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The Effects of Task Complexity on English Writing Performance

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Abstract

Based on Skehan's Limited Attentional Capacity Model and Robinson's Cognitive Hypothesis Model, and taking 79 sophomores from three parallel classes of English majors in Zhijiang College of Zhejiang University of Technology as subjects, this paper investigates the effects of three different types of writing tasks with different complexity on English majors' English writing output. Three writing tasks are designed with different levels of complexity by controlling four variables: elements, reasoning demands, prior knowledge, single task. The research aims to find out the influence of writing tasks of different complexity on learners' language performance (including accuracy, fluency and complexity), their total scores and the content of their compositions. The results show that task complexity has a significant impact on learners' language accuracy and total writing scores; It has some but not very significant effects on learners' lexical complexity, but it has no effect on language fluency and syntactic complexity. The study also finds that task types have a significant impact on students' English writing content. The comprehensive writing task can measure students' English writing ability more effectively, in that it triggers richer contents and optimized structures in students' compositions.

Key words: Task complexity; Task difficulty; Task types; Accuracy; Fluency

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1. INTRODUCTION

In recent years, the study of foreign language learning tasks has gradually become a hot topic in the field of second language acquisition (SLA). There are two main reasons for this. First of all, with the emergence of task-based syllabus in the 1980s, and the increasing enthusiasm of SLA researchers and teachers for the balanced development of the form and meaning of inter language for foreign language learners, people gradually realize the importance of studying the task itself in foreign language learning. Task-based language teaching (TBLT) has thus developed rapidly into a hot spot in the mainstream of language teaching and SLA research. Unlike the traditional teaching method which is based on teachers' instruction, students' training and practicing, the TBLT method asserts that students' abilities should be evaluated by tasks. By stimulating students' interests and activities, students' learning initiative should be mobilized so as to improve their language skills and develop their comprehensive language abilities in the process of completing tasks. Moreover, the TBLT method takes students as the center, with tasks as the driving force, means and goals, which makes the classroom language teaching real and socialized, fully embodies the students' subjectivity and effectively improves the traditional teaching methods based on teacher teaching (Nunan, 2004).

Secondly, since the late 1980s, people have used theories in cognitive psychology to study the process of foreign language learning and found that "noticing" (Schmidt, 2001) is very important in learners' foreign language development. In psychology, the basic assumptions concerning attention have been that it is limited, selective and is partially subject to voluntary control, and that attention controls access to consciousness, and is essential for action control and for learning. Some researchers used this discovery to design different learning tasks, which made it easier for learners

to notice the neglected aspects of foreign language pronunciation, vocabulary and sentence structure due to lack of perception and psychological prominence, so as to improve learning effects.

A central question in the research of task-based instruction is: what are the effects of different task requirements on language acquisition and language production? Generally speaking, task complexity and task difficulty are two main variables in task design. Task difficulty is related to individual differences. The emotional factors are more difficult to judge and measure, while task complexity is a more controllable indicator. It is the main foothold and reference point of task design (Robinson, 2001). In recent years, attention has become the focus of SLA research, and task design variables are important factors in determining learners' attention distribution, which restricts the process and effect of information processing.

Writing is a multi-factor, complex and cyclical psychological cognitive process. English writing requires high accuracy and logic, which is one of the main challenges for Chinese English learners. According to a large number of theoretical and practical studies at home and abroad, the factors affecting the second language (L2) writing ability (or level) mainly include mother tongue ability (native language thinking), metacognitive knowledge and strategy, met discourse knowledge, L2 proficiency, cognitive strategy, task type, task condition and task complexity (Wang, 2013). What's more, writing, as an means of language output, is a way to test students' comprehensive language competence and logical thinking ability. Writing tasks are also more flexible in that it is not rigorously limited by time, space and task forms. It is a cognitive process that integrates preparation, writing and revision. However, compared to other language skills (i.e. speaking and reading), few studies have focused on investigating the effects of different writing tasks (and task conditions) on learners' language use. As a relatively weak link in English teaching, how to effectively improve college students' English writing level should be paid more attention to.

Through classroom experiments, this study uses different task instructions to guide learners' attention, explores the effects of task complexity on English learners' writing output, and then proposes suggestions for improving the teaching of English writing.

2. THEORETICAL FRAMEWORK

This chapter illustrates theories that the present study is based on. Among them, the two most representative are the Cognition Hypothesis Model (Robinson, 2001) and the Limited Attentional Capacity Model (Skehan & Foster, 2001). Robinson, Skehan and Foster operationalized task complexity in different levels through the manipulation of different factors. Both convergence and divergence take place in their models. The convergence lies in the crucial role of attention and how attentional resources are used during task completion, while the divergence is about an important prediction of the effect that increasing task complexity has on linguistic performance. The former claims that increase in task complexity promotes the language production while the latter claims that language production is negatively affected by the increase of task complexity.

2.1 Task Complexity

Task complexity and task difficulty are two main variables of task design, but they are also two different concepts. However, in many early studies, researchers often confuse them and think that their actual effects are the same. It is now found that learners' perception of task difficulty is influenced by intelligence level, while task complexity is determined by internal factors of task, and has nothing to do with intelligence level. The ambiguous boundary between task difficulty and task complexity is partly due to the lack of acceptable definition of task complexity.

