Effects of Perceptual Learning Styles on Chinese EFL Learners' Writing Proficiency in the Reading-writing Integrated Continuation Task

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Abstract

Previous studies have manifested that the reading-writing integrated continuation task has great language learning potential and linguistic alignment facilitated by the continuation task positively affects L2 learners' written performance. As an individual difference construct, perceptual learning style has been investigated from its impact on EFL learning, while research on how it affects learners' performance in the continuation task seems deficient. To this end, this study investigated the relationship between Chinese EFL learners' perceptual learning style and writing proficiency in the reading-writing integrated continuation task. Participants were 46 intermediate learners of L2 English from two intact classes who were required to perform both independent topic writing and the continuation task. The results

showed that 1) group and auditory style learners slightly outperformed on phrasal alignment while visual and tactile performed better on clausal alignment; 2) visual, tactile and auditory learners were likely to generate content-rich, well-organized and more accurate written production, but students' linguistic fluency in topic writing outperformed that in the continuation task; 3) learners who prefer audio input showed in inferiority on the continuation writing. These findings confirm that perceptual learning style might be a mediator affecting learners' linguistic alignment within the continuation task.

Keywords: Individual difference, Perceptual learning style, Writing proficiency, Reading-writing integrated continuation task

1. Introduction

Every learner performs a variety of personalities or traits in the process of second language acquisition, which may have the potential to affect language learning and development (Skehan, 1998; Bill & Alessandro, 2010). Investigating the individual differences is a continuing concern within EFL learning, such as aptitude, motivation, working memory and writing strategies (e.g. Grigorenko *et al.,* 2000; Robinson, 2005; Baddeley, 2003). One of these factors, students' learning style, "an approach for understanding individual differences among linguistically and culturally diverse students" (Kinsella, 1995: 171), has triggered a huge amount of scientific inquiry (e.g. Isemonger & Sheppard, 2003; Reid, 1987; Peacock, 2001). Some scholars have manifested that learners' learning style might be a considerable factor which influenced their writing strategies, motivated L2 behavior and writing proficiency (e.g. Feng *et al.,* 2020; Zhang, 2015; Kim & Kim, 2014). Nevertheless, some controversial opinions have yet existed on the relationship between learning styles and EFL/ESL writing proficiency. A possible explanation for such debate might be the lack of diversity in measurement indicators for diverse L2 writing tasks as the monolithic score was concerned in the previous literature.

Recent trends in L2 writing have led to a proliferation of studies that the reading-writing integrated continuation task, a new writing model which has been widely adopted at English class and serves for National College Entrance Examination in China, could effectively facilitate foreign language learning (Wang & Wang, 2014). Given these, this study attempts to examine the effects of perceptual learning styles on Chinese EFL learners' writing proficiency in the reading-writing integrated continuation task via a common L2 learners' learning style scale, Reid's perceptual learning style preference questionnaire (1987).

2. Literature Review

2.1 Perceptual Learning Styles

The term "learning style", defined by various scholars, was an important issue in learning, focusing on individual differences from the perspective of psychology. Dunn (1975) described that learning style was the way how learners concentrated on, processed and internalized new difficult academic information. Learning styles can also be interpreted as the habit which learners preferred to use or distinct attitudes in their learning experiences (Nunan, 1997; Dunn & Griggs, 1998), as well as the cognitive, affective, and physiological

personalities when interacting with the learning environment (Fleming, 2001; Keefe, 1979). Reid (1995: viii) claimed that learning styles were "an individual's natural, habitual, and preferred ways of absorbing, processing, and retaining new information and skills". To sum up, learning style was identified as learners' steadily preferred ways of cognition construction and information processing.

During the authentic classroom, scholars have noticed "the process by which the brain systematically collects information" was individually distinct. Such process was defined as "perception" (Keefe, 1988) where learners tend to receive the information through perceptual modalities such as sights, hearing, touch (Barbe *et al.,* 1979). Then students increasingly develop the preferred channel when learning, which is their perceptual learning style preference. According to Reid's (1987) definition, "perceptual learning style" (PLS) is "variation among learners in using one or more senses to understand, organize, and retain experience", which was categorized into six sub-series: visual, tactile, kinesthetic, auditory, group and individual:

> *Visual:* learners prefer to remember new information through visual input, such as textbooks, diagrams, pictures, chalkboard handwriting or other materials, which could improve memory retention through imagery thinking stimulation.

> *Tactile:* learners enjoy participating in hands-on activities, notes taking, models handling or lab experiments, implying the conception of learning by doing.

> *Kinesthetic:* learners tend to physically get involved in the learning experiences, where activities like role-play or field trip could effectively promote knowledge absorption and internalization as a multi-tasker.

> *Auditory:* learners show the preference of acquiring a new language via auditory channels, such as oral explanation, lectures, tapes or conversations, which could help them memorize new materials more quickly (Nilson, 2003).

> *Group:* learners are prone to interact with others or study in groups, during which communication skills and cooperation spirit would be strengthened, as well as checking learning outcomes in turn.

> *Individual:* learners favor autonomous learning that contributes to better performance after deliberating and processing new information individually.

Some scholars have investigated PLS of Chinese learners mainly through Reid's Perceptual Learning Style Preference Questionnaire (PLSPQ), the most commonly utilized scale for assessing non-natives, string for providing more evidence to describe effective language learning in L2 English context. Based on Reid (1987), kinesthetic and tactile learning styles were the major preferences of Chinese students attending university in the USA while group learning style was the minor one. Similar results showing that participants favored multiple PLS consisting of kinesthetic and tactile styles were found by Jones (1997) among 81 Chinese Taiwan students, echoing Melton's research (1990). In line with those commonly discussed results on Chinese learners' PLS preferences, Zhang's (2015) finding indicated that

visual learning style was the favorite for Chinese students on account of educational environment where students were used to passively accepting all materials given by the teacher such as textbooks and notes, which was in parallel with Chen's conclusion (1999). To sum up, aforementioned studies have presented that Chinese learners' preferred a uni-modal with visual, kinesthetic and tactile learning style independently or performing as a multi-modal learner (e.g. Reid, 1987; Melton, 1990; Peacock, 2001).

