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A Study on the Influence of Writing Task Complexity on the Syntactic Complexity of Senior High Students' English Writing

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Abstract: Task complexity, which is reflected in the cognitive difficulty of writing tasks, is an important factor affecting the quality of writing output, while syntactic complexity, as an important indicator to measure the quality of second language writing, has attracted researchers' attention. Based on the "cognitive hypothesis", this study turns the College Entrance Examination composition genres and topics into task complexity, and explores the impact of tasks with different complexity on the dimensions of learners' syntactic complexity, so as to provide further reference for English writing teaching and learning.

1. Introduction

In the process of English writing, learners' syntactic complexity has always been an important indicator to measure the quality of English writing. Syntactic complexity refers to the diversity and complexity of syntactic structures in language production [1] (bull é& housen2014). In recent years, the study of syntactic complexity in English learners' spoken and written language has attracted extensive attention at home and abroad, and has achieved rapid development. Among them, the study of syntactic complexity and its influencing factors has attracted much attention. Previous studies have recognized the relationship between syntactic complexity and other control variables, especially those related to learners, tasks and context. At present, the high-risk English test in China contains a variety of topics and types of writing tasks, such as narration, description, discussion, charts, letters and summaries. However, few researchers have explored the impact of task complexity on learners' L2 syntactic performance [2]. Based on the "cognitive hypothesis" of Robinson (2001) [3], this study classifies the question types and topics in college entrance examination English writing according to the complexity framework. Through empirical research, it measures the syntactic complexity of L2 learners' writing output, examines the relationship between task complexity, students' language proficiency and syntactic complexity, and discusses the possible reasons for the differences.

2. Research background

2.1 Task complexity

Task complexity refers to the cognitive characteristics of tasks and the requirements of task

structure on learners' attention, memory, reasoning and information processing (Robinson 2011) [4]. The concept of task complexity originates from the need of task sequencing in classroom teaching, but its research soon expanded to the second language classroom. The relationship between task complexity and learners' language output has attracted attention[5]. Second language task researchers have made different predictions about the relationship between the two, of which the two most influential views are the "competition hypothesis" (Skehan 1998, 2009, 2014) and the "cognitive hypothesis" (Robinson 2001, 2007, 2011).

So far, a large number of studies have been conducted in the field of task research around the above two hypotheses. Most of these studies take a single feature in a certain dimension as a variable to investigate its impact on L2 writing output. In terms of resource consumption, relevant studies focus on preparation time and topic familiarity (Johnson2017) [6]. In terms of resource guidance, researchers focus on variables such as conditional factors (Kuikenetal. 2005; Kuiken & Vedder2008), reasoning (Ishikawa2007). This study adopts the framework of Ruiz-Funes (2015) [7] which transforms task complexity into the task genre and theme.

2.2 Syntactic complexity and its measurement framework

At present, complexity has become an important means to measure learners' second language writing ability, but empirical research involving syntactic complexity and lexical complexity is still insufficient. Syntactic complexity refers to the change and complexity of language forms in language production (Crossley & McNamara2014) [8], which can be used to assess the language level of second language learners and describe their language ability and language development (Ortega2012) [9]. Larsen Freeman (1978) [10] argues that it is necessary to design or determine a measurement standard in the study of second language acquisition as a standard to classify second language learners into different levels of language development. Different scholars have chosen different measurement standards and generated a variety of software to automatically analyze syntactic complexity. This study will adopt the most extensive syntactic complexity measurement standards at home and abroad. Lu (2010) from Wolfe-Quintoretal (1998) and Ortega (2003) [11] selected fourteen syntactic complexity measurement indexes of second language writing to achieve automatic analysis [12]. Among them, eleven indexes have been shown by previous studies to have a significant relationship with learning level, second language development or writing quality, while the other three indexes are Wolfe-Quintoetal (1998) recommended indexes for L2 writing researchers. These fourteen indexes can be divided into five categories which can be seen in the following Table 1.

Table 1 Syntactic complexity measurement framework

Category	Indexes	
Length of production unit	Mean Length of Sentence	MLS
	Mean Length of T-unit	MLT
	Mean Length of Clause	MLC
Sentence complexity	Clause per Sentence	C/S
Subordination	Clause per Sentence	C/T
	Complex T-unit Ratio	CT/T
	Dependent Clause per Clause	DC/C
	Dependent Clause per T-unit	DC/T
Coordination	Coordinate Phrase per Clause	CP/C
	Coordinate Phrase per T-unit	CP/T
	T-unit per Sentence	T/S
Particular structures	Complex nominal per Clause	CN/C
	Complex nominal per T-unit	CN/T
	Verb phrase per T-unit	VP/T

3. Research design

3.1 Participants

The corpus used in this study comes from the classroom limited time writing texts of senior three students in several senior high schools in Sichuan and Chongqing collected from 2017 to 2019. The corpus includes different styles such as narration, description, discussion, charts, letters and summaries, covering about 23 different topics (task types) within the scope of the composition outline of the college entrance examination. Each composition is between 80 and 160 words in length.

