

## **An Empirical Research on Schema Theory Based Teaching of the Continuation Task for Chinese Senior High School Students**

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### **Abstract**

The continuation task, a novel type of source-based writing task which requires students to read and accomplish an unfinished source text, has gained growing popularity in English writing tests, particularly in China. This study employed schema theory in the teaching of senior high school continuation tasks and delved into its resultant effects on learners' overall writing ability, lexical richness, syntactic complexity, and semantic coherence. Theoretically, it serves as an extension of the Schema theory, Practically, it contributes to the improvement of the continuation task instruction and offers a realistic method to achieving better writing from the perspectives of linguistic schema, content schema, and formal schema. This research revolves around such questions: What effects do schema theory-based Continuation task instructions have on students' overall writing competence; lexical richness; syntactic complexity and semantic coherence? During the research, two groups of EFL students (N=110) from Chinese senior high schools participated in the trial for fourteen weeks. One group was randomly selected as Control Class where the teacher adopted traditional teaching approaches. At the same time, the other was set up as the Experimental Class guided by schema theory. The participants writing performance were evaluated through the lexical richness, syntactic complexity and semantic coherence. Sample T-test and paired T-test found statistically significant differences between the Control class and the Experimental class. These findings suggest that the schema theory-based approach, such as providing a semantic map or outlining the story to participants, was proven effective in honing the students' overall writing capability, lexical richness, syntactic complexity, and semantic coherence. Because of the chosen research approach, its efficacy is limited concerning language and discourse.

**Keywords:** continuation task, lexical richness, Schema theory, semantic coherence, syntactic complexity

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## Introduction

Recently, source-based writing tasks is becoming increasingly popular in large-scale English assessment( De Fina, A. A., Anstendig, L. L., & De Lawter, K., 1991; Esmaeili, 2002; Shin & Ewert, 2015). In China context, the continuation task, an innovative mode of source-based writing task, which requires students to read and accomplish an unfinished source text, has been incorporated into the *National Matriculation English Test* (NMET), the university entrance English language test for the entire nation(Cheng & Qi, 2006), as early as 2016. Previous studies have revealed its facilitative effects on language learning. It is deemed a contributor to promoting vocabulary learning, writing fluency, writing accuracy, and divergent thinking ability ( Cui, Y., Yang, L., & Wolter, B., 2019; Peng, J., Wang, C., & Lu, X., 2020; Zhang, X., Du, L., & Zhu, X. 2022). Nevertheless, the pedagogical theories related to the Continuation tasks remain unexplored. To fill the research gap, the current study investigates the impact of schema theory and the writing method used in continuation tasks.

In the 21st century, writing is regarded more cognitively demanding process based on multiple text comprehension and analysis(List & Alexander, 2017). During this process, schema supplies a significant role in collecting background knowledge, building text structure, and constructing hierarchical organization. (Carrell & Eisterhold, 1983). The Schema theory has provided a new perspective for the study of Continuation Task teaching, as it explores a variety of effective strategies for activating existing schema, constructing new ones, and consolidating the inherent schema from the perspectives of linguistic schema, content schema, and formal schema. Theoretically, it contributes to the current set of ideas on Continuation task instruction and should be a development of the Schema theory. Practically, this study carries implications for both instructors and learners. As for the rank of teachers, this thesis offers a sound and panoramic view of the new writing task: The writing process of the continuation task instruction could also be considered a cognitive process of schema activation, schema conversion, and schema reorganization (Flower & Hayes, 1984). For students, it presents a viable solution to quality writing from the perspective of linguistic schema, content schema and formal schema. Therefore, this research revolves around such questions: What effects do schema theory-based Continuation task instructions have on students' overall writing competence; lexical richness; syntactic complexity and semantic coherence? To sum up, the above introduction describes the research background, purpose, and significance. Following are descriptions of the literature review, research methodology, discussion, and conclusion.

## Literature Review

### *Schema Theory*

Schema is the information structure by which knowledge is represented and stored in the human brain(Cook, 2000; Dahlin, 2001; Rumelhart, 1980). Linguistic schema, content schema, and formal schema are the three primary classifications of schemata from a linguistics standpoint(Al-Issa, 2006). linguistic schema refers to how pupils currently possess their innate language knowledge, which serves as the foundation and requirement for English writing(Carrell & Eisterhold, 1983). Content schema means the background knowledge of a discourse content stored, including familiarity with the topic, cultural knowledge, and related experience(Carrell, 1984b). Formal schema refers to the knowledge stored in humans' minds about the form, rhetoric, and structure of different types of discourse (Li, 1998).

Numerous research has shown the efficiency of the schema theory in various facets of EFL learning and teaching. Some studies have demonstrated that schema theory has been an important factor in the development of reading instruction models and has had a significant impact on reading comprehension (Carrell & Eisterhold, 1983; Sadoski et al., 1991; Xue, 2019). Recent studies have found that the application of the schema theory in English reading teaching enhances information processing and predictive reasoning (Yan, 2020). Others discovered that schema theory has been considered to activate learners' listening ability (Bilokcuoğlu, 2014; Chiang & Dunkel, 1992; Herron et al., 1995). Farangi and Kheradmand Saadi (2017) compared the effects of two well-practiced Schema theory-oriented approaches in listening comprehension. It was demonstrated that the schema group indicated a "more remarkable improvement in listening comprehension" compared to the dynamic assessment group.

One gap in the schema theory research is the majority of research concerning the application of schema theory in reading and listening instruction. For the past few years, several empirical studies have been conducted to explore the theory in the writing area (Zhou, 2005). The influence of Schema theory on the writing of test-takers in the Continuation task has hardly been investigated. Hudson (1982) found that once the readers' background knowledge was activated, it would complement writing competence with their language skills, which means the readers' lack of language skills can be compensated by their background knowledge. Accordingly, schema plays a greater role than one's foreign language proficiency in understanding the text. The schema theory probably provides researchers and teachers with a writing teaching model for representing and generating knowledge. This study examines the guiding function of schemas in the continuation task. Students in senior high school should benefit greatly from the new method of instruction because it offers them a fresh perspective and a different approach to learning.

### ***The Continuation Task***

The Continuation task has been around for many years. It was believed to "stimulate language learning efficiently" (Wang, 2012; Wang & Wang, 2015). Specifically, this type of story-end writing task furnishes scaffolding in terms of context structure, rhetorical devices, and language production, which is likely beneficial for learners to enhance their language competence (Hyland, 2000). In 2016, it has been incorporated into the *National Matriculation English Test* (NMET) writing section in Zhejiang Province (one of the NMET reform pilot zone). In the evaluation part, students' writing performance is evaluated by story development, usage of underlined expression from the source, language diversity and correctness. (Zhao, 2016). In the task, test-takers need to establish a situation model for comprehension and develop the story based on the model built to ensure the coherence of the whole story (Wang & Wang, 2015). More specifically, students are supposed to complete an unfinished story with 350 words, with a total score of 25.