Moreover, substantial studies attempted to reveal or confirm the relationship between PLS and ESL/EFL proficiency (e.g. Lau & Gardner, 2020; Pendyala *et al.,* 2021). Kim and Kim (2014) examined the relationship between PLS, English learning motivation, and achievement among 2682 Korean tertiary students. Findings suggested that visual and auditory styles positively correlated with learning motivation and English proficiency, while kinesthetic style was in a significantly negative correlation. In addition, visual style was indicated as the most crucial factor to be proficient in L2 English. Different from Kim and Kim's finding, Peacock (2001) reported that EFL learners with group learning style were significantly in low proficiency. One concern regarding in this study is the rationality of PLS preferences classification. It was revealed that no significant correlations between PLS and academic performance (Zwanenberg *et al.,* 2000), which was consistent with the previous hypothesis that PLS could not directly reflect students' EFL proficiency as a predictor (Isemonger & Sheppard, 2003; Ghadirzadeh *et al.,* 2013).

Unlike the previous outputs, a few studies focused on the impacts of PLS employing Reid's PLSPQ in EFL/ESL writing. Mulinti (2020) carried out a survey among 40 middle school students, whose finding demonstrated that L2 writing skills were significantly improved for visual learners compared to other PLS in ESL context. Furthermore, PLS was in relation to writing strategies (Wang & Zhang, 2013). "Students with different learning styles often choose strategies that reflect their style preferences" (Green & Oxford, 1995: 292). However, no significant differences were found by Srijongjai (2011) between English majors' learning styles and academic writing achievement. One limitation of this study is overlooking the influence of teaching circumstances and the variability or dynamism of PLS.

In sum, although the greater part of the literature reviewed above has well investigated categorization of Chinese learners based on Reid's model, controversies still remained whether PLS influence or correlate with EFL/ESL proficiency. Moreover, such studies remain deficient in the application of PLS in EFL/ESL writing context. Therefore, the current study aims to further explore the relationship between PLS and EFL writing proficiency in new writing tasks like the reading-writing integrated continuations more than topic writing (Sahragard & Mallahib, 2014) or online letter writing (Van *et al.,* 2014).

2.2 Reading-Writing Integrated Continuation Task

As a new shift for cultivating the potential of language learning and teaching in SLA, Wang (2012) advocated the reading-writing integrated continuation task (RWICT), where EFL learners are presented an input text with its ending removal and are required to read the story then write a completion in a coherent and logical way (Wang & Wang, 2014), coupling with reading comprehension and writing production. When performing such task, learners are

stimulated to "imitate appropriate language use in interactional contexts and to use language creatively based on imitation" (Miao, 2021). Here, "imitation is anything but parroting" (Wang, 2021).

The core of such successful language learning is the principle of "alignment", proposed by Pickering and Garrod (2004) from the perspective of psychology, who claimed that interlocutors achieve mutual understanding within L1 dialogue, where they automatically align to various representations through priming mechanisms. While Atkinson *et al.* (2007) extended alignment into SLA from the socio-cognitive view, whereby "human beings effect coordinated interaction, both with other human beings and environments, situation, tools and affordances" (p. 169), whose research went beyond interpersonal dialogue to wider social activities. However, distinct from the previous description of alignment in authentic dialogues and environment, alignment effect is also entailed between learners and reading materials where reading comprehension and writing production are closely bound (Wang &Wang, 2014) through comparison between English-to-English experiment group and Chinese-to-English control group among 48 English majors in China. It was confirmed that participants in English-version outperformed the other at lexical, phrasal and structural levels, echoing the hypothesis of Interactive Alignment Model (Pickering & Garrod, 2004) that alignment is characterized at various levels of representation.

So far, empirical evidence of facilitating effective L2 learning in RWICT has attempted in various dimensions (e.g. Wang & Wang, 2014; Wang *et al.,* 2021; Chen, 2021). Jiang and Chen (2015) investigated the longitudinal effect of written accuracy, complexity and fluency through comparing RWICT and topic writing, which revealed that participants of RWICT outperformed on linguistic accuracy and complexity than the other as a result of iterative noticing authentic idiomatic expressions within the source text, bridging the L2 gap through interaction and imitation. Similar findings indicated that RWICT could promote L2 vocabulary learning on meaning and use as well as syntactic patterns which were imitated from the input text (e.g. Jiang & Tu, 2016; Zhang, 2016). Different from the linguistic level, Miao (2017) examined the alignment intensity and interaction contexts from the perspective of discourse. It was showed that L2 learners could automatically self-adjust and self-organize various contexts to achieve the maximal alignment as interaction changes, which validly mirrored the mechanism of RWICT: interaction-comprehension-alignment-production-acquisition (Wang, 2010). Moreover, Wang and Wang (2016) found RWICT could significantly reduce grammatical errors in target structures for Chinese L2 learners since production coupling with comprehension was conducive to stimulate their linguistic representations or structural priming, extending the research range beyond EFL/ESL learners.

While other scholars attached great attention to diverse factors that may influence the effectiveness of L2 learning in RWICT, such as interestingness (Xue, 2013), genre (Zhang & Zhang, 2017), rhetorical styles (Yang, 2018), complexity of the source text (Peng *et al.,* 2020; Xin & Li, 2020), task instructions (Yuan, 2013). Recently, less of the research available to date investigate more individually intrinsic variables other than extrinsic task design like critical thinking and academic emotions (e.g Yu & Wang, 2020; Zhang, 2016; Zhang, 2019).

Having analyzed L2 learners' transcripts of think-aloud protocol and retrospective interview, Jiang *et al.* (2019) focused on L1 thinking and provided the evidence that students' L1 thinking could be significantly decreased by the scaffolding of authentic L2 context. Similar qualitative methods were adopted in Zhang and Qin's (2020) research, which manifested the effectiveness of reduction in avoidance behaviors and writing anxiety, stimulating other positive academic emotions in RWICT. Mao (2021) attempted to reveal the effect of cognitive (field-independent/dependent) styles on RWICT and the finding suggested that learners with FI cognitive style achieved higher writing proficiency while FD cognitive style learners outperformed at the lexical alignment. One limitation concerning this study is that all participants had mastered basic techniques of RWICT, which could be the main cause of students' L2 writing achievement rather than cognitive styles. As a consequence, certain significant effects reported in this study maybe less convincing.

2.3 Current Study

The aforementioned studies have adduced empirical evidence of PLS in EFL writing and the washback effect to successful L2 learning in RWICT from the standpoint of social-culture. However, no consensus has yet achieved on the relationship between PLS and EFL/ESL proficiency; little is known about the individual factors of RWICT from psychological and cognitive angles. Given these, the current study aims to examine the relationship between Chinese EFL learners' PLS and writing proficiency in RWICT. The following three research questions were addressed:

1) Do EFL learners with different PLS differ in alignment in RWICT?