2.1.1 Skehan & Foster's Limited Attentional Capacity Model

Skehan (1998), Skehan and Foster (1999, 2001) decomposed task difficulty into three dimensions: code complexity, cognitive complexity and communicative stress. Code complexity is the language requirement of tasks, including language complexity, vocabulary quantity and information density. Cognitive complexity is related to the content and structure of tasks, which can be measured by cognitive familiarity and cognitive processing. Then they claimed that learners allocated less available attentional resources to linguistic output if more attention and high-level cognitive processing were distributed to content. Consequently, attentional resources are likely to be drawn away from language forms because of the cognitively demanding tasks.

In their Limited Attentional Capacity Model, Skehan and Foster's (1999, 2001) claimed that task complexity stands for how much attention is required and demanded for finishing tasks. Increasing task complexity will lead to pressure for the limited attentional capacity. Learners will concentrate on the meaning of language at first instead of form when their notice of task need reach or exceed the upper limit of the attentional capacity. Thus, the increase in task complexity will impose learners to make up for the insufficiency of meaning processing in sacrifice of the notice of form.

Other researchers got similar findings in terms of this phenomenon. A study by VanPattern (1990) demonstrated that learners cannot pay attention to language forms without a loss of attention to language content, and that when allowed to allocate attention freely, they will prioritize the concern for content over concern for form. In this view, tasks which are cognitively demanding in their content are likely to draw attentional resources

away from language forms, encouraging learners to avoid more attention-demanding structures in favor of simpler language for which they have already developed automatic processing. Conversely, very cognitively demanding content might result in learners paying insufficient attention to language forms.

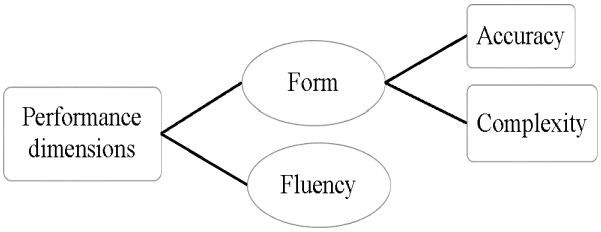

Figure 1
Theorising dimensions of performance

In other words, the core of Limited Attentional Capacity Model is human's limited capacity for processing information. When learners are required to allocate more attentional resources in demanding tasks, the trade-off effects among accuracy, fluency and complexity of language performance may take place. In other words, increase in any one of these three aspects sacrifices other two aspects. The performance dimensions theorized by Skehan (1998) is shown in Figure 1.

2.1.2 Robinson's Cognition Hypothesis

As shown in Skehan's theories, the terms task complexity and task difficulty are used interchangeably, and the potential internal, external, and interactional influences on them are confusingly believed to be the same. Robinson (2001) made a further distinction between task complexity and task difficulty, and proposed a Cognitive Hypothesis Model. The Cognitive Hypothesis Model distinguishes components from three dimensions for the first time task: complexity (cognitive factor), difficulty (learner factor) and task condition (interaction factor), which interact to affect learning and task performance. Therefore, it is also called the Triadic Componential Framework (Table 1).

Table 1
Robinson's Triadic Framework

Task Complexity (cognitive factors)	**a) resource-directing variables** e.g., +/- few elements +/- here-and-now -/+ intentional reasoning -/+ causal reasoning	**b) resource-depleting variables** e.g., +/- planning time +/- single task +/- prior knowledge +/- task structure
Task Difficulty (learner factors)	**a) affective variables** e.g., h/l task motivation h/l processing anxiety h/l control of emotion h/l openness to experience	**b) ability variables** e.g., h/l aptitude h/l working memory h/l reasoning h/l task-switching h/l field independence
Task Condition (interactive factors)	**a) participation variables** +/- open solution +/- one-way flow +/- convergent solution +/- few contributions needed	**b) participant variables** +/- same proficiency +/- same gender +/- familiar +/- shared content knowledge

According to Robinson (2001), task difficulty is caused by individual differences of second language learners. It is a personal factor, which includes two dimensions: affective factors and competence factors. The differences of learners' abilities (aptitude, working memory, and reasoning) will make great differences in their assessment of the difficulty of the same task, and some temporary emotional factors (control of emotion, task motivation, processing anxiety) will have an impact on resource reserve. However, task complexity, which is an objective factor, depends on the cognitive processing requirements of the task for learners. A given task has different difficulty for different learners, but the task complexity is the same, because the task complexity is affected by the structure and design of the task itself, and has nothing to do with the learners' personal ability.

From Robinson's (2001) point of view, task complexity refers to two types of the cognitive task features: resource-directing and resource-depleting, which can be manipulated either to increase or decrease cognitive demands placed on the learners when they perform a task. These cognitive task features include participation variables, such as, the nature of the task (open/closed, one-way/two-way, convergent/divergent) and participant variables (same/different gender, extent of familiarity, power and solidarity). In Robinson's (2001) definition, task complexity is the result of the attention focus, working memory, reasoning and other cognitive demands imposed by the structure of the task on the language learner, and it is an objective factor. A given task is different for different learners, but the task complexity is the same, because the task complexity is affected by the structure and design of the task itself, and has nothing to do with the individual ability of the learner.