Several studies determined that the testing application of the Continuation task can carry a positive wash-back (Peng et al., 2020; Wang, 2021; Ye et al., 2021; Zheng, 2019). Wang (2015) illustrated that when students were offered source text in English, they tended to employ more individual words and lexical chunks from the source and fewer linguistic errors in singular/plural forms, infinitive forms and tense. Zhang (2022) has examined the Continuation task gains more on correctness and enhances the writing quality of Cambodian Chinese students.

The gap in the continuation task research is that it laid too much emphasis on exploring whether alignment occurred and how the continuation task affected students writing performance. Until now, little attempt has been made to assess teachers' perspectives regarding how to promote students writing ability through a specific Continuation task teaching method. The current study aims to fill these research gaps. In the writing process of integrated reading-writing tasks, Bracewell et al. (1982) stated that discourse production requires the generation of text by language use, and comprehension involves the adherence of the language users to an already existing text, which exposes the close relationship between reading and writing. Moving from task representation to the cognition of reading and writing, Flower et al. (1990) explored reading not only for understanding the text but also provides a practical approach to help learners acquire helpful information from the source text. To these studies, the writing process requires the integration of background knowledge and involves the activation of a series of thinking processes. It coincides with the Schema theory, which shows the significance of the thinking process about activation and construction of existing knowledge. Therefore, this research will focus on the application of Schema theory to Continuation task teaching. By activating the schema that students inherently have in their minds, they can be assisted to produce new writing "schemata" to improve the quality and efficiency

### ***Schema Theory-Based Approach as the Design Equation***

Writing is a complicated mental activity that grows by interaction with other people or other texts (Sari et al., 2020; Smith et al., 1987). For half a century, studies have discussed a variety of instructions to teach writing, including the Product Approach, the Process Approach, and the Genre Approach (Bijami & Raftari, 2013). In this study, we adapt Process Approach to Continuation task instruction. The Process approach is based on communication theory and cognition theory, with the cultivation of students' ability to employ various skills during reading and cognitive activities as focuses. The teaching pattern of a typical Process Approach contains four stages, including pre-writing, drafting, revising, and editing (Faraj, 2015).

The learner's comprehension of the source paragraph in the Continuation task, according to Schema theory, is a mix of the text and their prior knowledge, experience, and cultural setting. O'malley et al. (1990) made a detailed explanation of the writing procedure: 1. Meta-cognitive, serving as planning the structure of written discourse or monitoring; 2. Cognitive, in the manner, that using known linguistic information to facilitate a new learning task; 3. Social/affective strategies, such as cooperating with peer revision classes. In addition, Sun (2014) suggests three main steps for Schema theory-based writing instruction: 1. Activating existing schemata. 2. Construct new schemata. 3. Consolidating students' schemata.

Hence, writing is the process that ESL learners are expected to activate existing schemata, construct new schemata, and consolidate schemata (see figure one). From above, we should follow some main points: 1. In Continuation writing, linguistic schema, content schema, and formal schema are combined to work. 2. Learners' schema can be built and enhanced in the process of pre-writing, while-writing and post-writing, which contains preparations, drafting, revising, editing, evaluating, and summary.

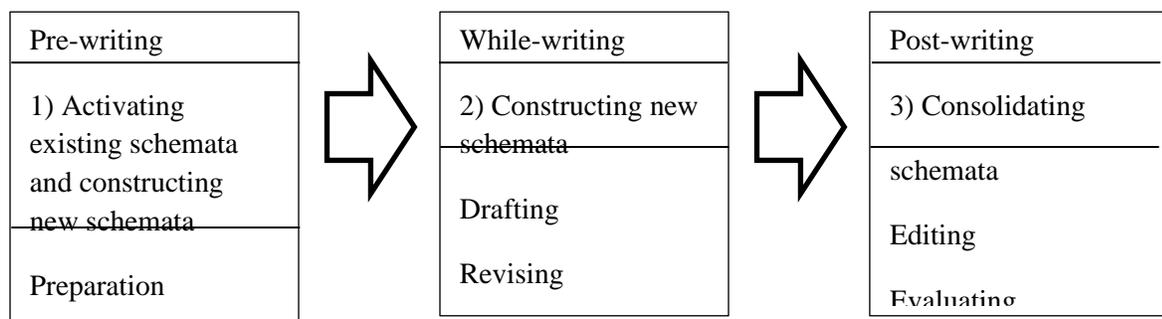


Figure 1. The teaching design based on schema theory

Given that attitudes have been associated with distinctive aspects of the continuing task and schema theory, the present study aims to evaluate the effectiveness of schema-theory-based instructional design for different linguistic elements.

### Method

This section contains the research questions and research design. The fourteen-week teaching experiment was conducted to determine the effect of Schema Theory on Senior High School Continuation task writing. To ensure the reliability and accuracy of schema theory applied to writing, the quantity and quality measurements were adopted in this research.

### Research Questions

The following research questions served as the direction for the investigation:

1. What effects do schema theory-based Continuation task instructions have on students' overall writing competence?
2. What effects do schema theory-based Continuation task instructions have on the lexical richness of students' writing?
3. What effects do schema theory-based Continuation task instructions have on the syntactic complexity of students' writing?
4. What effects do schema theory-based Continuation task instructions have on the semantic coherence of students' writing?

### Participants

At the beginning of the first semester, 110 freshmen at senior high school in Heze, a city of northern China, participated in the experiment. The school was chosen randomly from a pool of five public senior high schools in the city. Participants were selected following the purposive sampling principle and they were from two parallel classes, class 11 and class 12, with 55 students respectively. Class 11 was the experimental class with the guidance of the schema-based teaching method. While Class 12 was the control group, and they received instruction using the conventional methods. Table one shows the basic information of the participants.

Table 1. *Basic Information of participants*

	Number	Age	Years of learning English	The average of score (150-point scale)
EC	55	16-17	About 8 years	97.41
CC	55			95.25

Note: EC=experimental class; CC=control class

### **Research Instruments**

#### *Pre-test and Post-test*

The purpose of the pre-test was to determine whether students from the two distinct classes continued to write at the same level. While the purpose of the post-test was to determine whether students' writing skills improved after receiving schema-based instruction. The two tests were selected from the Continuation tasks in the Zhejiang NMET English test paper (see Appendix A). During the test, students were given 25 minutes to develop an unfinished source story within 150 words.

#### *Interview*

After the teaching intervention, six students, including two top students, two average students, and two low-level students were chosen to participate in the structured interview, and they answered the following questions:(1) What do you think of the new teaching approach? (2) Does the new teaching approach bring some benefits to you? What are these benefits? (3) Do you have any suggestions for the Continuation task writing class? To avoid confusion, participants were permitted to use their first language when necessary.

### **Research Procedures**

The experiment ran for 14 weeks to examine the effectiveness of Schema theory in the Continuation task teaching (see figure two).