2) Do EFL learners with different PLS differ in linguistic complexity, accuracy

and fluency in RWICT?

3) Do EFL learners' PLS correlate with writing proficiency in RWICT?

3. Methodology

3.1 Participants

A total of 46 freshmen, with the experience of learning English over 8 years, majoring in English in certain normal university participated in this study. No significant variance of English proficiency was found (*Mean=36.74, Std. Deviation=4.94, CV=0.13*), which were all regarded as intermediate-level learners based on the score of *Quick Placement Test (version 1).* Reid's PLSPQ (Appendix 1) was distributed for each student and the response rate reached 100% but at a 96% valid data rate exclude two participants with no major preference. Specific details of participants' PLS preferences were displayed in Figure 1.
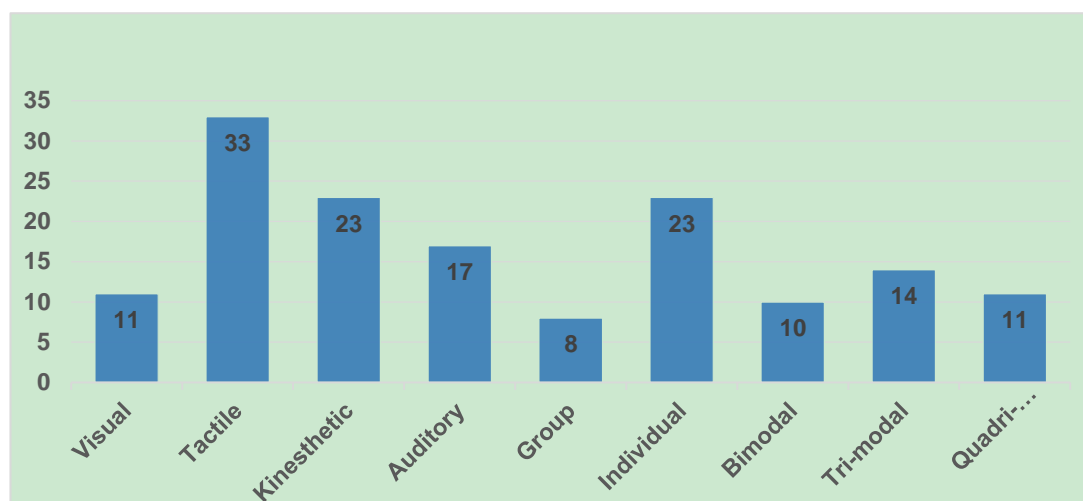
Figure 1. Distribution of participants' PLS preferences

3.2 Instruments

3.2.1 Reading Materials

As mentioned before, having considered topic interestingness (Xue, 2013), text length and topic familiarity (Guo *et al.,* 2018) and linguistic complexity (Xin & Li, 2020), reading material of RWICT in this study was adopted from the English part of Zhejiang NCEE. The source text, consisting of 360 words, described a funny thing happened to Arthur, but the climax and ending part had been eliminated. Participants were asked to continue about 200 words to gear to the incomplete passage within 40 minutes. While the theme of topic writing was consistent with college life: *Is it advisable for a college student to have a part-time job?* Participants were allowed 30 minutes to finish a composition about 200 words. All time limits were adjusted through a pilot study (Appendix 2 & 3).

3.2.2 Immediate Interview

To further qualitatively acknowledge L2 learners' perceptual differences between RWICT and topic writing, all participants were received an immediate interview through stating three following questions. They were encouraged to use Chinese to fully express their authentic emotions and spontaneous thoughts, during which participants' answers were throughout recorded and stored: *1) Which channel do you prefer while learning English, visual input, auditory scaffolding, role-play, making learning tools, learning in groups or individually? 2) Whether your preferred learning styles are helpful for RWICT? If yes, please elaborate it from language, structure or content. 3) Do you have any different perceptions when experiencing RWICT and topic writing?*

3.3 Data Collection, Coding and Analysis

All together 46 participants' RWICT and topic writings were transcribed through computer, composing two small-scale corpus. While oral interview was taped into text based on participants' description for further qualitative analysis. Linguistic performance was measured through writing scores, language accuracy, complexity and fluency, while linguistic

alignment was examined from lexical, phrasal and clausal levels (Peng *et al.*, 2020). All statistics were analyzed on SPSS 26.0, where Kruskal-Wallis tests, Wilcoxon Signed Ranks tests and paired samples tests were conducted to compare linguistic performance and alignment effect among Chinese EFL learners with different PLS in RWICT and topic writing; as well as the Pearson correlation rate was tested the relationship between students' PLS and writing proficiency.

3.3.1 Linguistic Performance

Participants' RWICT and topic writing were scored from content, organization and language adopted the rating criteria of TEM-4 (Note 1) but modulating certain details like adding item "coherence with the input text" or "interest" (Appendix 4). Inter-rater reliability was reached .956 and .937 respectively by Cronbach's Alpha.

Complexity, accuracy and fluency (CAF) have been regarded as key variables for assessing learners spoken or written performance (Robinson, 2001; Alex & Folkert, 2009; Plakans *et al.*, 2019). Accordingly, "accuracy was measured by calculating the number of error-free T-units as a percentage of the total number of T-units" (Skehan & Foster, 1999). Each error identification was consistent with Polio and Shea's error coding system (2014). Inter-rater reliability of errors labeling was reached .962 and .917 respectively by Cronbach's Alpha. Additionally, based on Lu (2010: 478), syntactic complexity could be reflected by the amount of subordination (clauses per T-unit, dependent clauses per clause) and coordination (coordinate phrases per clause) through L2 Syntactic Complexity Analyzer (L2SCA) online. While fluency refers to learners' capacity of using languages in real time (Skehan & Foster, 1999). The measurement was to divide the total number of words by the total number of T-units, which was widely applied to identify learners' proficiency as one of the three best ones (Wolfe-Quintero *et al.,* 1998). Five indicators observed in this study to examine participants' linguistic performance were presented in Table 1.