In Robinson's (2001) Triadic Componential Framework, task complexity encompasses two key dimensions: the resource-directing dimension, and the resource-depleting dimension. The two dimensions

affect resource allocation in sharply different ways. The resource-directing dimension makes conceptual demands whilst the resource-depleting dimension makes procedural demands on learners. The two dimensions are composed of factors such as whether the task requires learners to make reference to events in the past or events in the present, whether the task requires learners to make reference to few or many elements, and whether a single task or multiple tasks are carried out concurrently by learners, etc. Increasing task complexity along resource-directing dimensions (e.g., +/-here and now, +/-reasoning demands, +/-few elements), will lead to more accurate and complex oral production as learners have to attend to the conceptual or functional demands of the task, but will lead to a lower fluency, as learners have to deliberately and explicitly process language. In contrast, increasing task complexity along resource-depleting dimensions (e.g., +/-planning, +/-prior knowledge, +/-single task), will lead to less fluent, accurate, and complex oral production because learners' attention will not be directed to any particular aspects of the linguistic system to meet the increased task demands. It is argued that increasing task demands with respect to the resource-depleting dimension will constrain the attentional and working memory resources of learners and divert them away from focusing on critical aspects of solving the task. This will not only lead to a depletion of learners' attentional and memory resources, but also result in deteriorated task performance.

The two dimensions of task complexity tend to interact and affect task production — resource allocation arrives at an optimum when a pedagogic task is made simple along a resource-depleting dimension (e.g., by allowing planning time), and complex along a resource-directing dimension (e.g., by requiring reasoning) to satisfy the linguistic demands of the task, in comparison with when the task is made complex on both dimensions simultaneously. Thus it can be reasonably supposed that the change of task complexity can result in difference of language production and thereby affect the accuracy, complexity and fluency of English writing.

In brief, in contrast to Skehan and Foster, Robinson declared that learners' performances are affected by multiple attentional resources. If more cognitive demands are required for the tasks, learners' production will be more complex and accurate. Robinson also claimed that task complexity is regarded as internal factor of tasks, while task difficulty stands for external factors which are partially interfered by factors from learners themselves. Task difficulty should help explain variation in task performance between two learners performing the same task, whereas task complexity should help explain learner variation in two tasks.

2.2 Writing Performance

Writing is a comprehensive skill that involves many language paradigms. Among the four basic language skills (listening, speaking, reading, writing), writing is considered the most practical, comprehensive, and challenging one for language learners. Writing is a cognitive activity, the practice of which is an effective way for students to develop their abilities of thinking and expression. Writing is also an act that takes place within a context, that accomplishes a particular purpose, and that is appropriately shaped for its intended audience. Writing is a meaning-making activity that is socially and culturally shaped and individually and socially purposeful. Therefore, writing is one of the best approaches to assess the teaching and learning outcomes (Yeonsuk, 2003).

However, the complex and subjective job of assessing writing proficiency deters any efforts to use it as a mark of language learners' overall language ability. The ability to spell the English words correctly and use punctuation correctly does not mean the ability to write complete sentences. The ability to write complete sentences does not mean the ability to write a coherent composition. To write a coherent composition involves spelling, vocabulary, grammatical knowledge, as well as other factors such as content, logic, appropriateness of style and rhetoric, etc. Traditionally, we break down learners' writing abilities to five dimensions: language use, mechanical skills, treatment of content, stylistic skills, judgment skills (Heaton, 2000), but successful writing involves more abilities: mastering the mechanics of letter formation, obeying conventions of spelling and punctuation, using the grammatical system to convey one's intended meaning, organizing content at the level of the paragraph and the revising of one's initial efforts, selecting an appropriate style for one's audience, etc (Nunan, 2004).

But these still cannot account for the students' writing competence completely. Often, the assessment of writing is referred to as language performance test. For the test of writing, writing ability cannot be validly abstracted from the contexts in which writing takes place. To some extent, the ability to write indicates the ability to function as a literate member of a particular segment of society or discourse community, or to use language to demonstrate one's membership in that community (Lin, 2006).

This study evaluates students' English writing ability through the content, structure and language of their English writing output. In terms of content, the research examines whether the students have successfully completed the tasks prescribed by the test questions, whether the theme is prominent, whether there are sufficient arguments to prove their views, and whether the reasoning is clear. The structure of essays is mainly assessed by whether the students' writing structure is clear, whether the logic is strong, and whether the arguments are coherent. The language sphere is checked from two aspects: grammar (whether students can use various sentence patterns, whether they use words accurately and appropriately and whether there are spelling, punctuation

or capitalization errors) and language (whether their language is appropriate or convincing).

2.3 Task Types

The "task" refers to language activities that teachers arrange students to complete in the classroom. However, these activities are not centered on language forms, but on communicative activities designed to meet the needs of students in using language. They have the following characteristics: (1) the expression of meaning occupies the first place; (2) they have some connection with the real world; (3) task completion is better than language expression; (4) the quality evaluation of task execution is based on the result of task completion (Skehan, 1998).

There are abundant task types and are classified according to different perspectives and various demands. In second language acquisition research, there are a range of tasks varying from traditional assignments (story retelling, interview, spot-the-differences) to more real-life tasks (seeking information, giving instruction, map tasks). The types of writing tasks include descriptive, narrative, discursive or the products of demonstrating understanding through the target language.