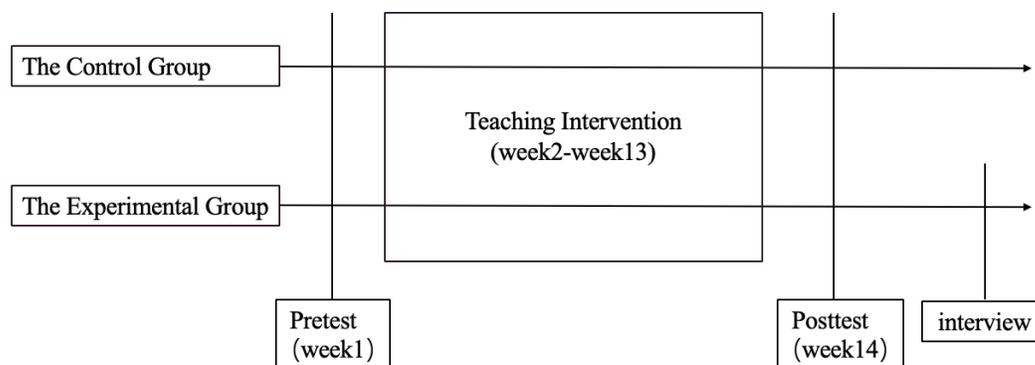


Figure 2. Experimental design

In the beginning, the researchers carried out a pre-test to fathom students' writing levels. Selected from the writing assignment for the 2016 Zhejiang NMET, the text paper was marked by a researcher and three experienced English teachers following *The Chinese Detailed Grading Rules on the National Matriculation English*.

The students in control and experimental groups were separated to attend different classes, which were assigned weekly. In the Control class, students received the traditional writing procedure. While in experimental class, the subjects would complete their compositions under the guidance of Schema theory.

After the experiment training, the researchers conducted a post-test in two classes. The test materials were selected from the writing part of the Zhejiang entrance examination papers, 2017 which they had never written before. All students in both classes were required to finish about 150 words in 30 minutes. Then, the students from EC were requested to accomplish the interview, aiming to figure out the effect schema-oriented writing teaching approach has on the students.

### ***Design of Teaching Intervention***

#### *Teaching procedures in the Experimental Class*

In experimental class, the subjects were instructed to complete their compositions under the guidance of Schema theory. Table two illustrated the flow of the teaching procedure.

Table 2. *A summary of the flow of the teaching procedure*

1. The teaching design in the pre-writing stage
Schemata processing: Activating existing schemata and constructing linguistic schema, content schema, and formal schema
Example activities: providing relevant background knowledge materials; pre-reading questions, outlining the structure of the source text; semantic mapping.
2. The teaching design in the while-writing stage
Schemata processing: Constructing new schemata
Example activities: drafting; making an outline of the story; revising the words and grammar; teacher supervision
3. The teaching design in the post-writing stage
Schemata processing: Consolidating new schemata
Example activities: self-editing and peer-editing; evaluating by teachers; Summary

As shown in Table two, activating existing schemata and building new schemata should be accomplished in the pre-writing stage. Schemata activation refers to inspiring the existing components of schema to help students predict what comes next in the source text (Anderson, 1984). In this scenario, teachers should strive to cultivate their students for them to realize and appreciate schemata activation. Before reading the source text, a brief introduction to the general topic, such as relevant reading materials, pictures, and short videos, can lay the groundwork for students to proceed well. Then, the focus should be turned to framework analysis. Carrell (1984a) did an experiment to prove that a precise critique of the text structure can serve to enhance learners' reading comprehension. In the writing task, understanding the source text's organization will be crucial for understanding and plot prediction in the continuation assignment. Take *Arthur and robbery* as an example (see table three).

Table 3. *The outline of the story: Arthur and robbery*

Wh-	What happened?
Who	Arthur; the young man
Where	Park Avenue near the First National Bank
When	One day
What	<u>Tone</u> : A funny story

Beginning: Arthur helped a young man who carried a big suitcase.

Development: Arthur heard the long, loud noise. He realized that the young man might be a bank thief.

Climax: Because of carrying the suitcase, Arthur was suspected as the robber. Frightened and nervous, Arthur ran. (Finished by students)

Ending: Arthur took a taxi and went to the police station. (Finished by students)

Additionally, students can build a bridge between the unfinished part and the source text through semantic mapping. Semantic mapping is a diagram that aids group discussion and helps students to see how concepts and ideas correlated to others (Freedman & Reynolds, 1980; Johnson et al., 1986). It reveals what students already know about the topic and provides a base upon which they can construct the new information acquired and extracted from a text. Take *Arthur and robbery* as another example (see figure three).

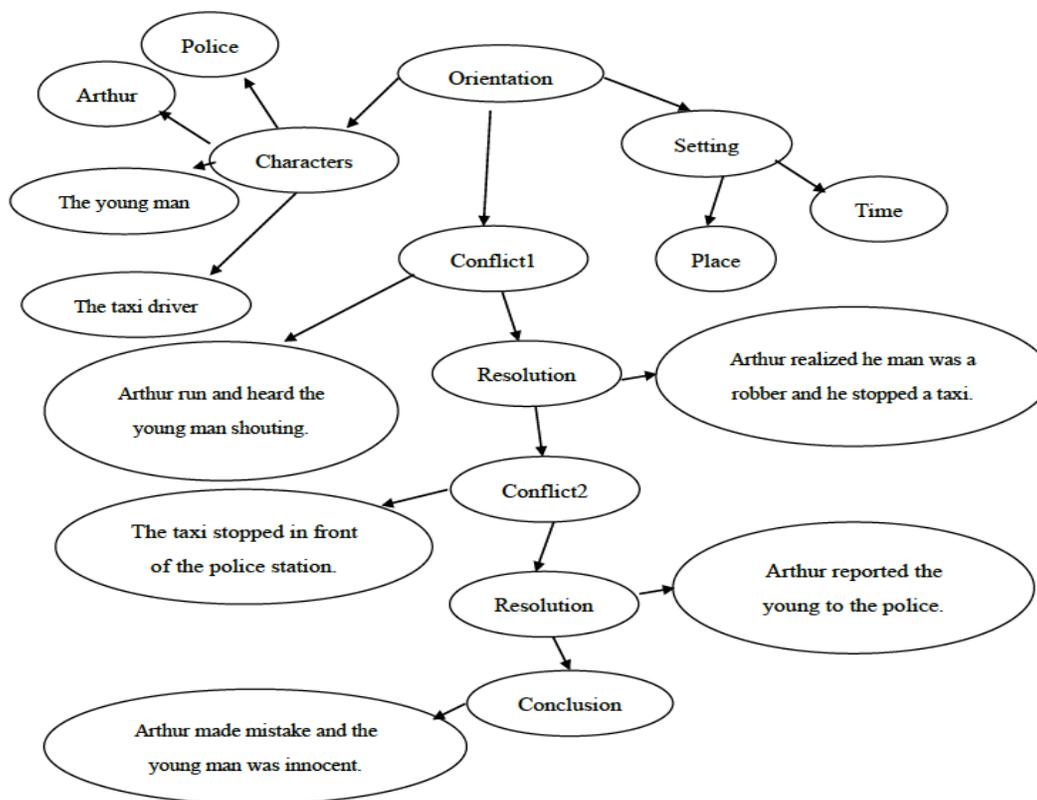


Figure 3. Semantic map

According to Rumelhart (1980), schemata bring connected concepts to life in the memory, suggesting that schemata would be useful for students to examine the text's material and construct new information. The teacher focuses on cultivating students' new schema, including linguistic schemata, content schemata and formal schemata. Linguistic schemata served as the cornerstone of writing, which refers to basic knowledge of pronunciation, vocabulary, and grammar. Content schemata refer to students' familiarity with their related background knowledge, such as subject-specific knowledge, cultural knowledge, and life experiences. Formal schemata are the understanding of the genre and organization of a text, such as allegories, narratives, poetry, and

plays. To sum up, based on the pre-writing activities, the existing schemata in students' minds have been activated and the new schemata constructed.