Table 1. Criteria of CAF

Criteria of CAF		
Accuracy	error-free T-units / T-units	
Complexity	T-unit complexity ratio	clauses / T-units (C/T)
	dependent clause ratio	dependent clauses / clauses (DC/C)
	coordinate phrases per clause	coordinate phrases / clauses (CP/C)
Fluency	words per T-unit (W/T)	

3.3.2 Linguistic Alignment

In line with Peng *et al.*'s conclusion (2020), linguistic alignment did emerge on multiword sequences and clauses, beyond lexicons discovered by Wang & Wang (2014). At the lexical level, "keyword list" in AntConc 3.4.4w was utilized to identify 30 unusual frequent keywords compared the corpus with the reference corpus, which was ranked by "keyness"

(i.e. log-likelihood ratios or chi-square values). Each PLS was classified into a sub-corpus from RWICT corpus, whereby keyword lists of six sub-corpus were compared with the source text respectively, as the reference corpus, to measure the extent of lexical alignment.

At the phrasal level, multiword sequences were calculated manually as indicators of phrasal alignment. On the basis of Peng *et al.* (2020), a multiword sequence refers to "a sequence of words that as a whole is meaningful, such as to *chop wood, to stare at, I went to*", which may occur in the following three conditions. First, two multiword sequences share the same words or lemmas. Second, they have all the same words or lemmas but differ in additional elements like modifiers which do not change its original meaning. Third, they contain over half of the words or lemmas which are the major components of its fundamental meaning but differ only in the words which do not change its structure like pronouns.

At the clausal level, overlapping strings of words that comprise clauses (such as SV/SVO/SVC/SVA/SVOO/SVOC/SVOA) were labeled both in the continuous writing and the given input. Clausal alignment identification was consistent with the criteria in phrasal alignment. Each disagreement of phrasal and clausal coding has been resolved and Cronbach's Alpha indicated the inter-rater reliability reached .979 and .989 respectively. Specific examples were showed in Table 2.

Table 2. Examples of clausal and phrasal alignment

Alignment	Expression in the input text	Expression in RWICT
Phrasal	in a big hurry	in big hurry
	the long loud noise of an alarm	the long loud noise of an alarm/loudly noisy
	he became frightened...	he was so frightened that...
	a young man who...	a young man/person who...
	started to	began to
	was filled with	was full of
Clausal	What happened?	What happened?
	Arthur looked around at the crowd of people.	Arthur looked around at the crowd of people.
	He became frightened, and without another thought, he started to run.	He became frightened, and without another thought, he started to run.
	He tried again and again but couldn't get the car moving.	The real bank thief still couldn't get the car moving.
	Now the air was filled with the sound of the alarm and the shouts of people running from all directions.	He ran as quickly as he could, when the sound of the alarm and shouts of people fined with the air.

Note. Synonym replacement was also marked as phrasal alignment in this study.

4. Results

4.1 Differences of EFL Learners With Different PLS on Alignment in RWICT

Table 3 describes lexical alignment in six PLS where 30 unusually frequent keywords were ranked by keyness and table 4 presents lexical alignment frequency in two categories. Overall, individual, visual and auditory style learners were prone to align notional word, with frequency accounting for 55.23%, 47.24% and 45.65% respectively. Specifically, EFL learners with visual and kinesthetic learners tended to focus on verbs (Mean = 2.80, Mean = 4.22). While individual and auditory styles were the top two as concerns alignment on nominal (Mean = 6.67, Mean = 4.88) and individual and group students were inclined to align adjective (Mean = 4.00, Mean = 3.00) words. However, Kruskal-Wallis tests showed

that the differences among verbs (H = 8.647, p = .124), nouns (H = 6.342, p = .274) and adjectives (H = 7.808, p = .167) did not reach statistically significant in the six groups. Having eliminated certain abbreviations, participants with tactile and kinesthetic styles tended to focus on functional words, such as *of, at, for, from,* which produced the average of 39.64 and 35.14 per 100 words in each, but no statistically significant differences were found among the six styles (H = 8.343, p = .138). Based on Paired Samples Test, no statistically significant differences were found among notional words and functional words in the six categories (t = -1.674, p = .155).

Table 3. Lexical alignment in six PLS

Rank	Visual		Tactile		Kinesthetic		Auditory		Group		Individual	
	freq.	keyword	freq.	keyword	freq.	keyword	freq.	keyword	freq.	keyword	freq.	keyword
1	2(5)	looked	12(5)	looked	8(5)	looked	6(5)	looked	3(5)	looked	5(5)	looked
2	15(8)	at	6(3)	get	3(3)	get	3(3)	turned	1(3)	turned	1(3)	get
3	20(9)	of	53(8)	at	4(3)	turned	1(2)	walked	14(8)	at	4(3)	asked
4	2(3)	get	7(3)	turned	1(2)	trouble	4(3)	get	1(2)	again	4(3)	one
5	3(3)	one	2(2)	trouble	36(8)	at	32(8)	at	1(2)	first	35(8)	at
6	1(2)	again	3(2)	start	55(9)	of	5(3)	asked	1(2)	sound	6(2)	turned
7	1(2)	avenue	11(3)	asked	3(2)	avenue	5(3)	from	1(2)	start	2(2)	stopped
8	1(2)	park	4(2)	sound	3(2)	sound	2(2)	again	3(3)	asked	2(2)	trouble
9	1(2)	start	89(9)	of	3(2)	start	2(2)	other	3(3)	get	7(3)	from
10	1(2)	stopped	6(2)	again	3(2)	walked	2(2)	sound	6(4)	it	8(4)	car
11	4(3)	she	6(2)	avenue	10(3)	asked	2(2)	trouble	22(9)	of	3(2)	avenue
12	2(2)	been	16(3)	one	10(3)	from	7(3)	one	33(12)	and	3(2)	start
13	2(2)	front	7(2)	first	11(3)	'm	7(3)	she	4(3)	'm	3(2)	walked
14	2(2)	other	1(1)	carrying	5(2)	again	3(2)	avenue	4(3)	one	9(3)	she
15	5(3)	asked	1(1)	'd	5(2)	first	3(2)	start	2(2)	avenue	24(5)	bank
16	6(4)	car	1(1)	glad	5(2)	front	8(3)	help	2(2)	been	4(2)	again
17	6(3)	from	1(1)	national	5(2)	heard	8(3)	'm	2(2)	front	4(2)	heard
18	6(3)	'm	1(1)	problem	5(2)	park	4(2)	be	2(2)	on	4(2)	other
19	3(2)	alarm	1(1)	quiet	5(2)	suitcases	4(2)	like	2(2)	suitcases	4(2)	park
20	3(2)	can	1(1)	shouts	12(3)	one	4(2)	stopped	11(5)	bank	4(2)	sound
21	3(2)	got	1(1)	trying	1(1)	air	29(5)	I	5(3)	from	11(3)	'm
22	3(2)	into	8(2)	alarm	1(1)	answer	23(5)	bank	5(3)	she	5(2)	alarm
23	3(2)	like	8(2)	park	1(1)	carrying	5(2)	alarm	3(2)	all	5(2)	been
24	3(2)	suitcases	8(2)	stopped	1(1)	'd	5(2)	front	3(2)	back	5(2)	front
25	3(2)	walked	8(2)	walked	1(1)	face	5(2)	park	3(2)	crowd	5(2)	suitcases
26	4(2)	all	18(3)	from	1(1)	glad	1(1)	along	3(2)	into	1(1)	along
27	4(2)	happened	18(3)	'm	1(1)	hurry	1(1)	filled	3(2)	like	1(1)	answer
28	4(2)	heard	19(3)	she	1(1)	national	1(1)	ground	3(2)	other	1(1)	carrying
29	13(4)	suitcase	9(2)	been	1(1)	thing	1(1)	much	3(2)	park	1(1)	couldn
30	1(1)	afraid	9(2)	front	1(1)	worried	1(1)	national	3(2)	started	1(1)	each

