UK. The key textbook used in their study was *New Practical Chinese Reader Volume 1* (Liu 2010). When the study was carried out, they had already completed the first six chapters and had consequently acquired approximately 60 Chinese characters.

The four participants reported that they were native English speakers, though there was variance in language background and experience. Participants B and D (as shown in Table 2) were born and educated in the UK, while participant C was born in Spain and participant A in the United States. Participants B and D studied Spanish in secondary school; participant C was a native Spanish speaker who also studied German in secondary school; and participant A spoke French and Spanish fluently, along with some German. As a result, the participants demonstrated a variety of experience in languages other than English (see Table 2) and were undoubtedly in possession of a multilingual repertoire.

Table 2. Participant profiles

Student	Place of birth	Language background (home)	Language background (formal education)
A (female, age 20)	United States	English, French and Spanish	German
B (female, age 20)	United Kingdom	English	Spanish
C (male, age 20)	Spain	English and Spanish	German
D (male, age 19)	United Kingdom	English	Spanish

Apart from the weekly six hours of Chinese language teaching offered by the university, all participants reported spending 10 to 15 independent learning hours on Chinese per week. It was during this independent learning time that participants carried out their character learning through the think-aloud technique for this research.

4.3 Data collection

A pilot study was conducted in order to make sure the participants were familiar with and comfortable with the think-aloud protocol. This also helped the researchers to test whether the smartphone audio recordings made by the participants were feasible and reliable. As the think-aloud method focuses on the cognition in short-term memory, the study also used follow-up quizzes to investigate participants' long-term memory of characters. The ten-minute quiz, aimed at investigating the learning outcome of Chinese characters, was given within a week of the think-aloud activity.

The data was collected through five think-aloud activities and five corresponding quizzes at weekly intervals over a period of five weeks. From the new Chinese characters introduced to the participants every week, five characters of five different structures – integral, top-bottom, left-right, half-surround, surround – were selected for each think-aloud activity (see Table 3). Consequently, there are five characters for each type of structure. This allowed the researchers to investigate whether the translanguaging strategies are applicable to all types of characters.

Table 3. Number of Chinese characters in each activity

	Week I	Week II	Week III	Week IV	Week V
Number of new characters	21	20	33	25	24
Number of characters for think-aloud	5	5	5	5	5
Number of characters for quiz	5	5	5	5	5

The participants were required to speak out loud and record everything going through their mind while copying each of the five characters ten times, in order for the strategies employed during the process of learning meaning and composition to be recorded. As shown in Table 3, approximately 25 new characters were introduced each week, with five of them chosen for the think-aloud practice and then tested in the follow-up quiz. Since this research is likely the first of its kind to investigate translanguaging strategies when learning Chinese characters, the findings include the coding of the data itself.

5. Findings

Thematic analysis was conducted first, to identify the translanguaging strategies employed by the learners in the process of learning the meaning and composition of Chinese characters. The scores of each quiz were then calculated based on the level of accuracy, entailing in-depth analysis of the possible impact of the translanguaging strategies on the long-term memory of these characters.

5.1 Translanguaging strategies found in data coding

The think-aloud technique offered a substantial amount of data for the later thematic analysis of translanguaging strategies. Each participant produced five audio files, and accordingly five transcriptions were obtained. From a total of twenty transcription files, more than 3,000 words were collected from each think-aloud practice, and consequently a total of 16,027 words were collected from five think-aloud activities (see Table 4).

Table 4. Number of words in the think-aloud transcription

Think-aloud week / Participant	Week I	Week II	Week III	Week IV	Week V	Total
A	696	994	977	681	920	4,268
B	874	868	831	674	550	3,797
C	1,500	1,058	608	976	680	4,822
D	329	471	671	711	958	3,140
Total	3,399	3,391	3,087	3,042	3,108	16,027

The audio recordings were first transcribed by a researcher. All twenty transcription files were then read in detail and coded independently by the second researcher using NVivo 12 (QSR International 2022). The transcription and proposed coding were reviewed and discussed among the research team in order to clarify any questions or concerns. The coding was then streamlined by the transcriber/first researcher for any changes and refinements, based on the discussion. The refined coding was finalised and agreed by the research team. In other words, the coding was reviewed and compared twice in order to compile all translanguaging strategies found in the transcription.