Nunan (2004) discriminated between real-world tasks or target tasks and pedagogical tasks. Target tasks refer to making use of language in the real world beyond the classroom. Pedagogical tasks are those tasks that occur in the classroom. It is on the basis of the theory of second language acquisition and aimed specifically to achieving a certain learning goal. In the process of completing the pedagogical tasks, learners need to receive process and transmit information along with expressing opinions and thoughts.

Richards (2001) made a list of variety of pedagogical tasks: (1) jigsaw tasks, in which the learners need to swap with each other about the different information they have respectively and to set up a complete meaning with this information; (2) information-gap tasks, in which one group of learners need to consult with and discuss to get information they need to accomplish certain tasks; (3) problem-solving tasks, in which the teacher provides the learners a question and some information, and the learners need to create a solution; (4) decision-making tasks, in which the teacher provides a problem to learners while offering them with several possible outcomes. Through consultation and discussion, the learners choose one outcome of the decision; (5) opinion exchange tasks, in which learners need to be engaged in discussion and exchange of opinions without needing to reach agreement.

Empirical studies of L2 writing output often take task type as an independent variable to examine its impact on writing output. Writing tasks are generally classified into types of literature, theme, task structure, planning time and task complexity. Among them, task complexity is the most important one, which focuses on the information processing resources such as attention, memory and reasoning in the cognitive process of learners. Since task types are defined from different perspectives, researches concerning the effects of task types on language production in terms of accuracy, complexity and fluency are also carried out from different points of view.

In this study, writing tasks chosen for the experiment have communicative goals. In addition, tasks in writing are classified into three types in this study. They are material composition, chart composition and propositional composition. There are several reasons for this classification. Firstly, tasks are classified in accordance with Prabhu's classification of tasks, in which tasks are divided into information-gap tasks, opinion-gap tasks and reasoning-gap tasks (Tian, 2009). Material composition is similar to the reasoning-gap tasks, in which learners synthesize and summarize the given information by the method of deduction and reasoning. Propositional composition represents the opinion-gap tasks. There are not too many restrictions on the propositional composition. Students can choose different angles to express their opinions according to the topic, so there can be different viewpoints. Chart composition resembles the information-gap tasks. Because chart information is not presented in the form of words, but needs to be described by the learners themselves. And each learner knows different ways of describing chart information, so there will be some information gap. Secondly, all the writing abilities that require learners to grasp are involved in completing these three tasks, namely the ability of expressing oneself in the target language, the ability of expressing their own opinions on a topic and the ability of summarizing reading materials.

3. RESEARCH METHODOLOGY

3.1 Research Questions

The present study aims to investigate the influence of task complexity on Chinese EFL learners' writing performance along two dimensions under the framework of Robinson's Cognition Hypothesis. Three research questions are addressed as follows:

1) What is the influence of writing tasks with different complexity on the language performance of learners' English writing output, including accuracy, fluency and complexity?

2) What is the influence of writing tasks with different complexity on the total score of the learners' writings?

3) What is the influence of writing tasks with different complexity on the learners' writing content?

3.2 Participants

The participants were 79 university learners of English in Zhijiang College of Zhejiang University of Technology. All of the participants were Chinese, and their ages ranged from 20 to 22 years old. Students were divided equally

into three groups according to their three previous writing tests scores. They have been learning English writing for a year in an instructed setting and are thus homogeneous in terms of L1 background and English learning history.

3.3 Writing Tasks

The writing tasks of this study are based on the three test types for the Writing part listed in the Syllabus for TEM4 (2015). Theoretically speaking, there are three test types for TEM4 writing. However, since the reform of 2015, the Writing part of every TEM4 test is invariably material compositions. Before the 2015 reform, the writing part of TEM4 had always been propositional compositions. Never had TEM4 tested students with chart compositions. Compared with other types of writing tests, the material composition seems to be more demanding for students, which requires them to read a report or essay before the writing task begins. Other than testing their writing competence, it also tests students' ability to capture information from source materials and use it in their argument for or against the target topics.

In this study, the same topic of "whether charging congestion fee is a good way to ease traffic jams" were designed into three writing tasks with different degrees of complexity (Table 2), and the three tasks were assigned to the three test groups.

Table 2
Writing task design with different task complexities

	Task types	Resource-directing			Resource-depleting		
		Here-and -now	No reasoning demands	Few elements	Planning	Prior knowledge	Single task
Task 1	**Material composition**	/	+	+	/	-	+
Task 2	Chart composition	/	-	-	/	+	+
Task 3	Propositional composition	/	-	-	/	+	-

Task 1 is material composition, which requires students to read a topic-related English essay of about 250 words in 5 minutes, and then complete an argumentative writing of at least 250 words in 45 minutes according to the requirements of the task.

Task 2 is chart composition, which requires students to complete an argumentative writing of at least 250 words in 45 minutes according to the phenomena in the chart.

Task 3 is propositional composition, which requires students to complete an argumentative writing of at least 250 words in 45 minutes on the basis of a given topic.

As shown in Table 2, the complexity of the three tasks varies from one task to another, which covers +/-elements and +/-reasoning in the resource-directing dimension and +/-prior knowledge and +/- single task in the resource-depleting dimension.