Note. The number in brackets represents the frequency which the word appears in the reference corpus.

Table 4. Descriptive statistics of lexical alignment in two categories

	Lexical Alignment							
	Notional Words						Functional Words	
	Verb		Noun		Adjective			
	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.
Visual	2.80	1.32	4.14	4.26	1.50	0.71	11.09	17.59
Tactile	6.33	4.00	4.88	3.31	1.00	0.00	39.64	64.84
Kinesthetic	4.22	3.03	2.60	1.84	1.00	0.00	35.14	43.01
Auditory	4.25	2.12	5.75	7.15	1.33	0.58	16.73	27.23
Group	2.33	1.03	3.43	3.41	3.00	.	13.38	26.46
Individual	2.82	1.78	6.67	6.71	4.00	.	14.67	21.89

As for phrasal and clausal level on the whole, the mean number of aligned phrases was 3.76 (SD = 2.57), while the average of aligned clauses was 1.24 (SD = 1.18). Table 5 shows the descriptive statistics of phrasal and clausal alignment in six PLS. It was found that group and auditory styles relatively outperformed on phrasal alignment while visual and tactile performed better on clausal alignment. However, Kruskal-Wallis tests indicated that no statistically significant differences among these six classifications on phrasal (H = 3.245, p = .662) and clausal (H = 2.958, p = .706) alignment.

Table 5. Descriptive statistics of phrasal and clausal alignment in six PLS

		Alignment			
Group	N	Phrasal Alignment		Clausal Alignment	
		Mean	SD.	Mean	SD.
Visual	11	3.18	2.79	1.55	0.93
Tactile	33	3.76	2.53	1.45	1.39
Kinesthetic	23	4.00	2.36	1.26	1.29
Auditory	17	4.18	2.88	1.06	1.03
Group	8	4.25	3.15	0.88	1.13
Individual	23	3.17	1.70	1.26	1.32

4.2 Differences of EFL Learners With Different PLS on Linguistic Performance in RWICT

Table 6 describes differences of each PLS in total scores, content, structure and language respectively. Overall, the mean score of participants' RWICT outperformed topic writing in each sub-dimension except for group styles in language, but the differences did not reach statistically significant (p = .243). Wilcoxon Signed Ranks tests statistically revealed that significant differences in total scores (p = .000), content (p = .000) and structure (p = .000), while the differences in language did not reach statistically significant. Further analysis of paired samples tests and Wilcoxon Signed Ranks tests were displayed in table 7. Specifically, in regard to writing scores, significant differences between RWICT and topic writing were observed among participants with visual (p = .022), tactile (p = .002), auditory (p = .035)

and individual ($p = .016$) styles, but no significant differences were found in kinesthetic and group styles. For participants' writing content, differences among visual ($p = .042$), tactile ($p = .003$), auditory ($p = .043$) and individual ($p = .011$) styles reached statistically significant exclude kinesthetic and group styles. Furthermore, in the case of structure, significant differences were found among visual ($p = .002$), tactile ($p = .001$), kinesthetic ($p = .045$), auditory ($p = .019$) and individual ($p = .001$) learning styles, while no significant differences were found in group styles.

Table 6. Descriptive statistics of scores in two writing tasks

	Score		Content		Structure		Langugae	
	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.
Visual A	75.45	6.44	30.14	2.85	22.32	2.19	23.00	2.51
Visual B	79.34	5.06	31.95	2.10	24.00	1.12	23.39	2.84
Tactile A	75.73	6.09	29.88	3.03	22.55	1.75	23.31	1.93
Tactile B	79.74	5.23	31.80	2.47	23.98	1.49	23.95	2.11
Kinesthetic A	76.04	5.85	30.04	2.79	22.67	1.46	23.33	2.19
Kinesthetic B	78.30	5.70	31.11	2.69	23.57	1.71	23.63	2.30
Auditory A	76.12	6.41	29.97	3.00	22.38	1.87	23.76	1.97
Auditory B	79.85	4.41	31.53	2.18	23.76	1.29	24.56	1.55
Group A	77.81	4.90	30.31	2.67	22.75	1.20	24.75	1.74
Group B	78.38	4.61	30.94	2.35	23.44	1.50	24.00	1.74
Individual A	75.48	6.64	30.04	2.99	22.24	1.96	23.20	2.39
Individual B	79.34	4.97	31.80	2.25	23.93	1.33	23.60	2.30

Note. A-topic writing, B-RWICT

Table 7. Differences among scores, content and structure in two writing tasks

		Visual A & B	Tactile A & B	Kinesthetic A & B	Auditory A & B	Group A & B	Individual A & B
	N	11	33	23	17	8	23
	Scores	0.022*	0.002**	0.132	0.035*	0.723	0.016*
P-value	**Content**	0.042*	0.003*	0.126	0.043*	0.431	0.011*
	Structure	0.02*	0.001**	0.045*	0.019*	0.264	0.001**

Note. A-topic writing, B-RWICT

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

As for linguistic performance in CAF, table 8 summarizes EFL learners' language accuracy in the reading-writing integrated continuations are mildly superior to topic writing exclude individual styles, while the difference was not statistically significant ($p = .658$). Further analysis of paired samples test in accuracy between topic writing and RWICT was given in table 9, which indicated significant differences did specifically exist in learners with visual ($t = -3.646$, $p = .004$), tactile ($t = -5.187$, $p = .000$), kinesthetic ($t = -3.973$, $p = .000$) and auditory styles ($t = -3.171$, $p = .006$) with the exception of group and individual styles. In terms of three indexes of language complexity, Wilcoxon Signed Ranks tests showed that statistically significant differences between topic writing and RWICT ($p = .000$, $p = .000$, p

= .001 *respectively*). Only two dimensions showed an opposite trend, like learners with group styles on C/T and visual learners on CP/C, but the differences did not reach statistically significant ($p = .401$, $p = .901$ *respectively*). In the case of fluency, statistically significant differences in each PLS were reached between two writing tasks ($p < .05$).