In the while-writing period, students should give full play to the related schema knowledge to transform information into sentences and paragraphs. During this period, firstly, students are supposed to make an outline according to the pre-writing activities and organize their ideas to complete the compositions of a specific topic independently within a required amount of time in class. In this phase, they do not need to care too much about grammar and spelling errors but focus on the story's content. In this way, students can pay attention to the development of the storyline and apply what they have formed to the upcoming process of while-writing. Secondly, after finishing the draft, the students are supposed to read their compositions to correct words, grammar, and others. During while-writing, teachers should observe the whole writing process and offer instructions. Moreover, students have 30 minutes to do their 150-word writing assignments.

Editing, including self-editing and peer-editing, remains a crucial stage in post-writing period. Seen as a complex and repeated process of trade-off and refinement, the process of editing plays a significant role in consolidating students' schemata and unleashing their passions for writing. According to composition marking standards, teachers are primarily responsible for analyzing composition structures, sentence content, grammar, and vocabulary (Appendix B). After editing and evaluating, students were required to rewrite their drafts based on the instructor's and their classmates' comments after distributing their works.

#### *Teaching procedures in the Control Class*

Step 1: At the beginning, the teacher gave students a sample essay about a fixated topic.

Step 2: After reading the passage, the teacher mainly walked students through vocabulary, phrases, and grammar. The teacher then gives instructions on how to learn important words, phrases, and sentence patterns.

Step 3: The teacher translated the essay sentence by sentence, and let students focus on the grammar.

Step 4: The instructor paid attention to the genre and structure of the writing sample, and allowed the students to use it as a model for their own compositions.

Step 5: Submit completed pieces, and the teacher will check these works after class.

#### *Measures*

We adapted the *English Writing Scoring Rubric for College Entrance Examination* (see Appendix B) to rate students' writing tasks, with a final score of 25. The researchers and three experienced raters scored test papers independently, and then took the average score as the final. Compared with the *ACTFL Proficiency Guidelines; Common European Framework of Reference for English Curriculum Standards; China's Standards of English Language Ability*, and the scoring rubric, the measurement of writing ability can be concluded within three criteria: lexical richness, syntactic complexity, Semantic coherence (Plakans & Gebril, 2013) (see Appendix C).

Lexical richness is about the quality of vocabulary in a language sample, which mainly focuses on lexical variation and lexical sophistication. (Wolfe-Quintero, 1998). On the one hand, the types-tokens ratio (TTR) defines lexical variation as the frequency of the same word in a

paragraph. Lexical sophistication, on the other hand, is the fraction of 'advanced' terms in the text. Syntactic complexity reveals itself in second language writing through the variety and sophistication of production units and grammatical structures.(Foster & Skehan, 1996; Ortega, 2003; Wolfe-Quintero, 1998). In this research, the measurement of syntactic complexity adopted three most commonly used measures: length of the production unit, clause density, and frequency of sentence types. In this study, the Continuation task is a narration and examined for students writing semantic relatedness. Accordingly, the author will take Latent semantic analysis as an indicator to measure the semantic coherence of the Continuation task. Latent Semantic Analysis (LSA) does not rely on the superficial feature of the text. Instead, it provides a fully automatic method for comparing units of textual information to each other to determine their semantic relatedness(Foltz et al., 1998). There are three variables in LSA, namely LSA sentence all, LSA paragraph, and LSA sentence adjacent. Since the top sentences in each section have already been given in the Continuation task, we analyzed LSA sentence all and LSA sentence adjacent.

### ***Data Collection and Analysis***

#### ***Data collection***

In this study, the researchers collected 220 valid compositions from Experimental Class (EC) and Control Class (CC) in the pre-test and the post-test, 110 students each from the pre-test and the post-test. To guarantee the reliability of the scores from all participants, besides the researchers, three experienced teachers were invited to grade composition based on the *English Writing Scoring Rubric for College Entrance Examination* (see appendix B). If the difference in scores graded by three teachers is less than three points, the average value would be considered the final score.

#### ***Data Analysis***

The scores of participants writing were recorded with Excel and analyzed by SPSS 25.0. Data analysis mainly included lexical richness, syntactic complexity, and semantic coherence. The online tool Vocabprofile (<http://www.lexutor.ca/vp/eng/>), created by Paul Nation and Averil Coxhead, was used to analyze lexical richness. Scientifically, it was able to determine the precise number of word varieties. The online software L2 Syntactic Complexity Analyzer (<https://aihaiyang.com/software/l2sca/>), built by Professor Lu Xiaofei, was used to analyze syntactic complexity. In this study, the author uses Coh-Metrix (<http://www.cohmetrix.com/>), a web-based discourse analyzer to deter students' discourse. It was designed by McNamara together with his team. Among the 11 Coh-Metrix analysis indicators, Latent Semantic Analysis (LSA) is viewed as a practical method that provides an accurate assessment of semantic coherence (McNamara et al., 2014).

### **Results**

#### ***Results from the Tests***

##### ***Research question 1: Overall writing competence***

Before the experiment, a pre-test was offered to evaluate students' potential for Continuation tasks. Writing test materials were selected from the Zhejiang college entrance examination papers (see appendix A), with a total score of 25.

Table 4. *Independent sample T-test of the pre-test scores*

Class	N	Mean	SD	t	Sig.
EC	55	16.747	2.221	.464	.543
CC	55	16.212	2.617		

According to Table four, the mean pre-test scores of the experimental group and the control group were 16.747 and 16.212, respectively. The P-value (Sig.) was equal to 0.543, which was greater than the significance level of 0.05. Statistics above certified there was no apparent distinction in writing competence between students from EC and CC. After four months of training, both classes took part in the post-test.

Table 5. *Independent sample T-test of post-test scores*

Class	N	Mean	SD	t	Sig.
EC	55	18.034	3.214	3.904	.001
CC	55	17.298	2.029		

In table five, the mean score of the EC(18.034) was higher than the CC(17.298), and the P-value was 0.001(<0.05), indicating a marked difference in mean post-test scores between the two groups.