From the perspective of the resource-directing dimension, task 1 is more complex, because before writing, students need to read a 250-word English material related to the topic, summarize the viewpoints in the material, and finally explain their reasons. Therefore, there are certain reasoning demands and more elements involved than the other two tasks. From the resource-depleting dimension, Task 1 has both reading and writing tasks, so it is a dual task, but its reading materials also provide students with prior knowledge.

From the perspective of the resource-directing dimension, task 2 has a lower complexity than task 1, because although the students need to analyze the chart, there is no need for them to resort to their reasoning ability. From the perspective of resource-depleting dimension, Task 2 has a high complexity. In addition to the writing task, it requires the students to analyze the chart and explain reasons. Therefore, it is a dual task. That's more, students who are not very familiar with the topic and are only provided with a chart do not have much more prior knowledge than those who are assigned a propositional composition.

Task 3 is a propositional composition. From the perspective of resource-directing dimension, task 3 has a lower complexity, because it only provides a topic, so it has no reasoning demands and less elements involved. From the perspective of resource-depleting dimension, task 3 is a single task, and it does not provide learners with prior knowledge.

According to Robinson's cognitive hypothesis, adding task complexity to the resource-directing dimension will lead learners' attention resources to specific language structures and forms, thus making the output language more accurate and complex. However, increasing task complexity in the dimension of resource-depleting dimension will consume more attention and working memory of learners, and reduce the attention resources allocated to language forms by learners. Therefore, Task 2 is the most difficult of the three tasks, foreboding poorer English writing output. Task 1 and Task 3 are not significantly different in the resource-depleting dimension, but in the resource-directing dimension, Task 1 is more complex than Task 3. Therefore, it can be assumed that Task 1 is more complex than Task 3, so the English writing language output might also be better.

3.4 Measures of Complexity, Accuracy and Fluency

79 compositions were evaluated and corrected by one writing teacher. Since the purpose of this study is to discuss learners' L2 writing language competence, the main task of the assessment is to analyze the texts. Writing proficiency is assessed by a combination of overall assessment and target measurement. The overall

assessment is based on TOEFL Writing Scoring Standard. The teacher evaluated compositions comprehensively from four aspects: grammar, appropriateness, content and logical structure, and give the total score. And target measurement uses three specific indicators: accuracy, fluency, and complexity, as is shown in Table 3.

Table 3
Experimental measurement index

Measurement indexes	Accuracy	Fluency	Complexity	
			Syntactical complexity	lexical complexity
Formula	EFT/T	T	C/T	W/T

Notes: EFT/T=Error-free T-units/T-units; T= T-units; C/T=Clauses/ T-unit; W/T=Words/ T-unit.

The Accuracy index is indicated by the ratio of the number of Error-free T-units to the total number of T-units. The larger the value, the higher the accuracy of the language. The T-unit is the smallest unit that contains a main clause and all subordinate clauses and phrases.

Fluency is measured by the total number of T-units per composition. The higher the value, the higher the fluency.

Complexity includes syntactic complexity and lexical complexity. Syntactic complexity is based on the number of clauses per T-unit, and the more the number of clauses, the higher the syntactic complexity. Lexical complexity refers to the number of words per T-unit. The more words produced per T-unit, the higher the lexical complexity.

3.5 Research Procedures

3.5.1 Data Collection

There were three main steps in the experiment. Firstly, three writing tasks with different complexity were assigned to three groups in a writing class. Students in each group were required to complete their writing in 45 minutes. Except for the five-minute reading time of the group given the material composition, all the other requirements being the same, and the subjects were told that the writing was an English writing test, which needed to be completed independently, and they were not allowed to consult the any other online materials, reference books or dictionaries. Then, after collecting the paper version of the composition, the compositions were converted into electronic versions. During this period, the composition teacher carefully reviewed the composition errors, including spelling, grammar, collocation, expression and so on, found out the number of clauses, and verified them. Finally, error statistics, parallel data integration and analysis were carried out.

3.5.2 Data Analysis

After analyzing and scoring the electronic version of the writing, the required data were cross-checked with the manual data and was entered into SPSS17.0 for statistical analysis. Descriptive analysis and standard deviation analysis were used.

4. RESULTS AND DISCUSSION

4.1 Effect of Task Complexity on Writing Performance

4.1.1 Effect of Task Complexity on Accuracy

The accuracy of this study is measured by the ratio of the number of Error-free T-units (EFT) to the total number of T-units. The larger the value, the higher the accuracy of the language. Through descriptive statistics (Table 4), we can find that the mean scores of students' English writing accuracy is shown as Task 2<Task 3 < Task 1 from the lowest value to the highest. One-way ANOVA data showed that the accuracy of the three tasks is significantly different ($F=18.84$, $P<0.001$). After Post-Hoc analysis, it is found that there were significant differences between Task 1 and the other two groups ($P<0.001$). There is a difference in accuracy between Task 2 and Task 3, but the difference is not significant ($P=1.138$). The above results also validate the previous hypothesis that Task 1 has the highest accuracy, while Task 2 has the lowest accuracy.