Table 8. Descriptive statistics of CAF in two writing tasks

| | Accuracy | | Complexity | | | | | | Fluency | |
| | | | C/T | | DC/C | | CP/C | | | |
	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.
Visual A	0.30	0.30	1.79	0.50	0.39	0.09	0.21	0.15	16.90	5.83
Visual B	0.61	0.27	1.42	0.25	0.26	0.10	0.22	0.14	10.43	3.08
Tactile A	0.45	0.27	1.67	0.35	0.35	0.09	0.19	0.11	14.66	4.15
Tactile B	0.67	0.17	1.48	0.22	0.29	0.09	0.14	0.10	10.47	2.16
Kinesthetic A	0.46	0.25	1.64	0.33	0.36	0.09	0.21	0.11	14.80	3.88
Kinesthetic B	0.65	0.18	1.49	0.21	0.28	0.09	0.14	0.10	10.39	1.84
Auditory A	0.49	0.32	1.62	0.35	0.33	0.08	0.20	0.13	15.45	3.95
Auditory B	0.69	0.17	1.53	0.25	0.29	0.10	0.16	0.13	11.50	1.86
Group A	0.64	0.24	1.61	0.25	0.36	0.10	0.14	0.09	14.61	1.67
Group B	0.67	0.19	1.70	0.16	0.35	0.09	0.11	0.04	11.55	1.33
Individual A	0.42	0.23	1.63	0.31	0.36	0.09	0.22	0.13	15.33	4.18
Individual B	0.41	0.22	1.41	0.17	0.26	0.06	0.18	0.13	10.43	1.58

Note. A-topic writing, B-RWICT

Table 9. Results of paired samples test in accuracy of two writing tasks

	Paired Samples Test							
	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Visual A & B	-0.310	0.282	0.085	-0.500	-0.121	-3.646	10	0.004**
Tactile & B	-0.222	0.246	0.043	-0.310	-0.135	-5.187	32	0.000***
Kinesthetic A & B	-0.192	0.232	0.048	-0.293	-0.092	-3.973	22	0.001***
Auditory A & B	-0.199	0.259	0.063	-0.333	-0.066	-3.171	16	0.006**
Group A & B	-0.033	0.192	0.068	-0.193	0.128	-0.484	7	0.643
Individual A & B	0.004	0.220	0.046	-0.092	0.099	0.078	22	0.939

Note. A-topic writing, B-RWICT
*** Correlation is significant at the 0.001 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

To sum up, for linguistic performance, Chinese EFL learners with visual, tactile and auditory learning styles were prone to generate content-rich, well-organized and more accurate continuous writing.

4.3 Correlations Between EFL Learners' PLS and Writing Proficiency in RWICT

Having eliminated two invalid data, participants' scores of topic writing and RWICT were as the indicator of correlations. Table 10 presents correlations between six PLS and two writing tasks respectively. According to Person Correlation, negatively significant correlation was tested between auditory learning styles and RWICT scores ($r = -.634$, $p = .006$), but correlations were not found in topic writing proficiency and other PLS in RWICT.

Table 10. Correlations between EFL Learners' PLS and writing proficiency in two writing tasks

<div align="center">Correlations</div>

		Visual A	Tactile A	Kinesthetic A	Auditory A	Group A	Individual A
topic writing	**Pearson Correlation**	-0.102	0.12	-0.149	-0.038	-0.44	-0.139
	Sig. (2-tailed)	0.766	0.504	0.497	0.884	0.275	0.526
	N	11	33	23	17	8	23
		Visual B	Tactile B	Kinesthetic B	Auditory B	Group B	Individual B
continuation task	**Pearson Correlation**	-0.409	-0.016	-0.063	-.634**	-0.078	0.093
	Sig. (2-tailed)	0.211	0.928	0.774	0.006	0.854	0.672
	N	11	33	23	17	8	23

Note. A-topic writing, B-RWICT

** Correlation is significant at the 0.01 level (2-tailed).

4.4 Interview Results

Results from participants' immediate interview showed similar tendency in the first two questions. Most students preferred to precept new information through visual and auditory input, as well as participating in learning activities as a tactile or kinesthetic style learner. They also indicated that RWICT was conducive to content construction and language expressions. For example:

> With an understanding of the culture and logical thinking in English, I was able to read and then write in a more authentic way, and the more stories I read, the more ideas I will have. Role play or class activities can enhance my absorption and understanding of a language. This language will also be more authentic (student 9, tactile & kinesthetic style).

> When I read and then write, I associate the whole story framework, try to fit the language to the given story and to the characters, and then think outside the box to continue the plot (student 16, tactile & kinesthetic style).

While experiencing RWICT and topic writing, the majority of participants expressed their different perceptions. For example:

> Topic writing can be finished at a more restrictive or identical way. There is no room to extend since abundant templates have been stored in our memory. However, RWICT can use individual imagination and the content will be more different depending on personal accumulation and logical thinking, which is a test of thinking skills, demanding a lot of time to design and refine (student 14, visual & individual style).

> I think topic writing is more formatted, so reciting more templates is a common test-taking skill. But RWICT focuses on the use of sentences, which requires accurate application of grammar and vocabulary. The latter is a little more difficult (student 46, tactile & auditory style).

5. Discussion and Conclusion

Consistent with Reid' perceptual learning style model in a new EFL writing form, the present

study was aimed at examining the effect of perceptual learning styles on Chinese EFL learners' writing proficiency in the reading-writing integrated continuation task. Three conclusions were drawn from the current study.