Table 5 demonstrates the coding employed by the researchers in this study, based on participants' think-aloud dialogues. A brief explanation and/or examples are also provided for each code. Please note that the examples are direct quotations from the transcription of participants' audio recordings. As mentioned earlier, the emphasis of the study is on the translanguaging strategies, which should demonstrate trans-semiotising features showing learners' mobilisation between all available multilingual and multimodal resources to learn characters. Coding 6 and 7, referring to strategies irrelevant to translanguaging, are therefore excluded from further analysis.

Table 5. Coding in the study

Coding name		Brief explanation and examples
1	Link to motion (LM)	In the composition of a character, strokes are associated with a

		motion, such as "down", "across" or "leg up".
1.1	Link to animated motion (LaM)	A subcategory of LM. In the composition of a character, strokes are associated with an animated motion, such as "kick", "flick" or "kicking legs".
2	Link to other objects (LO)	The shape/form of a character is associated with objects other than a Chinese character, such as "skirt", "bridge" or "fork".
2.1	Link to body parts (LbP)	A subcategory of LO. The shape/form of a character is associated with body parts of a human or an animal, such as "legs", "eyes", "bunny ears" or "a smile".
3	Link to other characters (LC)	The composition of a character is associated with another character with a similar shape or that shares similar parts. For example, the right-hand part of 瓶 is linked with 五: "So the first character I'm writing is 瓶 […] so first there's almost like a curve, little curve at the top but straight down […] then the next part looks almost like 五."
4	Link to Roman alphabet shape (LR)	The shape/form of a character is associated with a Roman alphabet letter that has a similar shape. For example, the outside radical of 送 is linked with the letter L: "I'm now writing the character for 送, which means 'to give', 送, 送. So the fancy 'L' with a flick."
5	Creating a narrative (CN)	A short narrative, usually a story, is created in order to memorise the composition of a character. For example: "It looks like curtains which have been tied back to stop covering up the sunshine coming in through the window" – this narrative was used to describe the character 四."

6	Describe English meaning (DEM)	For example, "瓶, which means 'bottle'".
7	Describe stroke number (DSN)	For example, "So that's 1, 2, 3, 4, 5, 6, 7 strokes."

Codings 1-5 in Table 6 pinpoint the specific translanguaging strategies employed by the participants in the study. At a surface level, it is noted that the participants mainly focused on linking the meaning of the character with the physical shape in a variety of ways. For example, participants linked specific characters to various motions, objects and other similar characters; in some cases a connected narrative for a given character was created. Interestingly, no reference was made to the sound of the character in any translanguaging strategies identified, which further emphasises the strong connection between meaning and composition when learning Chinese characters.

Codings 1-4 clearly display the trans-semiotising features in their names; that is, they draw from divergent semiotic resources to assist in memorising the meaning and composition of Chinese characters. Since a person's narrative usually employs a wide range of multimodal and multilingual semiotics, such as sound, image and action, Coding 5 is actually an umbrella for multiple instances of trans-semiotising features. In other words, Codings 1-4 indicate the transformation from one semiotic mode to another, whereas Coding 5 contains a compound conversion of various semiotic resources. As a result, references in Coding 5 may overlap with Codings 1-4.

Table 6. Number of files and references in each coding

Coding and abbreviation		Number of files	Number of references
1	Link to motion (LM)	20	1,133
1.1	Link to animated motion (LaM)	11	153
2	Link to other objects (LO)	20	625
2.1	Link to body parts (LbP)	13	324
3	Link to other characters (LC)	14	339
4	Link to Roman alphabet shape (LR)	8	60
5	Creating a narrative (CN)	8	43

Table 6 also shows the number of references according to the coding. The number of files in which these references appear is also displayed here. As mentioned before, a total of twenty transcription files were gathered from five think-aloud activities. The more files in which a coding appears, the more likely that this translanguaging strategy is shared across different participants.

LM has the most references (N=1,133), followed by LO (N=625). LbP and LC are fairly similar (N=324 and N=339 respectively), followed by LaM (N=153). While only 60 references are grouped under LR, CN has the smallest number of references (N=43). However, as explained above, each reference in CN may demonstrate several trans-semiotising features.