Table 6. *Paired-samples T-tests of the Scores of the Experimental Class*

Test	N	Mean	SD	t	Sig.
Pre-test	55	16.212	2.617	3.016	.000
Post-test	55	18.034	3.214		

In addition to the independent samples T-test, paired samples T-tests were employed to compare the pre-test and the post-test performance of EC and CC pupils. In table six, the mean score of the post-test in the EC was 18.034, higher than the pre-test(16.212). The P-value of 0.000(<0.05) reveals a statistically significant difference between the two data sets.

### *Research question 2: Lexical richness*

The effect on lexical richness is presented from two indexes: lexical variation and lexical sophistication.

#### *Lexical variation*

TTR (Type-token ratio) is a measure of lexical variation. The number of words in a text is regarded as the number of tokens. The P-value(0.002<0.05) in table seven indicates a considerable distinction between the Experimental Class and the Control Class.

Table 7. *Independent-Samples T-test of Lexical Variation*

Test	Indicator	Class	N	Mean	SD	t	Sig.
Pre-test	TTR	EC	55	.573	.131	-.681	.317
		CC	55	.556	.127		
Post-test	TTR	EC	55	.683	.100	2.853	.002
		CC	55	.564	.148		

Table eight displays the EC's test results for the pre-test and the post-test. The mean EC post-test score was 0.683, which was higher than the mean EC pre-test score (0.573). Moreover, the P-value of 0.000 ( $<0.05$ ) suggests that the results are substantially different.

Table 8. *Paired Samples t-test of lexical variation of the experimental class*

Test	Indicator	N	Mean	SD	t	Sig.
Pre-test	TTR	55	.573	.131	2.447	.000
Post-test	TTR	55	.683	.100		

### *Lexical sophistication*

As an important addition to the lexical richness, the distribution of the three bands of words was used to quantify lexical sophistication.

Table 9. *Lexical sophistication of EC and CC*

Test	Indicator	EC		CC		t	Sig.
		Mean (%)	SD	Mean (%)	SD		
Pre-test	K1 words	88.136%	5.66	88.721%	4.15	.517	.647
	K2 words	9.87%	2.24	9.34%	2.37	-.422	.359
	K3 words	3.16%	3.62	2.83%	4.16	.653	.637
Post-test	K1 words	81.17%	5.78	86.83%	4.78	2.356	.025
	K2 words	12.52%	2.86	10.51%	1.24	3.533	.004
	K3 words	6.32%	4.02	3.62%	4.02	2.542	.001

Notes:

K1 words: The proportion of the first 1000 words of a composition that are used the most.

K2 words: The proportion of the second 1000 most frequent words in the composition.

K3 words: The proportion of a composition's words that are beyond the first 2000 high-frequency words.

Table nine presents the lexical sophistication of the pre-test and the post-test in both EC and CC. In the pre-test, there was no significant difference between K1 words, K2 words, and K3 words in EC and CC. Their P-values were 0.647 ( $>0.05$ ), 0.359 ( $>0.05$ ), and 0.637 ( $>0.05$ ), respectively. In the post-test. The mean scores of K1 words were 81.17% and 86.83%, respectively, in EC and CC. There is a significant difference between them in terms of K1 words ( $p=0.025<0.05$ ). As for the percentage of K2 words, data extracted from EC (12.52%) was equal to that of CC (10.51%), and the difference is statistically significant ( $p=.004<0.05$ ). Besides, the mean scores of K3 were 6.32% and 3.62% in EC and CC, respectively. The difference had also reached a statistically significant level. ( $p=0.001<0.05$ ).

Table 10. Paired samples t-tests of lexical sophistication of the experimental class

Class	Indicator	Pre-test		Post-test		t	Sig.
		Mean (%)	SD	Mean (%)	SD		
EC	K1 words	88.13%	5.66	81.17%	5.78	2.577	.007
	K2 words	9.87%	2.24	12.52%	2.86	2.913	.003
	K3 words	3.16%	3.62	6.32%	4.02	3.3.11	.021

Table ten shows that in K1, K2, and K3 terms, the mean lexical sophistication for the EC was 88.13%, 9.87%, and 3.16%, compared to 81.17%, 12.52%, and 6.32% for the CC. The P-values were 0.007, 0.003 and 0.021, and all of them were far away from 0.05. This has shown significant changes between pre-test and post-test in the EC.

Therefore, it could be concluded that the Schema-Oriented Approach contributed much more than traditional teaching regarding increasing lexical variation in students' composition.

#### Research question 3: syntactic complexity

To answer question three, we focus on the syntactic features from three aspects: production unit length; clause density, and sentence patterns.

#### Production Unit Length

Table eleven shows the mean values and standard deviations of production unit lengths. The mean scores of W/T in the pre-test were 11.02 in EC and 10.78 in CC. The mean scores (8.25, 8.19) and P-values (0.203, 0.25) of production unit length in the pre-test revealed two classes were almost at the same level. In the post-test, there was a statistical difference between their unit length. (P-value in W/T=0.014<0.05; P-value in W/C=0.002<0.05).

Table 11. Independent sample t-test of the length of the production unit of EC and CC

Test	Indicator	Class	N	Mean	SD	t	Sig.
Pre-test	W/T	EC	55	11.02	2.59	.934	.203
		CC	55	10.78	2.44		
	W/C	EC	55	8.52	2.17	.841	.259
		CC	55	8.19	1.81		
Post-test	W/T	EC	55	12.94	2.98	4.627	.014
		CC	55	11.31	2.46		
	W/C	EC	55	10.61	2.65	3.147	.002
		CC	55	9.02	1.97		

To depict changes more precisely, the Paired Samples T-test was used to analyze the data. In table twelve, the mean of W/T and W/C for the EC were 11.02 and 8.52, while that for the CC was 12.94 and 10.61. The P-values in W/T and W/C were 0.004(<0.05) and 0.001(<0.05), which represented significant changes between the pre-test and the post-test in the EC.

Table 12. Paired sample T-test of the length of the production unit of EC

Class	Indicator	Test	N	Mean	SD	t	Sig.
EC	W/T	Pre-test	55	11.02	2.59	9.173	.004
		Post-test	55	12.94	2.98		
	W/C	Pre-test	55	8.52	2.17	5.326	.001
		Post-test	55	10.61	2.65		

*Clause Density*

The second index is clause density, qualifying through T-unit complex ratio (C/T) and dependent clause ratio (DC/C).

Table 13. Independent sample t-test of clause density of EC and CC

Test	Indicator	Class	N	Mean	SD	t	Sig.
Pre-test	C/T	EC	55	1.282	2.643	1.023	.137
		CC	55	1.256	2.579		
	DC/C	EC	55	.197	4.106	-2.367	.299
		CC	55	.199	3.887		
Post-test	C/T	EC	55	1.286	4.022	-2.987	.246
		CC	55	1.249	3.557		
	DC/C	EC	55	.222	2.634	1.338	.108
		CC	55	.217	3.259		

In table thirteen, two classes were at the same level of clause density before the trial ( $p=0.137$ ,  $0.299$ ). In the pre-test, there was a minor difference in the post-test mean score of C/T and DC/C. Furthermore, the P-values for C/T and DC/C were  $0.246(0.05)$  and  $0.108(0.05)$ , respectively. Altogether, the implementation of the Schema theory had no significant effect on students' clause density.