3.2 Corpus description

This study chooses two different compositions with different complexity as the research object. Topic one is an applied essay in which students are required to write an email to apply for the Chinese pen pal of British netizen Jacob. The composition framework has been given in the item, that is, students need to briefly introduce their personal information and hobbies and specialties; Topic two is a picture composition which requires students to introduce a set of housing information near the school according to the picture, and explain the reasons for renting a house.

According to the task complexity framework of Ruiz-Funes (2015), we believe that the cognitive difficulty of topic two is greater than that of topic one, because students are more familiar with topic one. Students only need to complete their compositions according to their personal life experience, feelings and emotions, and lack high-level cognitive thinking processes such as reasoning and reasoning; While in topic two, the amount of information that students need to deal with increases, including the internalization of diagrams and logical reasoning. Therefore, task two is considered as a cognitive composite of topic or task type, which has higher requirements for cognitive processing in terms of information organization and information type.

3.3 Research questions

This study intends to answer the following questions: What is the relationship between writing task complexity and measures of syntactic complexity among students with different language proficiency level?

3.4 Research methods

This study collected 388 valid essays in advance, and 204 essays are written based on topic one and 184 topic two. These compositions were scored by three teachers who had rich experience in marking the College Entrance Examination compositions according to the College Entrance Examination Composition scoring standards, and they were divided into high-score and low-score groups. Table 2 shows the data statistics of high-score group and low-score group compositions under each topic.

This study uses quantitative research methods to classify compositions according to writing task complexity, then uses the syntactic complexity analyzer (L2SCA) to analyze 14 indicators in the five dimensions of syntactic complexity, and finally uses SPSS to statistically analyze the data.

Table 2 compositions numbers in high-score and low-score groups under two topics

Task type	High-score group	Low-score group
Topic one	35	65
Topic two	34	25

4. Research results and discussion

Taking the writing task complexity as the control variable, Table 3 is the descriptive statistics and independent sample T-test results of topic one and topic two.

Table 3 Descriptive statistics and independent sample T-test results of high-score and low-score groups for topic one

	Group	Numbers	Average value	Standard deviation	Significance (two tailed)
MLT	High score	35	12.4162	2.7099	0.033
	Low score	65	11.1097	2.9759	
MLC	High score	35	8.3955	1.2092	0.000
	Low score	65	7.2926	1.4746	
CT/T	Low score	65	1.5310	0.3111	0.043
	High score	35	0.4159	0.1501	
	Low score	65	0.3512	0.1504	
CN/C	Low score	65	1.0284	0.1830	0.000
	High score	35	0.8713	0.2858	
	Low score	65	0.6510	0.1890	
CN/T	High score	35	1.3086	0.5395	0.003
	Low score	65	1.0120	0.4133	
	Low score	65	1.9823	0.4074	

It can be seen from the data in Table 3 that in the high-score and low-score groups of the two topics, regardless of the task complexity, the average value of each syntactic complexity index of the low-score group composition is lower than that of the high group composition, and there are five syntactic complexity indexes that have reached significant differences in topic one and topic two, namely MLC (average clause length), MLT (average T unit length), CT/T (complex T unit ratio) CN/C (amount of complex noun phrases in clauses) and CN/T (amount of complex noun phrases in T units). It can be seen that students' writing level is an important factor affecting students' syntactic performance. Through comparison, we find that at the macro syntactic level, the high-level students use more subordinate structures to increase the sentence length; At the micro phrase level, the amount of complex noun phrases and verb phrases of the students in the low-score group is significantly lower than that of the students in the high-score group. This result shows the trend of students' syntactic development from simple sentences, coordinate structures and subordinate sentences to complex phrase structures from another perspective, and the result also supports Crossley & Mcamara (2014) and Guoetal (2013) 's conclusion[13]: that is, there are more complex noun phrases in high-score compositions than in low-score compositions. This study is also Biberetal (2011) [14] provides new evidence for the hypothesis of writing ability development: the use of complex noun phrases in learners' compositions increases with the improvement of their language level, especially those containing post prepositional phrase modifiers [15].