The large quantity of LM might be due to the learning process in which the think-aloud activity occurred. Participants were asked to write each character ten times while speaking out loud what was in their mind. The handwriting movement is likely to stimulate participants to think from a motion perspective. Indeed, repeated handwriting practice helps establish the spatial configuration of strokes and radicals, along with a temporal sequence of motor movements associated with stroke composition (Zhang and Reilly 2015). Therefore, graphic-motor planning is involved in the handwriting exercises (Lyu et al. 2021). In addition, allograph-shape conversion, meaning the shape of a character becoming motor programmes (i.e., allographs) in memory through handwriting, benefits the retention of its shape (Guan et al. 2011). That is to

say, the think-aloud activities took place at a moment in the learning process when a wide range of motor movements and motor programmes were involved. The participants unsurprisingly employed a strategy that associates the memorisation of a character with different motions.

While a rather small number of the LM subcategory LaM (N=153) were identified, these references actually appeared in more than half of the files (N=11) where LM were found. As Xu et al. (2021) point out, repeated handwriting is a kind of kinaesthetic movement. Therefore, the strategy of feeling movements of limbs and body in the process of handwriting characters is reflected in the animation of motions.

The pictographic origin of Chinese writing script is likely to be the main reason for the large number of LO (N=625). CFL learners tend to exploit all available images of objects in enhancing the recall of character forms. Interestingly, more than half of the LO belong to LbP (N=324), which is again associated with kinesthesis. This translanguaging strategy allows the participants to relate the shape of a character to a body or body part of a human or animal, which may boost the establishment of motor memory of the character composition.

Codings 1-2 show the characteristics of personification and embodiment, whereas Codings 3 and 4 mainly rely on the semiotic resources available in a person's linguistic repertoire. Although the participants are CFL beginners, they still manage to apply their existing knowledge of approximately 60 characters learned before the commencement of the study to the learning of new characters. As all of them are native English speakers, their L1 is also involved in assisting with the memorisation of the shape of characters.

However, imbalanced attention seems to be assigned to each aspect of a character. Codings 1-4 all concentrate on the learning of character composition, whereas the study of the meaning of a character seems to be left in CN (N=43). This means the translanguaging strategies were used much less in establishing the grapheme-morpheme mapping. The translanguaging strategies were chiefly employed to memorise the graphic shape of characters, while the correlation between grapheme and morpheme was unlikely to be established through those strategies. This leads to a question regarding long-term memory for Chinese characters that demand learning of both the graphic shape and the grapheme-morpheme mapping, which will be dealt with in the next section.

5.2 Long-term memory of characters

A quiz was carried out within a week of each think-aloud activity, in order to examine participants' long-term memory of characters. The quiz had three sections: i) write the character according to the meaning in English, ii) write the character according to the pinyin provided, and iii) dictation, with each character read twice. Each part of the quiz examined a set of five characters learned through the think-aloud activity in the previous week. Therefore, each section totalled five points and the total mark for each quiz was 15 points. In particular, Section (i) examined long-term memory of the grapheme-morpheme mapping (see Figure 1).

(i): Please write down the correct character according to the English meaning given on the left (1 point each).

For example:	
mother	妈
(1) egg	
(2) picture; drawing	
(3) doctor; to cure	
(4) lesson; class	
(5) to come	

Figure 1. Example of Section (i) of the quiz

Since there were only four participants, this is unlikely to provide any reliable results through statistical analysis (Budiu and Moran 2021). However, a comparison between the results of the quizzes and the individual differences in translanguaging strategies used presents some interesting findings. Table 7 breaks down the quiz results of each participant and the frequency of occurrence of each translanguaging strategy.

LM appears more often than other strategies in each practice exercise. Specifically, participants A and B used LM predominantly in each think-aloud practice. While participants C and D tended to adopt translanguaging strategies in a discursive way (see grey highlights in Table 7), participant D still showed a preference for LM and participant C showed the same preference for LM and LO. Therefore, the popularity of LM can be observed here.

While LR does not appear as a prominent strategy for any participant, the transcriptions show that this strategy tended to be used when describing only parts of the character (e.g., 辶 being described as a "fancy L"). Therefore, it is unsurprising that this strategy was not as popular as those that could be applied to the entire shape of a character (e.g., LM).

Table 7. Individual quiz results and use of translanguaging strategies

Participant	Quiz result						Translanguaging strategies						
	I	II	III	IV	V	Total	LM	LaM	LO	LbP	LC	LR	CN
A	9	13	15	11	11	59	295	125	242	110	123	27	2
B	11	8	11	15	14	59	498	na	103	na	na	1	na
C	15	12	12	15	14	68	252	13	245	177	180	28	14
D	15	15	12	12	12	66	88	15	35	37	36	4	27

Participant C used the largest variety of strategies and came top in three of the five quizzes (see grey highlights in Table 7), as well as getting the highest total mark (68/75). Participant D, who also showed a larger than average variety of strategies, scored 66/75 across the five quizzes. Interestingly, participants A and B – who predominantly used only LM – came top in only one and two quizzes respectively. In addition, participant B, who almost exclusively used LM, scored the lowest in the second quiz, with the lowest mark among all five quizzes (see grey highlight in Table 7). The scores of participants A and B across the five quizzes were the lowest, both at 59/75. Therefore, a wide range of choices of translanguaging strategies might better support the study of Chinese characters.