*Sentence Patterns*

Sentence pattern refers to simple sentences, compound sentences, complex sentences, and compound-complex sentences.

Table 14. Independent sample T-test of sentence patterns in the pre-test

Indicator	Class	N	Mean	SD	t	Sig.
Simple sentence	EC	55	7.496	1.734	0.964	.337
	CC	55	7.314	2.012		
Compound sentence	EC	55	3.584	2.100	1.204	.425
	CC	55	3.266	1.666		
Complex sentence	EC	55	1.212	1.169	.487	.283
	CC	55	1.347	.918		
Complex-compound sentence	EC	55	0.466	.788	1.202	.106
	CC	55	0.425	.825		

Table fourteen shows that there was no significant difference between the two groups in the use of simple sentences, compound sentences, complex sentences, and complex-compound sentences before the instructional experiment ( $p=0.337>0.05$ ,  $p=0.425>0.05$ ,  $p=0.283>0.05$ ,  $p=0.106>0.05$ ).

Table 15. *Independent sample t-test of sentence patterns in the post-test*

Indicator	Class	N	Mean	SD	t	Sig.
Simple sentence	EC	55	5.012	2.565	5.253	.009
	CC	55	7.387	2.557		
Compound sentence	EC	55	5.843	2.832	3.172	.029
	CC	55	3.923	1.442		
Complex sentence	EC	55	1.321	1.185	.134	.429
	CC	55	1.463	.858		
Complex-compound sentence	EC	55	0.457	.137	-2.453	.124
	CC	55	0.432	.535		

Table fifteen concerns sentence patterns in the post-test. Participants from EC applied more compound sentences than their peers in CC ( $5.843>3.923$ ). Also, there was a reduced number of simple sentences in EC ( $5.012<7.387$ ). The frequency of simple sentences and compound phrases varied significantly between EC and CC, as shown by the Independent-samples T-test ( $p=0.009<0.05$ ;  $p=0.029<0.05$ ). However, the two groups' mean scores for complicated phrases and complex-compound sentences were quite similar ( $p=0.429>0.05$ ;  $p=0.124>0.05$ ).

Table 16. *Paired samples t-tests of sentence patterns of the experimental class*

Indicator	Pre-test		Post-test		t	Sig.
	Mean	SD	Mean	SD		
Simple sentence	7.496	1.734	5.012	2.565	4.845	.001
Compound sentence	3.584	2.100	5.843	2.832	2.622	.002
Complex sentence	1.212	1.169	1.321	1.185	-.752	.456
Complex-compound sentence	0.466	.788	0.457	.137	-1.345	.123

It can be seen from table sixteen that the frequency of using simple sentences was decreasing, while that of complex sentences and compound sentences experienced a marked rise. Meanwhile, the P-values of simple sentences, compound sentences, and complex sentences were  $0.001(<0.05)$  and  $0.002(<0.05)$ . Therefore, there was a statistically significant distinction in the frequency of simple and compound sentences. P-values of  $0.456$  and  $0.123 (>0.05)$  for complex and complex-compound sentences, respectively, indicating that there was no significant difference. Thus, Schema-oriented training has been seen as more effective for enhancing the application of simple and compound phrases.

*Research question 4: Semantic Coherence*

To explain the changes in students' writings in terms of semantic coherence, LSA sentence all and LSA sentence adjacent will be analyzed.

*LSA sentence all*

LSA sentence all explores the semantic coherence among all sentences; The higher the value is, the more overall semantic coherence the compositions are.

Table 17. *Descriptive statistics of LSA sentence all in EC and CC*

Test	Indicator	Class	N	Mean	SD	t	Sig.
Pre-test	LSA sentence all	EC	55	.094	.029	0.816	.159
		CC	55	.091	.014		
Post-test	LSA sentence all	EC	55	.131	.017	3.482	.025
		CC	55	.094	.017		

As shown in table seventeen, the pre-test mean values of LSA sentences by EC and CC remained almost the same(0.094; 0.091). After the experiment, the mean value of LSA sentences all in the post-test had witnessed a significant change( $p=0.025<0.05$ ).

Table 18. *Paired samples t-tests of LSA sentence all, LSA sentence adjacent in EC*

Indicator	Test	Mean	SD	t	Sig.
LSA sentence all	Pre-test	.094	.029	3.016	.002
	Post-test	.131	.017		

Table eighteen shows the statistical value of LSA sentences all from EC in the pre-test and post-test. The mean score of the post-test in the EC was 0.131, higher than that of the pre-test's 0.094. Moreover, the P-value was  $0.002<0.05$ , indicating a significant difference between the two data sets.

*LSA sentence Adjacent*

Another coherence index is LSA sentence adjacent, which reflects the partial semantic coherence of adjacent sentences.

Table 19. *Descriptive statistics of LSA sentence adjacent in EC and CC*

Test	Indicator	Class	N	Mean	SD	t	Sig.
Pre-test	LSA sentence adjacent	EC	55	.113	.027	1.254	.469
		CC	55	.112	.034		
Post-test	LSA sentence adjacent	EC	55	.171	.029	4.128	.001
		CC	55	.111	.025		

As is shown in table nineteen, the mean score of the LSA sentence adjacent to EC in the pre-test was almost the same as that in CC (0.113;0.112). After the trial, the mean score of EC was higher (0.171>0.111). This table shows that the mean LSA sentence value next to the pre-test did not change significantly from that of the post-test ( $p=0.469$ ), but the post-test showed a significant difference ( $p=0.001<0.05$ ).

Table 20. *Paired samples t-tests of LSA sentence all, LSA sentence adjacent in EC*

Indicator	Test	Mean	SD	t	Sig.
LSA sentence adjacent	Pre-test	.113	.027	2.987	.002
	Post-test	.171	.029		

Table twenty demonstrated that all LSA sentence nearby values increased following the education trial. Moreover, differences can be seen in the pre-test and the post-test ( $p=0.002<0.05$ ).

### ***Results from the Interview***

Moreover, the phenomena were complemented by the interview. Five students declared that they preferred the schema-oriented teaching approach, while only one low-level students showed disapproving attitude. Acting as a representative, a student at medium-level stated, “*The new teaching model makes me feel less stressed during composition. After the discussion with students and teachers in brainstorming, I become more organized in composing a continuation task*”. When asked about their efforts and benefits toward Schema theory, all interviewees stated that the new teaching approach is conducive to their completion of the Continuation task. One of the low-level students insisted, “*I have made some progress in sentence expressions. For instance, I used to write simple sentences only, but now I find the importance to write more compound sentences*”.

Overall, these signs suggest that schema theory-based education has improved the overall achievement, lexical richness, syntactic complexity, and semantic coherence of the participants.