The first research question is to identify the differences of learners with diverse perceptual learning styles on linguistic alignment in the reading-writing integrated continuation task. Although students tend to use words and expressions provided in the given passage, the results indicate that no significant differences were in lexical, phrasal and clausal alignment except for group and auditory styles slightly outperforming on phrases while visual and tactile learners performing better on clauses. Group and auditory learners mentioned that they paid more attention to content construction, which was held the story together through key words and expressions. Text-based continuation task in this study was conducive to visual students since they prefer to acquire new information through visual input. Traditional teaching methods where the teacher stands at the lectern then writes on the blackboard and students spend most of the time in taking notes, which stimulates the sensitivity of tactile learners to catch some expressions and sentence patterns by taking notes. However, other disappointing findings may be explained by two reasons: input and measurement methods. The essence of language learning in the continuations is to iron out the asymmetry existed between reading comprehension and writing production through alignment and creative imitation (Wang, 2021). To achieve successful language acquisition, input has played a crucial role. Krashen and Mason (2020) updated that the "optimal input" should be characterized as "comprehensible, compelling, rich and abundant". The repetition of a new language for EFL learners could accelerate the internalization of its grammatical structures, reinforce their brain representation and ultimately achieve the acquisition (Tomasello, 2003). Meanwhile, the alignment with idiomatic expressions provided in the reading material could not be optimized through single text-based continuation task in this study. The match between instructional design and perceptual learning styles could be promoted via multidimensional planning activities such as cooperative discussion or outline drawing and auditory/group/individual-oriented content as well. On the other side, the explanation for the small effect size in the present study is that perceptual learning styles should be regarded as a mediator other than a direct factor influencing learners' alignment within the continuation task. L2 learning strategies and learning efforts might be affected by perceptual learning styles, which enjoyed a direct connection with L2 writing proficiency (Teng & Zhang, 2016), but more variables like students' established English level (Yang, 2015), genre (Zhang & Zhang, 2017), learner's consciousness (Du, 2017) may contribute to the linguistic alignment. Moreover, albeit for the universality of Reid's scale for non-native learners, over-reliance on it might not faithfully mirror the dynamism and variability of perceptual learning styles, causing experimental error.

The second question in this study sought to determine the differences of language complexity, accuracy and fluency among learners with different perceptual learning styles in the continuation task. The most evident finding is that visual, tactile and auditory learners were likely to generate content-rich, well-organized and more accurate continuations, mirroring the previous studies that visual and auditory styles would avail L2 writing performance (Kim &

Kim, 2014; Mulinti, 2020). Compared with topic writing, students were provided a vivid context where grammatical structures such as attributive clauses, adverbial clauses of condition and psychological description of the figure could be drawn on from the input text, which has confirmed the washback effect on L2 production in the continuations. What is unanticipated is that students' linguistic fluency in topic writing outperformed that in the continuation task, corroborating the precious study that no significant differences were found on fluency between these two groups (Jiang & Chen, 2015). Three possible interpretations could give rise to this observation. First, "noticing is a prerequisite for the emergence of alignment" (Xin, 2017: 515), given that adults could not acquire the target linguistic forms without conscious attention since they seem to have lost the language ability as in childhood (Schmidt, 1983: 172). Without any appropriate attentional enhancement, students' cognitive competence is restricted in possessing such unfamiliar or not acquired language forms, for instance, several participants did not align with the simple past tense which was frequent in the input text even they have learned it from the middle school. When performing the continuation task, students were required to write a composition of completion, extension and creation (Wang, 2016), during which attentional resources are competed for content construction, structure cohesion, language accuracy and complexity, leading to certain grammatical errors triggered by the imbalance of attention allocation. Therefore, EFL learners should "notice the gap" between their individual L2 output and authentic L2 input (Schmidt, 2012) through underlining, highlighting or teaching guidance to bridge such asymmetry. Second, measurement of complexity, accuracy and fluency differs in linguistic system, where learners are required to extract underlying syntactic rules for harnessing complexity and accuracy, whereas those in fluency needs to retrieve lexical chunks from their memory (Skehan, 1998). When processing the new information, only long-term memory could contribute to preventing the influence of attentional resources. Given these, students' familiarity with the topic, fixed sentence patterns in the long-term memory and lucid reading material in this study lead to a better fluency in topic writing compared with the continuation task. Third, the source text which matches learners' production ability could generate more automatic alignment, coupled with the improvement in writing fluency and accuracy (Peng *et al.,* 2020). Consequently, simplified language units (*e.g. "It was from the bank." and "She thinks I'm the bank thief!"*) in the present research may not trigger the enthusiasm or potential of imitation and creation as such representations have been proficiently utilized for participants.

The last research question suggested that learners who prefer audio input showed in inferiority on the continuous writing. Such finding is contrary to the previous study which has reported by Kim and Kim (2014) that auditory styles was positively correlated with English proficiency. A possible explanation for such difference might be the non-equivalence between L2 English proficiency and L2 writing proficiency where the former is the ability of L2 learners to use the language in spoken and written contexts whilst "literacy variables like lexicon, syntax and cohesion as well as text genres attributed to L2 academic writing proficiency" (Marín, 2021). Meanwhile, "auditory students prefer listening to lectures and seminars, and participating in discussions" (Mulalic *et al.,* 2009), but no collaborated or discussed activities designed in the current writing have prohibited students' language

endowment, echoing Reid's (1987) hypothesis that a mismatch between task design and perceptual learning styles "causes learning failure, frustration and demotivation".

6. Implications and Limitations

The present study is the first attempt to testify the effect of Chinese EFL learners' perceptual learning styles on writing proficiency from the lens of the reading-writing integrated continuation task. Regarding the implications for language learning and teaching, three suggestions are provided. First, both students and teachers are recommended to identify and try to accommodate their/students perceptual learning styles as "a mismatch between teaching and perceptual learning styles causes learning failure, frustration, and demotivation" (Reid, 1987; Peacock, 2001). Given the dynamism of such implicit trait, students should consciously notice and adjust individual preferred learning habits since effective learners seem to manipulate diverse styles with flexibility (Dörnyei, 2005: 157). While teachers are encouraged to strive for the multimodal and changeable pedagogy. Second, this paper contributes to recent insight on individual difference in the continuation task, an important factor related to L2 proficiency (Skehan, 1989). The roles of effectiveness in the continuation task have been extensively studied, while investigation on interactor himself in a dynamic and implicit manner may be an intriguing turn for further exploration. Third, according to Ellis (2002), planning such as rehearsal, strategic planning, and within-task planning is conducive to language fluency. In this way, boost effect will be substantially increased and attentional resources will be appropriately allocated via targeted research design and teaching treatment.