However, in the statistics result of high-score and low-score group of topic two, there are significant differences in other three indicators, namely DC/C (ratio of subordinate clauses), DC/T (number of subordinate clauses in each T unit), CP/T (number of parallel phrases in each T unit). These indicators are related to subordinate structure and parallel phrases. It can be seen that topic two with higher cognitive difficulty is more conducive to distinguishing the hierarchy of students' syntactic performance. In order to control the differences caused by learners' factors, and then explore how task complexity affects the syntactic complexity of students' writing at the same level. We selected high score group compositions for comparative analysis. A total of 66 high score

compositions were compared, including 35 topic one compositions and 31 topic two compositions. The data of descriptive statistics and independent sample T-test analysis based on this are shown in Table 4.

Table 4 Descriptive statistics and independent sample t-test results of high score writings on different topics

	Index	**Topics**	**Numbers**	**Average value**	**Standard deviation**	**Significance (two tailed)**
Length of production unit	MLS	One	35	12.185	2.676	0.033
		Two	31	13.587	2.645	
	MLT	One	35	12.416	2.710	0.118
		Two	31	13.376	2.250	
	MLC	One	35	8.396	1.209	0.506
		Two	31	8.585	1.128	
Sentence complexity	C/S	One	35	1.458	0.292	0.066
		Two	31	1.596	0.316	
Subordinate	C/T	One	35	1.490	0.308	0.251
		Two	31	1.570	0.264	
	CT/T	One	35	0.416	0.150	0.042
		Two	31	0.492	0.151	
	DC/C	One	35	0.326	0.093	0.012
		Two	31	0.383	0.087	
	DC/T	One	35	0.508	0.248	0.057
		Two	31	0.616	0.206	
Coordination	CP/C	One	35	0.102	0.080	0.185
		Two	31	0.127	0.070	
	CP/T	One	35	0.154	0.125	0.139
		Two	31	0.198	0.113	
	T/S	One	35	0.987	0.115	0.281
		Two	31	1.021	0.142	
Particular structure	CN/C	One	35	0.871	0.286	0.224
		Two	31	0.803	0.157	
	CN/T	One	35	1.309	0.540	0.685
		Two	31	1.265	0.331	
	VP/T	One	35	2.083	0.377	0.457
		Two	31	2.017	0.343	

According to the results of descriptive statistics, the average value of each index of topic two in the four dimensions of unit length, sentence complexity, subordinate sentence ratio and use of parallel structure is higher than task one, and topic two is only lower than topic one in the use of particular structures. Therefore, in high-score group, topic two which requires higher cognitive difficulty also has higher syntactic complexity. The results of this study are consistent with those of previous studies, that is, to a certain extent, the higher the task complexity, the more complex the syntactic use, regardless of whether the writer is at the medium or advanced learning level. The reason for this result may be that for topic one, learners use a variety of words or phrases to explain their personal hobbies to increase the richness of the article, while the topic two aims to examine students' information integration ability and require concise language, so students often use more micro syntactic structures.

According to the analysis of T-test results of independent samples, there are significant differences in three syntactic complexity indexes in the compositions of high-level students with different writing task complexity, which are MLS (average sentence length), CT/T (complex T-unit

ratio) and DC/C (dependent clause ratio). The indicators with critical significance are MLC (average clause length) DC/T (dependent clause quantity in T-unit). In general, the indicators of significant difference and critical difference are mainly reflected in the length of sentences and the use of subordinate clauses. The results show that topics or writing tasks have an impact on the syntactic characteristics of high-level high school students: the syntactic structure of illustrative articles is more complex than that of simple descriptive or declarative articles. As Ruiz-Funes (2014) pointed out, writing tasks with high complexity usually involve more formal and unfamiliar topics, requiring learners to have higher induction and reasoning skills. Therefore, learners' compositions are more characterized by academic writing, that is, longer and more diverse sentence structures, and more subordinate structures are used to strengthen the logic of the articles.

5. Conclusion

These results show that task complexity has an impact on students' syntactic complexity. For learners with high proficiency in language, such as advanced level learners, they have achieved a high professional level in writing. They are aware of the challenge of language complexity, and can pay attention to higher-level cognitive operations while paying attention to language forms in the writing process (Ortega, 2012) [16]. On the other hand, for language learners whose writing proficiency is not outstanding, more complex cognitive tasks will prevent them from paying attention to syntactic complexity, accuracy and fluency at the same time. This can be explained as that, due to the limited processing ability, learners only pay attention to one aspect of language production and ignore other aspects.

Therefore, while designing writing tasks, we should their cognitive and language needs. At the same time, in writing teaching, in order to increase the complexity of students' language output, we should strengthen the training of subordinate structure, juxtaposition structure and sentence overall complexity for low-level English learners, and strengthen the training of phrase complexity for intermediate and advanced English learners.

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