Table 4
Descriptive Statistics of Students' Language Performance

Task Types		Accuracy	Fluency	Complexity	
				syntactical complexity	lexical complexity
Task 1	Minimum	0.48	19.00	0.10	8.30
	Maximum	0.92	38.00	0.48	11.61
	Mean	0.68	27.21	0.30	9.62
	Std. Deviation	0.13	5.09	0.10	0.83
Task 2	Minimum	0.20	17.00	0.16	7.76
	Maximum	0.78	41.00	0.48	14.56
	Mean	0.47	28.96	0.29	9.83
	Std. Deviation	0.14	6.24	0.09	1.43
Task 3	Minimum	0.29	22.00	0.11	8.54
	Maximum	0.74	38.00	0.47	11.91
	Mean	0.54	27.78	0.29	9.91
	Std. Deviation	0.11	5.17	0.10	0.89

Through the above analysis, we can find that task complexity has a significant positive impact on the accuracy of learners' English writing output, i.e. when task complexity increases, learners' accuracy also increases, which is consistent with some conclusions of Wang (2013).

Task 1 (material composition) increases the complexity of task in terms of reasoning demands and elements in the resource-directing dimension, because students should first summarize and explain the views in the materials, and then explain their reasons. On the other hand, task complexity decreases on the resource-depleting dimension, because material composition not only requires students to read some material and summarize it, but also elaborates their own views for writing, so it is a dual task. But reading materials provide students with prior knowledge, which helps to stimulate students' imagination and broaden their thinking, and they can use the vocabulary and sentence patterns in the materials to process their own language, resulting in higher accuracy in language, richer content and reasonable structures. This result also partly conforms to Robinson's cognitive hypothesis that increasing task complexity in the resource-directing dimension can direct learners' attention resources to specific language structures and forms, thus making the output language more accurate and complex. Task 2 (chart composition) has a high task complexity in the resource-depleting dimension because it is a dual task. Although it has chart information, it is not presented in the form of words, and the students need to organize the language by themselves, so the prior knowledge is insufficient, and because students lack vocabulary to express numbers in English, they will deplete a lot of attention in limited time, which will lead to the decrease of language accuracy. This result conforms to Robinson's cognitive hypothesis theory that increasing task complexity in the dimension of resource-depleting will consume more attention and working memory of learners, and reduce the attention resources allocated to language forms by learners. Task 3 (propositional writing) has a low task complexity in the resource-directing dimension, because it only provides a topic information and no other materials, so it has neither reasoning demands nor many elements involved. In the resource-depleting dimension, learners only need to complete the writing task, so it is a single task. The task provides only topic information, so students have less prior knowledge, ultimately leading to lower accuracy.

4.1.2 Effect of Task Complexity on Fluency

The measurement of fluency in this study is based on the number of T-units of learner's writing output. Through descriptive statistics of students' language performance (Table 4), we can find that there are some differences in language fluency when learners complete writing tasks with different complexity, but there is no significant difference (P = 0.57) between them according to one-way ANOVA test. The mean scores of students' English writing fluency is shown as Task 2>Task 3>Task 1 from the highest value to the lowest. It seems that task complexity has no impact on learners' fluency in English writing. Possible explanations are: In this study, all tasks were completed under time-limited conditions, so whether given low-complexity tasks or high-complexity tasks, students will complete the corresponding length of text. Another reason is that most students tend to think that in a writing test, the longer their compositions are, the better the scores they will be given. However, it seems that Task 2 requires students to account for the reason of traffic congestions during the May Day holiday, so students tend to write a longer essay than those who were given other tasks.

4.1.3 Effect of Task Complexity on Language Complexity

The measurement of language complexity in this study includes lexical complexity (the number of words per T-unit) and syntactic complexity (the number of clauses per T-unit). Through descriptive statistics (Table 4) the average syntactic complexity of task 1, task 2 and task 3 are 0.30, 0.29 and 0.29 respectively. One-way ANOVA analysis revealed that there is no significant difference among the three tasks (P=0.75). The average lexical complexity of task 1, task 2 and task 3 are 9.62, 9.83, 9.91 respectively. One-way ANOVA analysis revealed that there was also no significant difference among the three tasks (P=0.11). But based on descriptive data, task complexity may have a slight influence on lexical complexity, although it is not statistically significant. As is shown in the table, the mean scores of lexical complexity of the students is sequenced as Task 3 > Task 2 > Task 1. That is, the lexical complexity is higher in the simple task (Task 3) than that in complex tasks, the higher the cognitive complexity of tasks, the lower the lexical complexity, which is consistent with the conclusions of Li Zhen and Liu Xuelian (2016). This happens because in limited time, the reading material of the text (Task 1) makes the students' information processing load increase, which reduces the possibility of switching to a relatively familiar non-material writing mode, interrupts or interferes with their relatively independent conception and writing process, so the complexity of their output composition language is lower. When dealing with tasks with higher cognitive requirements, students will give priority to the content of tasks, thus distracting their attention to language forms, resulting in a decline in lexical complexity, which also confirms Skehan's Limited Attentional Capacity Model.

4.2 Effect of Task Complexity on the Total Score of the Learners' Writings

Through descriptive statistics (Table 5), we can find that the mean scores of students' English writing compositions is shown as Task 1 (43.69)> Task 3 (41.17)>Task 2 (37.68). In terms of standard deviation, the inter-group differences in the Task 2 are generally smaller than those in the Task 1 and the Task 3. The results of one-way ANOVA showed

that there was significant difference in the total score of students' English compositions among the three groups (F=12.51, P<0.001). Multiple Post-Hoc comparative analysis showed that there were significant difference between Task 1 and Task 2 (P=0.000), and Task 2 and Task 3 (P=0.027).

