

Independent Writing Tasks vs. Integrated Writing Tasks: The Cognitive Demands and Their Impacts on Linguistic Complexity in EFL Writing

Ziming Zhao

Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, Kuala Lumpur, Malaysia;

School of English, Jilin International Studies University, Changchun, China

Vahid Nimehchisalem*

Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, Kuala Lumpur, Malaysia

Mei Yuit Chan

Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, Kuala Lumpur, Malaysia

Abstract—Despite many studies investigating the effects of task complexity on L2 writing performance, little attention has been given to the specific effects of independent vs. integrated writing tasks and their cognitive demands on EFL learners. This study aimed to address this gap by conducting a comprehensive examination of the cognitive demands exerted by these two types of writing tasks and their effects on linguistic complexity outcomes among 35 Chinese EFL learners. Employing mixed methods involving learner self-ratings, expert judgments, and dual-task measures, the study revealed that, compared to the independent writing task, the integrated writing task places higher cognitive demands on students. In terms of written performance, participants demonstrated enhancements in lexical and syntactic complexity when responding to the integrated writing task, supporting Robinson’s Cognition Hypothesis (CH). These findings highlight the importance of understanding the cognitive load imposed by different types of writing tasks and offer implications for educators in the design and sequencing of writing tasks within Task-Based Language Teaching (TBLT) contexts.

Index Terms—cognitive demands, integrated writing task, independent writing task, linguistic complexity, EFL writing

I. INTRODUCTION

As a basic component of TBLT (Task-Based Language Teaching), tasks provide learners with a context where language is used meaningfully, thus playing a facilitative role in second and foreign language learning. The task syllabus requires organizing content to maximize learning development, and more specifically, the complexity of a task needs to be determined to match learners with their learning levels. In the field of TBLT, there has been extensive research on the effects of manipulating task characteristics on second language (L2) development and performance. Robinson (2005), for example, asserts that understanding the cognitive demands that tasks place on L2 learners ensures predictable gains in their language development.

Two major frameworks—Skehan and Foster’s (1996, 1998) Limited Attentional Capacity Model (LAC) and Robinson’s (2001a, 2003, 2005b, 2011a) Cognition Hypothesis (CH)—have offered conceptual and empirical guidelines regarding how task complexity influences learners’ language performance. While both Robinson and Skehan agree on the concept of task complexity and the notion that manipulating task complexity may influence speech production in terms of fluency, complexity (lexical/syntactic), and accuracy (CAF), they differ in their perspectives on how increasing task complexity may impact learners’ language production. It is noteworthy that most of the research in this domain has primarily centered on oral production with comparatively less empirical attention devoted to exploring the complexity of writing tasks (Frear & Bitchener, 2015; Golparvar & Azizsahra, 2023; Kuiken & Vedder, 2012; Lee, 2021; Ong & Zhang, 2019).

* Corresponding Author. Email: vahid@upm.edu.my

The results of most research on task complexity in writing have been interpreted in line with Robinson's Cognition Hypothesis and the Triadic Componential Framework (2005, 2007), which primarily investigate the effects of cognitive task complexity on writing performance along two dimensions: the resource-directing dimension and the resource-dispersing dimension. According to the findings of research synthesis and meta-analysis by Johnson (2017), the most common resource-directing variable manipulated in task complexity involves adding or subtracting elements within the task, while the factor of planning, whether offered or not, is most operationalized along the resource-dispersing dimension.

Previous research has also shown that the manipulation of cognitive task demands can result in varying levels of task complexity, thereby resulting in diverse effects on L2 writing performance (Zhang, 2018). Furthermore, in nearly every one of these studies, task complexity is examined in independent writing tasks, while the integrated writing task is rarely considered by researchers. Nevertheless, recent years have witnessed a shift towards the application of integrated writing tasks on English proficiency exams such as the TOEFL or IELTS. In China, integrated tasks are also part of the writing section of the Test of English Majors (TEM), a national exam for English majors in college. To better understand the relations between task types and task cognitive complexity, it is necessary to widen the investigative scope of task complexity research. For educators and syllabus designers, the findings on validating the disparity between independent and integrated writing tasks, as well as their effect on EFL writing production, are valuable. First, it offers guidance on how to design pedagogical tasks and sequence them from simpler to more complex tasks that require more cognitive effort. Moreover, they provide teachers with valuable insight that can be used to select and design academic writing tasks that will enhance their students' proficiency.

There are two primary objectives of this research. First, by utilizing three methods—dual-task methodology, self-ratings, and expert judgments—the study aims to explore the disparities in cognitive demands exhibited between independent and integrated writing tasks. Second, it seeks to examine the effects of varying levels of cognitive complexity in these two writing tasks on Chinese EFL learners' writing production, focusing on both lexical and syntactic complexity.

II. LITERATURE REVIEW

A. *Cognitive Demands and Task Complexity in TBLT*

In the field of Task-Based Language Teaching (TBLT), understanding “the cognitive demands of task characteristics as contributing to their complexity and the cognitive abilities learners bring to task performance” (Robinson, 2015, p. 117) is pivotal for educators and test designers in guiding task design and sequencing. Moreover, this concerns how learners process information when engaged in a task.

Task complexity, conceptualized as cognitive task complexity, can be manipulated to impact L2 performance. “Task complexity mainly refers to the cognitive challenges faced by learners in language processing” (Robinson, 2007, pp. 196–197). When confronted with increased task complexity, and particularly with its cognitive demands, learners must reallocate their cognitive resources and adjust fluency, accuracy, and complexity (CAF) to ensure effective language output.