Table 8 displays the results of section (i) in each quiz. Since this section asked the participants to write down the corresponding Chinese characters according to the English meaning given, the results provide an overview of their learning of the grapheme-morpheme

mapping. Again, participants C and D, who employed a wide range of translanguaging strategies, scored highest (22/25).

Table 8. Results of Section (i) of five quizzes

Participant	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5	Total
A	3	5	5	3	3	**19**
B	3	3	3	5	5	**19**
C	5	4	4	5	4	**22**
D	5	5	4	4	4	**22**
Note:	Only results of section (i) are presented here, to highlight the learning of the grapheme-morpheme mapping.					

As mentioned, statistical analysis cannot be conducted with such a small number of participants; however, it is interesting to note that the greater variety of translanguaging strategies used throughout the learning process, the better the results appear to be in the quizzes.

6. Discussion: Proposal for a new LS typology

The results show that numerous translanguaging strategies were used during the process of memorising Chinese characters. LM and LO were most frequently applied, and there was also substantial use of LC, LR and CN. As mentioned earlier, the frequent employment of LM and LO is likely to be associated with the activation of the motor movement and memory involved in the writing practice embedded in the think-aloud activities.

Building upon the qualitative data, a new LS typology with a translanguaging parameter can be derived accordingly. Overall, we propose the following three types, encompassing all translanguaging strategies identified in the current study: a) embodiment, b) translanguaging resemblance, c) hybrid.

The personified features of LM and LO support the embodied cognition theory, which states that a person must "internally 'run' or 'simulate' the corresponding production process" when understanding a physical stimulus (Bi, Han and Zhang 2009: 1194). In the process of understanding a physical stimulus – in this case, a Chinese character – the simulation of such stimuli can be triggered and boosted through writing. Interestingly, two of five types of embodiment in language learning are haptic embodiment and imagined embodiment. The former

refers to "the sense registry through haptic channel[s] such that learners use their hands to write, touch, or click a mouse", whereas the latter emphasises "consciously engaging one's imagination to mentally picture movement or action" (Lu 2011: 46).

In this study, imagined embodiment, as shown in the employment of LM and LO, was established through haptic embodiment – handwriting practice. Moreover, while a learner's imaginative ability might be important to evolving translanguaging strategies, imagined embodiment can also be developed into a pedagogical tool to encourage the encoding and decoding of Chinese characters (Lu, Hallman Jr. and Black 2013).

The embodiment type of translanguaging strategy indicates the multimodal and multi-semiotic nature of linguistic repertoires in communication. Gesture as an essential component of communication is an important semiotic repertoire that a person relies on (Lau 2020). If we see the learning process as an internalised interaction with a visual object – in this case, a Chinese character – especially in the use of think-aloud, which pushes learners to verbalise their reflections of and responses to the visual object, gesture is embodied in their narrative to proactively engage with, critically reflect on and creatively make sense of the object through imagination.

Gesture, and any other body language, is usually a person's "already established biography of prior dealings with the other participants" (Blackledge and Creese 2017: 253). The corporeal, embodied narrative brings along one's biography; in return, the learning practice transforms one's existing and established knowledge and life experience to create new knowledge. This reciprocal relationship demonstrates the second interpretation of 'trans' in 'translanguaging', as reviewed in the literature (Li and Zhu 2013).

In addition, the embodiment type of translanguaging strategy challenges the conventional mind-body dichotomy in literacy education (Lau 2020); this leads to the third interpretation of 'trans'. Embodied narrative no longer perceives language learning as a mere cognitive exercise; instead, corporeal involvement in the cognitive process constantly offers insights to refine and rebuild existing language knowledge.

The second type of translanguaging strategy – translanguaging resemblance – is related to a learner's use of existing linguistic repertoire. Instead of moving between different modes of semiotic resources, the LC and LR strategies highlight the multiple utilisations of a CFL learner's multilingual repertoire in the learning process, including newly acquired Chinese

characters from previous lessons. This strategy demonstrates the translanguaging ability of CFL beginner learners to recognise the similarities between linguistic codes drawn from their multilingual repository and to apply that translanguaging resemblance in language learning.