Table 5
Descriptive Statistics of Students' Writing Achievements

Task types	N		Minimum	Maximum	Mean	Std. Deviation
Task 1	28	Content	12.00	17.00	15.18	1.47
		Structure	11.00	18.00	14.64	1.83
		Language	11.00	17.00	14.14	1.92
		Total score	35.00	52.00	43.96	4.70
Task 2	28	Content	8.00	17.00	12.25	1.96
		Structure	11.00	16.00	12.93	1.27
		Language	10.00	16.00	12.50	1.69
		Total score	30.00	48.00	37.68	4.46
Task 3	23	Content	10.00	17.00	13.22	2.09
		Structure	11.00	17.00	14.04	1.82
		Language	11.00	16.00	13.91	1.50
		Total score	33.00	49.00	41.17	5.01

Through the analysis of the data, we can find that task complexity has a significant impact on the total score of students' English compositions, which is further supported by the analysis of their language, content and structure. Task 1 has the highest total score, followed by Task 3 and Task 2 which has the lowest total scores. Possible explanations include:

1) Task 1 is a material composition, also known as comprehensive writing test task, which requires students to read an English material about 250 words related to the topic before writing, so that students can use a variety of skills and strategies to capture and process information from the source materials. Although the reading material has certain reasoning demands, it broadens the students' thinking, and students have a certain prior knowledge to inspire their thoughts. The content of the article will be very substantial, more convincing, the structure will be clear and coherent. Although it is a dual task, reading material provided students with some useful expressions and model structures for their reference, so students got higher scores in language and structure.

2) Task 2 is a chart composition, in which students were required to extract information from the chart in addition to the primary task of the essay. The task of describing the chart involves presenting and analyzing the figure of each curve and explain the differences, which is a relatively difficult task. Therefore, students were prone to make more mistakes in language expression. Furthermore, students would have to incorporate the information of the chart into the overall argumentative essay, so some students had problems in balancing the contents and the structure, resulting in poor patterns of paragraph arrangement.

3) Task 3 is a propositional composition, which is a single task without reasoning requirements and involves fewer components, but students do not have prior knowledge. Students who are not familiar with the topic of dialogue tended to have no clues at all when writing and developed a mental block which prevented them from producing anything original. Therefore, some students would have to activate the "writing templates" in their minds. This is what most students will do when they are desperate for any ideas to write but need to produce something to complete their writing before time runs out.

4.3 Effect of Task Complexity on the Learners' Writing Content

The influence of writing tasks with different complexity on students' writing content is reflected in students' writing viewpoints. From the descriptive statistics of students' writing achievements (Table 5), we can find that the mean scores of students' English writing content is ranked by the order Task 1>Task 3>Task 2. In terms of standard deviation, the inter-group differences in Task 2 are again smaller than that in Task 1 and Task 3. One-way ANOVA data analysis showed that there were significant differences in content scores among the three groups (F=18.33, P<0.001). There was significant difference between task 1 and other two groups (P<0.05), but there was no significant difference between task 2 and task 3 (P=0.16). The statistics of students' writing viewpoints (Table 6) showed that Task 1 is more diverse, of these viewpoints, 23% comes from the government, 22% from the society and 54% from the citizens; topics in Task 3 are mostly from the perspective of citizens, accounting for 69%; topics in Task 2 are more inclined to consider citizens' travel choices, accounting for 24%. By comparison, we can also find that Task 1 (23%) is significantly higher than Task 2 (10%) and Task 3 (15%) in terms of government's views shown in the reading materials.

From the statistics of students' writing viewpoints, we can find that students' writing content is not related to task complexity, but to task types. Most students' opinions in the material composition are related to the government initiatives suggested in the material. For example, the government needs to take measures to restrict the production and purchase of vehicles to limit the number of vehicles and the failures of Singapore and London are all related to the source materials. And the material composition has more varied points of view than the other two tasks. The reasons are as follows:

Material composition can provide more abundant writing materials and information sources for learners, help to stimulate students' imagination and broaden their thinking. However, from the teacher's comments, it is found that some students copied parts of the source text, which also shows that there are some drawbacks.

Topics in the chart composition are very scattered, mostly from the perspective of travel choice, because the chart is about the number of high-speed vehicles on holidays. Moreover, students tended to put too much emphasis on describing the phenomenon presented in the charts, while ignoring producing their own views. Besides, the chart did not help students with opening up their thinking. It only made their writing task more complicated by adding an additional task.

Topics in the Propositional composition are mostly from the perspective of society and human factors, which have a strong bearing on their daily life. Because there were not many restrictions on proposition composition, students could think freely and expound their views according to their familiar life experience. But like the topics in the chart composition, there is a lack of varied opinions, and students were more likely to resort to their "writing templates".