## **Discussion**

### ***Effect on Overall Writing Competence***

Schema theory honed up students’ overall writing competence effectively, especially for medium-level students, who saw the most noticeable progress against their peers. Similar findings can be found in Sun (2014), Zhou (2005), Li (1998), and Johns (1986) who argued that writing teaching based on Schema theory has a positive effect on students’ English writing competence. In the process of schema-oriented writing instruction, learners’ schema was activated by pedagogical practice: firstly, inherent knowledge was activated to streamline their current abilities to understand and learn (Bransford et al., 1986), doing pre-writing activities (brainstorming; experience sharing; guided questions;) and analyzing the language style of reading materials are viable ways to activate the existing schema and construct new ones. Secondly, students in corporative reading and writing had significantly higher achievements in reading comprehension, and language expression (Stevens, 2003). For instance, exercises like collaboratively creating the story’s outline and semantic maps would influence students to solidify new schema, as well as composition construction. Thirdly, as Chandler (2003) has suggested, linguistic competence is required for learners to interpret written corrective feedback. In the post-writing stage, students participate in peer review and self-revision to reinforce their new schema and enhance their preexisting ones. As a result, the new teaching strategy focuses more on input and output than traditional pedagogy does.

### ***Effect on the Lexical Richness***

The Schema oriented approach could improve students’ lexical richness of the Continuation task. In this study, it was represented by lexical variation and lexical sophistication. Several researchers suggest that the representation of lexical variation was richer in synonyms in which words and expressions remained constantly various. (Geeraerts et al., 2012; Wasow et al., 2011; Zhao, 2016). Students’ work demonstrated that verbs like blow, click, and waft were utilized to vividly express wind movement. Synonyms such as *suppose*, *believe*, *guess*, and *assume* could substitute *think*. The improvement of lexical variation is performed in various phrase expressions.

For example, when presenting the scene of Jane's sadness, students in EC applied *tears streaming down her face; shivering all over with sad and sorrowful memories flooded out* to make his composition brimming with rich sentiments.

### ***Effect on Syntactic Complexity***

Compared with the pre-test statistic, the average number of words in the post-test mirrored a significant difference in unit length under the guidance of the Schema theory-oriented approach. It is attributed to the content schema and linguistic schema. In the linguistic schema-building stage, the teacher trained students to apply various descriptive expressions in describing appearance, environment, and mental conflict through semantic maps. With the accumulation of words and phrases, students had more choices for their content output based on the input and reconstruction schema. It is consistent with Krashen's (1982) meaningful input theory and indicates that the input of schema activation can be significant if the students internalize the input.

As for clause density, there was no significant difference. This finding is opposite to those in Hundarenko (2019)'s research. In his tasks, more students can pay attention to their clause density in their academic writing through the schema theory teaching approach, thus producing high-quality scripts. To investigate the causes, researchers examined the compositions that students had produced while undergoing instruction and found that in the early stages of the experiment, students tended to add more clauses to enhance the content of their works. Thus, there tended to be an increase in the C/T ratio (one of the indexes to measure clause density) in compositions. As the investigation proceeded, students were trained to use accurate and simplified phrases to replace disjointed and obscure clauses, leading to a decrease in the C/T of the compositions in the post-test. Moreover, Language competency is gradually and abruptly enhanced (Baaqeel, 2020), which means Students require further work to develop their writing skills. When students become more aware of errors and content quality, they may not pay sufficient attention to the correctness of complicated phrase patterns. Thus, as for the other index of clause density, dependent clauses (DC) were employed in a broader range after the trial, while the frequency of clause adoption was constantly a variable. Thus, the ratio of DC/C was a variable. As a result, there was little change in the clause density.

### ***Effect on Semantic Coherence***

From the statistics above, we can conclude that the Schema theory-based teaching model has a positive effect on helping students to enhance the overall and partial semantic coherence of their compositions. The result mirrors Li's (1998)' survey, indicating that content schema and formal schema play significant roles in writing. The content schema contains the background schema that already existed in their brain and the new schema that relays on the text and the formal schema in narration is the chronological order.

After the training of content schema and formal schema, there is an inevitable increase in LSA sentence all and LSA sentence adjunct semantic coherence in the post-test of EC by the improvement of LSA sentence all and LSA sentence adjacent. Several researchers have already described the process training methods to improve semantic coherence in the Continuation task (Cui et al., 2019; Peng et al., 2020; Shi et al., 2020). For instance, Peng (2020) investigates the method's coherence alignment between the original text and the student's creation. By activating

and recreating the formal schema, the researchers in this study increased the semantic coherence of the Continuation task. In formal schema training, the instructor instructed pupils on how to use chronological order in their writing. The composition should follow a narrative model which covers the beginning, the development of the main idea, climax, and conclusion. For instance, Students were taught to use conjunctions to indicate chronological sequence, such as at first, next, soon, eventually, and since then. As stated by Li (1990), prediction capacity was the most useful method for connecting formal schema with semantic coherence. Accordingly, in formal schema training, students were instructed to evaluate the language characteristics and structure of source material to develop a new schema based on the source text. In addition, the underlined words in the original text should be highlighted to foretell the story's development. Therefore, students guided by Schema theory-based approach witnessed a remarkable improvement in a logical structure and semantic coherence

### Conclusion

We discovered the possible impacts of schema theory applied in the continuation task using the performance derived from the pre-test and the post-test. Firstly, the results demonstrated that the schema theory activates language schema, content schema, and formal schema, which have a substantial impact on learners' total writing skills. Secondly, writing grounded in Schema theory instruction could cultivate students' sensitivity to lexical richness. It helps learners develop language that is more complicated and sophisticated. In addition, the increasing use of adjectives, synonyms, and superordinate patterns enhances the variety of written expressions. Thirdly, Schema-oriented instruction has limited effect on improving syntactic complexity. Students become increasingly tempted to use longer sentences. In addition, the proportion of simple sentences on the post-test has reduced, while the proportion of complicated phrases has increased. However, there is no significant relevance to the changes in clause density and complex sentence and compound-complex sentence patterns. It is likely that students place a higher value on content quality and avoiding errors by avoiding complex phrase patterns. Finally, the author explored the influence brought by the new teaching method on semantic coherence. The changes of LSA sentence all and LSA sentence adjacent have demonstrated that the method enhances the coherence of writing. Findings in this study also provide advisable information that can guide L2 writing teachers' decisions in designing the Continuation task. Rather than caring too much about grammar errors, teachers may choose to devote time and energy to the process of schema activation and schema reconstruction by analyzing and outlining the source language before the task. With the language style in alignment with the given story, students tend to flesh out their ideas in a spontaneous way. Some limitations have inevitably appeared in this study. First, the samples of participants may be strengthened with more widespread grades. Second, this research gives the limelight to language and discourse. Students' mental capability and thinking patterns await further exploration.