The hybrid type of translanguaging strategy, namely CN, suggests an integrated use of all available translanguaging strategies in order to construct and store in memory multimodal representations of Chinese characters. The resources available for a narrative are not only linguistic, but also derive from culture, history or society. It is related to the third interpretation of 'trans' in 'translanguaging', as mentioned in the literature (Li and Zhu 2013).

Below is an excerpt from a participant's narrative that exemplifies the hybrid type of translanguaging strategy. It was used to assist in the learning of the character 层 (céng) – layer or floor – which is composed of the outside radical 尸 (shī, corpse) and 云 (yún, cloud). Using the well-known fairy tale Rapunzel, the learner reconfigures the story with a reference to the intended Chinese character:

> Rapunzel, with her long hair, and the cloud that she's dreaming about; or she's got her head in the clouds, I suppose you could say.
> (Example of CN, quoted from Transcription File 14)

In this sense, the hybrid employment of translanguaging strategies allows learners to create an imaginary translanguaging space built upon their creativity and criticality (Li 2011). Such a space allows learners to perform freely, penetrating any barriers of linguistics, modalities, or even cultures and societies. In addition, the translanguaging space is also fluid and dynamic, not only constructed in the creative mind of individual learners with their own linguistic reserves and prior knowledge, but also reconstructed and evolving through constant changing attitudes, values, ideologies and social interactions.

7. Conclusion

This paper highlights the translanguaging strategies used in the process of learning Chinese characters. Instead of using a self-reported survey, the think-aloud method was employed to pinpoint the LS in a globalised, multilingual world. Based on the findings of various

translanguaging strategies, a novel LS typology is proposed: embodiment, translanguaging resemblance, hybrid.

The exploration of a new LS typology with a translanguaging parameter is potentially a valuable theoretical framework for LS research across different linguistic systems, which offers a new angle by applying translanguaging as a methodology (Li 2022). It does indeed need further investigation, especially among a larger population. As Jiang and Cohen (2012) point out, self-designed inventories should be widely administered for the purposes of reliability and validity.

The small number of participants is indeed a limitation of this study. Nevertheless, given the fact that it is one of the first – probably the very first – to identify the translanguaging strategies in learning Chinese characters, the employment of a think-aloud protocol produces rich qualitative data for scrutinisation of the trans-semiotising features of strategies in the learning process. The three types of translanguaging strategy identified in this study also demonstrate the transformative capacity of translanguaging in language learning, indicating the appropriateness of using translanguaging as a parameter for the strategy typology.

The think-aloud method offers rich information to examine the hybridity of one's integrated multilingual, multimodal knowledge and experience of the social world. From a pedagogical perspective, the think-aloud method involved in the process of learning Chinese characters sheds light on the employment of rote memorisation in the acquisition of Chinese characters (Wang and Lin 2019; Wang and McBride 2017; Yu 2018). While rote memorisation has received widespread criticism due to the lack of creativity involved (Kim 2005; Tan 2001), a general consensus among CFL practitioners is that some element of memorisation is needed when acquiring characters (Winke and Abbuhl 2007; Yu 2018). In particular, Randall (2007) notes that it is essential for students to be completely focused on the task at hand and without distraction in order to successfully memorise the content, which is allowed for in the think-aloud method. Therefore, memorisation exercises incorporating the think-aloud protocol could benefit learners in their acquisition of Chinese characters, as these allow complete focus on the task at hand. As an added benefit, the lack of creativity normally associated with rote memorisation could be eliminated, as demonstrated in the translanguaging strategies employed by the participants in this study.

The small number of participants makes it impossible to use statistical analysis to examine the potential correlation between different types of translanguaging strategies and

learning outcome. In particular, the quiz in fact also assessed grapheme-phoneme correspondence; this has not been included in the data analysis, since the primary focus of this study is the learning of character shape and meaning, namely the grapheme-morpheme mapping. In addition, the small number of participants makes it unfeasible to conduct statistical analysis of the correlation between different translanguaging strategies and character structures. However, this paper provides a descriptive account of the possible impacts of translanguaging strategies on learning outcome. If future research could be carried out with a large sample size, it would be feasible to look into the correlation quantitatively, including both grapheme-morpheme and grapheme-phoneme mappings.

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