Table 6
Statistics of Students' Writing Viewpoints

	Viewpoints	Task 1	Task 2	Task 3
Government	1. Infrastructure	11 (14%)	2 (3%)	8 (15%)
	2. Revenue	3 (4%)	4 (6%)	0
	3. Limiting vehicle production and purchase	5 (6%)	0	0
	Total	19 (23%)	6 (10%)	8 (15%)
Society	1. Economic development	10 (12%)	0	0
	2. London, Singapore's Failure	7 (9%)	0	0
	3. Environment	1 (1%)	5 (8%)	1 (2%)
	4. Safety	0	5 (8%)	1 (2%)
	5. Unified standard	0	0	7 (13%)
	Total	18 (22%)	10 (16%)	9 (16%)
Human	1. Financial burden	9 (11%)	2 (3%)	1 (2%)
	2. The irreplaceability and purchase volume of cars	11 (14%)	7 (11%)	9 (16%)
	3. Choice of travel mode and time	10 (12%)	13 (21%)	13 (24%)
	4. Emotion	12 (15%)	0	6 (11%)
	5. Obeying the traffic rules	2 (2%)	10 (16%)	8 (15%)
	6. Travelling	0	15 (24%)	1 (2%)
	Total	44 (54%)	47 (75%)	38 (69%)

4.4 Discussion

After analyzing the data from the research, the three research questions can be address as follows:

a. Task complexity has an impact on the language performance of students' English writing output, and has different effects on language accuracy, fluency and complexity. Task complexity has a significant impact on language accuracy and a slight effect on lexical complexity. The influence on language accuracy conforms to Robinson's Cognitive Hypothesis Model. Task 1 increased task complexity in terms of reasoning demands and elements in resource-directing dimension, which made learners' writing language more accurate and complex. Task 2 increased task complexity in terms of prior knowledge and single task in the resource-depleting dimension which consumed more attention and working memory of learners, thus reducing the accuracy of students' language output. The influence on lexical complexity conforms to Skehan's Limited Attentional Capacity Model, that is, when dealing with tasks with high complexity, learners will give priority to the content of tasks, which reduces their attention to language forms, thus affecting accuracy. But in this research, task complexity had no effect on fluency and syntactic complexity.

b. There were significant differences among the total scores of students' three kinds of compositions. The analysis of their language, content and structure further supports the conclusion that task complexity has an impact on the total scores of students' compositions. Task 1 (material composition) had the highest total score, while task 2 (chart composition) had the lowest total score. It can be seen that material composition is a method that can accurately measure students' English writing ability. Although material composition seems to add difficulty to a test, it can effectively activate students' thoughts and trigger a better language output. Therefore, it has become the top choice of TEM4 and TEM 8 tests.

c. It can be found that when students completed material composition, reading material provided them with abundant information sources and background knowledge, which helped to stimulate students' imagination and broaden their thinking. But there were also students who copied materials for convenience, which is the disadvantage of this type of writing task. On the contrary, chart composition and the traditional proposition composition do not provide students with any information concerning the topic, which may pose a certain degree of difficulty for students who are not familiar with the topics and more likely to cause unfairness in exams.

In short, on account of language accuracy, lexical complexity, and richer contents, material composition is a better choice for testing students writing ability than the other two writing tasks.

5. CONCLUSION

This study explores the impact of task complexity on students' English writing output through manipulating the four dimensions: no reasoning demands, few elements, prior knowledge and single task, and analyses the causes of the impact. The findings of the study are as follows:

Task complexity has a significant impact on students' language performance in English writing, which is embodied in accuracy, complexity and fluency. Task complexity has a significant impact on language accuracy but only a slight effect on lexical complexity. Task complexity has no effect on fluency and syntactic complexity. Also, task complexity has a significant impact on the total score of students' English writing, which is embodied in the content, structure and language. This paper also finds that task types have a significant impact on students' writing content. Comprehensive writing tasks, i.e. material writing can effectively distinguish the level of students, because it provides many effective sources of information for students, enriches the content of the tested articles, optimizes the structure of the articles, and stimulates the learners' multi-literacy. It helps them fully express their rich ideological content by improving the structure and cohesion of the article. However, there are also some drawbacks, in that some students will directly quote the words in the materials.

The implications of this study are:

a. In order to make students write high-quality compositions, we can properly improve the complexity of the tasks and urge them to devote more attention to the processing of language forms, so as to meet the cognitive requirements of the task itself for language learners in the process of attention, memory, reasoning and other information processing, because language and cognitive complexity contribute to language acquisition. When learners devote more attention resources and efforts to complex language construction, the ultimate result is acquisition.

b. Foreign language writing teaching should use more comprehensive tasks, i.e. material writing, under the principle of teaching students according to their aptitude. This kind of task can better examine students' English writing ability. When the difficulty, form and topic of the input materials are appropriate, the college English learners should be trained to complete the reading and writing tasks in order to cultivate students' ability to use multichannel information to deal with problems and express ideas. However, in order to prevent "smart plagiarism", we need to further study this phenomenon and find a suitable writing method for students, which can comprehensively test their comprehensive English ability.

c. Most students have once used some templates in their writing, but lack innovative and creative consciousness. Therefore, in the future writing teaching, teachers should not only let students grasp the words, sentences and writing routines, but also emphasize the importance of cultivating their critical thinking ability. Students should be encouraged to extract ideas from the materials and organize the sentences and conclusion of articles with their own thinking. At present, college students should step out of the "template era" as soon as possible and return to the nature of creation.

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