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## Appendices

### Appendix A

#### Pre-test Task and Post-test Task

##### 【Pre-test Task】

A vacation with my mother

I had an interesting childhood: It was filled with surprise and amusements, all because of my mother-loving, sweet, and yet absent-minded and forgetful. One strange family trip we took when I was eleven tells a lot about her.

My two sets of grandparents lived in Colorado and North Dakota, and my parents decided to spend a few weeks driving to those states and seeing all the sights along the way. As the first day of our trip approached, David, my eight-year-old brother, and I unwillingly said good-bye to all of our friends. Who knew if we'd ever see them again? Finally, the moment of our departure arrived, and we loaded suitcases, books, games, camping equipment, and a tent into the car and bravely drove off. We bravely drove off again two hours later after we'd returned home to get the purse and traveler's checks Mom had forgotten.

David and I were always a little nervous when using gas station bathrooms if Mom was driving while Dad slept." You stand outside the door and play lookout while I go, and I'll stand outside the door and play lookout while you go." I had terrible pictures in my mind: "Honey, where are the kids?" "What?! Oh, Gosh... I thought they were being awfully quiet." We were never actually left behind in a strange city, but we weren't about to take any chances.

On the fourth or fifth night, we had trouble finding a hotel with a vacancy. After driving in vain for some time, Mom suddenly got a great idea: Why didn't we find a house with a likely-looking backyard and ask if we could set up tent there? David and I became nervous. To our great relief, Dad turned down the idea. Mom never could understand our objections. If a strange family showed up on her front doorsteps, Mom would have been delighted. She thinks everyone in the world as nice as she is. We finally found a vacancy in the next town.

注意:

1. 所续写短文的词数应为150左右;
2. 应使用5个以上短文中标有下划线的关键词语;
3. 续写部分分为两段, 每段开头语已为你写好;
4. 续写完成后, 请用下划线标出你所使用的关键词语。

Paragrapg1

The next day we remembered the brand-new tent we had brought with us.

Paragrapg2

We drove through several states and saw lots of great sights along the way.

#### 【Post-test Task】

One weekend in July, Jane and her husband, Tom, had driven three hours to camp overnight by a lake in the forest. Unfortunately, on the way an unpleasant subject came up and they started to quarrel. By the time they reached the lake, Jane was so angry that she said to Tom. "I'm going to find a better spot for us to camp" and walked away.

With no path to follow, Jane just walked on for quite a long time. After she had climbed to a high place. she turned around, hoping to see the lake. To her surprise, she saw nothing but forest and, far beyond, a snowcapped mountain top. She suddenly realized that she was lost.

"Tom!" she cried. "Help!"

No reply. If only she had not left her mobile phone in that bag with Tom. Jane kept moving, but the farther she walked, the more confused she became. As night was beginning to fall, Jane was so tired that she had to stop for the night. Lying awake in the dark, Jane wanted very much to be with Tom and her family. She wanted to hold him and tell him how much she loved him.

Jane rose at the break of day, hungry and thirsty. She could hear water trickling (滴落) somewhere at a distance. Quickly she followed the sound to a stream. To her great joy, she also saw some berry bushes. She drank and ate a few berries. Never in her life had she tasted anything better. Feeling stronger now. Jane began to walk along the stream and hope it would lead her to the lake.

As she picked her way carefully along the stream, Jane heard a helicopter. Is that for me? Unfortunately, the trees made it impossible for people to see her from above. A few minutes later, another helicopter flew overhead. Jane took off her yellow blouse, thinking that she should go to an open area and flag them if they came back again.

注意:

1. 所续写短文的词数应为150左右;
2. 应使用5个以上短文中标有下划线的关键词语;
3. 续写部分分为两段, 每段的开头语已为你写好;
4. 续写完成后, 请用下划线标出你所使用的关键词语。

Paragraph 1

But no more helicopters came and it was getting dark again.

Paragraph 2

It was daybreak when Jane woke up.

#### Appendix B

#### English Writing Scoring Rubric for College Entrance Examination

The Continuation assignment has a total score of 25, which is divided into five stages.

Band 5 (21-25)

- The continuation is closely related to the source text's key topics.
- The continuation adds substantial substance to the plot and thoroughly meets all assignment criteria.
- The continuation employs correct and varied grammatical structures and vocabulary, with minor faults that do not impair comprehension.
- The conclusion is well-structured and consistent. Sentences inside paragraphs are successfully linked together by using suitable, well-chosen, and diverse transition words and other cohesion methods.

Band 4 (16-20)

- The continuation is related to the source text's primary concepts.
- The continuation develops the tale with sufficient material and meets the assignment criteria.
- The continuation employs grammatical structures and vocabulary that are relatively accurate and diversified, with minimal faults that do not impair comprehension.
- The continuation is well-structured and consistent. Sentences inside paragraphs are successfully linked to one another via the use of suitable and diverse transition words and other cohesion strategies.

Band 3 (11-15)

- The continuation is mostly related to the source text's primary topics.
- The continuation adds some meaningful stuff to the plot and basically meets the task criteria.
- The continuation employs a wide range of grammatical structures and vocabulary, with some faults that do not impair comprehension.
- The continuation is well-structured and cohesive. Simple transition words and other cohesion methods link sentences inside paragraphs.

Band 2 (6-10)

- The continuation is tangentially related to the primary text.
- The continuation has minimal substance and only partially meets the task requirements.
- The continuation employs a restricted set of grammatical structures and vocabulary, with certain faults that may impair comprehension.
- The continuation lacks organization and coherence. Transition words and other cohesion techniques are used sparingly in sentences within paragraphs.

Band 1 (1-5)

- The continuation has little or no resemblance to the primary material.
- The continuation has minimal substance and does not meet the task criteria.
- The continuation employs a restricted set of elementary grammatical structures and vocabulary, with numerous faults that impair comprehension.
- There is no organization or coherence in the continuation. Transition words and other cohesion mechanisms are either ineffective or absent.

**Appendix C**

**Measures used to Analyze Test Takers' Writing Ability**

Category	Measures	Indicators	Definition	
Lexical richness	lexical variation	WT/W	The ratio of the number between types and tokens (TTR)	
	lexical sophistication	LFP (lexical frequency profile)	The ratio of K1 (the first most frequent 1000 words), K2 (the second most frequent 2000 words), and complex words (beyond K1 and K2 words)	
Syntactic complexity	Length of production unit	T-unit Length	Number of words/number of T-units	
		Clause length	Number of words/number of clauses	
	Clause density	T-unit complexity ratio(C/T)	Number of clause/number of T-unit	
		Dependent clause ratio(DC/C)	Number of dependent clause/number of clause	
	Frequency of sentence type	of	Simple	Number of simple sentences/number of sentences
			Compound	Number of compound sentences/number of sentences
Complex			Number of complex sentences/number of sentences	
Compound-complex			Number of compound-complex sentences/number of sentences	
Semantic Coherence	LSA(Latent Semantic Analysis)	LSA sentence all	the coherence among all sentences	
		LSA sentence adjacent	semantic relatedness between sentences adjacent	