However, several limitations need to be noted. Firstly, albeit for the wideness of Reid's scale, certain critiques argued on its ambiguousness. For example, Fleming (2001) proposed VARK mode to bridge the confusion among six categorizations by emphasizing four language skills (listen speaking, read and write). Secondly, students' continuation task proficiency might be influenced by numerous variables such as aptitude, motivation, ideal L2 self, anxiety, burndom, strategies, which contribute to the possible explanation for our disappointing results on alignment and linguistic performance. Thirdly, the reading material in this study is presented through text, the lack of multimodal input modes does not maximize other types of learners for optimum learning outcome. It only focused on compelling plot, where language forms were too easy to trigger students' interactive motivation and creative passion. Future studies of the input text are recommended to be compatible with their actual development level to maximize alignment effect and stimulate language endowment.

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Appendix 1. Perceptual Learning Style Preference Questionnaire

(Strongly Agree=SA, Agree=A, Undecided=U, Disagree=D, Strongly Disagree=SD)

Questionnaire statements	SA	A	U	D	SD
1. When the teacher tells me the instructions I understand better.	5	4	3	2	1
2. I prefer to learn by doing something in class.	5	4	3	2	1
3. I get more work done when I work with others.	5	4	3	2	1
4. I learn more when I study with a group.	5	4	3	2	1
5. In class, I learn best when I work with others.	5	4	3	2	1
6. I learn better by reading what the teacher writes on the chalkboard.	5	4	3	2	1
7. When someone tells me how to do something in class, I learn it better.	5	4	3	2	1
8. When I do things in class, I learn better.	5	4	3	2	1
9. I remember things I have heard in class better than things I have read.	5	4	3	2	1
10. When I read instructions, I remember them better.	5	4	3	2	1
11. I learn more when I can make a model of something.	5	4	3	2	1
12. I understand better when I read instructions.	5	4	3	2	1
13. When I study alone, I remember things better.	5	4	3	2	1
14. I learn more when I make something for a class project.	5	4	3	2	1
15. I enjoy learning in class by doing experiments.	5	4	3	2	1
16. I learn better when I make drawings as I study.	5	4	3	2	1

17. I learn better in class when the teacher gives a lecture.	5	4	3	2	1
18. When I work alone, I learn better.	5	4	3	2	1
19. I understand things better in class when I participate in role-playing.	5	4	3	2	1
20. I learn better in class when I listen to someone.	5	4	3	2	1
21. I enjoy working on an assignment with two or three classmates.	5	4	3	2	1
22. When I build something, I remember what I have learned better.	5	4	3	2	1
23. I prefer to study with others.	5	4	3	2	1
24. I learn better by reading than by listening to someone.	5	4	3	2	1
25. I enjoy making something for a class project.	5	4	3	2	1
26. I learn best in class when I can participate in related activities.	5	4	3	2	1
27. In class, I work better when I work alone.	5	4	3	2	1
28. I prefer working on projects by myself.	5	4	3	2	1
29. I learn more by reading textbooks than by listening to lectures.	5	4	3	2	1
30. I prefer to work by myself.	5	4	3	2	1

Appendix 2. Continuation task

Please read the incomplete story carefully and try to complete it to make it logical, coherent and interesting. You're encouraged to write on the *ANSWER SHEET* about 200 words within 40 minutes.

Marks will be awarded for content relevance, content sufficiency, organization, language quality and appropriateness. Failure to follow the above instructions may result in a loss of marks.

A funny thing happened to Arthur when he was on the way to work one day. As he walked along Park Avenue near the First National Bank, he heard the sound of someone trying to start a car. He tried again and again but couldn't get the car moving. Arthur turned and looked inside at the face of a young man who looked worried. Arthur stopped and asked, "It looks like you've got a problem," Arthur said.

"I'm afraid so. I'm in a big hurry and I can't start my car."

"Is there something I can do to help?" Arthur asked. The young man looked at the two suit cases in the back seat and then said, "Thanks. If you're sure it wouldn't be too much trouble, you could help me get these suitcases into a taxi."

"No trouble at all. I'd be glad to help."

The young man got out and took one of the suitcases from the back seat. After placing it on the ground,he turned to get the other one. Just as Arthur picked up the first suitcase and started walking, he heard the long loud noise of an alarm.

It was from the bank.There had been a robbery!

Park Avenue had been quiet a moment before. Now the air was filled with the sound of the alarm and the shouts of people running from all directions. Cars stopped and the passengers joined the crowd in front of the bank. People asked each other,"What happened?" But everyone had a different answer.

Arthur, still carrying the suitcase, turned to look at the bank and walked right into the young woman in front of him.

She looked at the suitcase and then at him. Arthur was surprised. "Why is she looking at me like that?" He thought. "The suitcase! She thinks I'm the bank thief!"

Arthur looked around at the crowd of people. He became frightened, and without another thought, he started to run...

Appendix 3. Topic writing

Write on the *ANSWER SHEET* a composition of about 200 words within 30 minutes on the following topic: *Is it advisable for a college student to have a part-time job?*

Marks will be awarded for content relevance, content sufficiency, organization, language quality and appropriateness. Failure to follow the above instructions may result in a loss of marks.

Appendix 4. Scoring criteria of continuation task and topic writing

categories		criteria	score	total
Content (40%)	thesis statement	Main idea/point of view of writer clear, reasonable and representing the text (explicit or implicit thesis).	10	40
	overall clarity	Presentation of ideas easy to understand, not confusing.	10	
	interest	Writing capturing reader's attention with imaginative, insightful, unusual perspectives.	10	
	developed ideas	Explanation or elaboration of the main idea; ideas relevant to the given topic.	10	
Organization (30%)	introduction	Opening focusing or pointing to what the writer will talk about, appealing to reader, preparing for what is coming.	6	30
	logical sequence	Ideas following logically within paragraphs.	12	
	conclusion	Synthesis of entire paper through summary, suggestions or predictions based on what has been said, strong finish preferred.	6	
	unity	Continuation task conforms to the given passage.	6	
language (30%)	Correctness	Each sentence is correct with a subject and a verb, subject-verb agreement and correct verb tenses.	24	30
	Mechanics	No errors like punctuation, spelling and capitalization.	6	

Note

Note 1. TEM-4 refers to Test for English Majors Band Four in China.

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