The most widely adopted theories from the research carried out on cognitive task complexity and its impact are Skehan and Foster's (1996, 1998) Limited Attentional Capacity Model (LAC) and Robinson's (2001a, 2003, 2005b, 2011a) Cognition Hypothesis (CH). Both theories delve into how different aspects of task design can either enhance or challenge the cognitive resources of L2/EFL learners, thereby directing learners' attention towards specific linguistic dimensions. However, these theories differ in their cognitive approach to tasks.

According to the Limited Attentional Capacity Model (LAC), an increase in cognitive task complexity results in a reduction in the available attentional resources for language learning. This reciprocal relationship arises because learners' attentional resources are inherently limited. In simpler terms, when the complexity of a task stretches learners' attentional resources to their limits, they actively redistribute their attention; that is, there is more focus on the meaning of language and less focus on linguistic form. This redistribution leads to decreased fluency, accuracy, and complexity (CAF) in L2/EFL performance.

In contrast, the Cognition Hypothesis (Robinson, 2005) proposes that different “dimensions of cognitive task complexity belong to different attentional resource pools” (p. 50). In other words, learners' attentional resources are not limited, allowing them to access multiple and non-competing attentional resources. Inspired by research in cognitive linguistics and L2 development, Robinson proposed the Triadic Componential Framework (TCF) for L2 task design. The basic principle of task sequencing and design should be based on increases in learners' cognitive complexity (Robinson, 2001a, 2001b, 2005a), and TCF introduces two dimensions that deal with cognitive loading: the resource-directing dimension and the resource-dispersing dimension. Depending on the cognitive requirements of tasks, the resource-dispersing component sets procedural constraints on learners' cognitive resources, while the resource-directing component, manipulated by +/- reasoning, +/- few elements, and so on, exerts varying degrees of cognitive demands on learners' attentional resources. Regarding the impact of the cognitive complexity of tasks on language production, Robinson claimed that increasing cognitive task complexity in the resource-directing dimension may lead to higher accuracy and complexity of L2 performance but also affect fluency. Previous research findings indicate that the nature

of tasks, such as independent or integrated tasks, may impose different levels of conceptual demands on participants (Plakans, 2009; Plakans & Gebriel, 2012). However, neither the Limited Attentional Capacity Model (LAC) nor the Cognitive Hypothesis (CH) offer predictions concerning the manipulation of task types (independent or integrated) and their potential impacts on learners' linguistic production.

B. Cognitive Load Measures in TBLT

Cognitive load is the stress placed on cognitive processing capacity or the capacity of working memory to process information. The concept of cognitive demand or cognitive load is multifaceted, so cognitive load assessment does not solely measure task complexity; rather, it quantifies the cognitive effort induced by changes in task complexity. It is assumed that cognitive load will increase as learners handle tasks of increasing complexity.

Révész (2014) and Révész et al. (2017) state that several methodologies have been used to measure cognitive load in previous research including subjective methods like self-rating scales, self-time estimation, and expert judgments, as well as objective ones like dual-task methodologies and eye tracking. In SLA research, subjective self-rating scales or self-report questionnaires have emerged as the dominant method for investigating task cognitive complexity (Sasayama, 2016). Using perceived mental effort ratings to examine cognitive load has demonstrated validity and reliability in previous studies. One of the earliest studies in this area was conducted by Robinson (2001) who used a nine-point self-rating scale to assess learners' perceptions of task difficulty. A two-item questionnaire, found to be valid by Sasayama (2016), was used to assess task difficulty and mental effort in storytelling tasks. Lee (2020) integrated self-rating methods with expert judgments and time-on task measures in his study on task complexity in L2 writing. Participants' self-reports were based on a nine-point Likert scale questionnaire regarding task difficulty, mental effort, and stress exerted by closed and open tasks.

Another subjective technique for assessing task-generated cognitive demands in language testing and SLA research is to seek the opinions of experts. To be more specific, linguistic and language education experts provide their opinions regarding task difficulties and anticipate cognitive burdens faced by task takers. For example, Brown et al. (2002) used expert opinions to evaluate cognitive loads after manipulating different task parameters in a large-scale performance assessment study. In the same vein, Révész et al. (2014) employed both expert opinions and self-ratings to assess the cognitive load between simple and complex tasks characterized by varying levels of reasoning demand. Previous validation research shows that the method of expert opinions is rarely used independently; that is, it is often applied with other objective measures of cognitive demand such as eye-tracking and dual-tasking. The previous findings have demonstrated that expert judgments can enhance understanding of cognitive demands in language learning contexts.

The dual-task methodology has been widely utilized in cognitive psychology research as a reliable means of measuring cognitive demands, and more recently, the dual-task methodology has been utilized in research on task complexity. For instance, along with other techniques, Révész et al. (2014, 2016) used dual-task methodology to assess task complexity validity where participants had to respond to changes in computer screen color while simultaneously completing the prime oral tasks. While the results showed that reaction time was not significantly different during simpler primary tasks, accuracy rates on the secondary tasks were higher. Sasayama (2016) utilized the dual-task methodology along with time estimation and self-rating measures to assess the intended complexity of tasks and found that participants' reaction time length was significantly associated with task complexity levels. To investigate the cognitive demands of L2 writing tasks, Xu et al. (2023) integrated the dual-task method (a primary writing task and a secondary auditory task) and self-ratings of task difficulty and mental effort. They discovered that there was a significant difference in the accuracy rate between secondary tasks; however, the research findings indicated that the choice of secondary tasks should be carefully considered as it impacted participants' attentional allocation. Indeed, many studies have demonstrated the value of dual-task methodologies in explaining cognitive demands in research on task complexity. Still, the application of this method has not received the attention that it deserves (Sasayama, 2016; Xu et al., 2021).

The previous studies have provided valuable insights into measuring cognitive demands in the context of TBLT. Moreover, further investigation in L2 writing, especially in integrated writing tasks, has not, on the other hand, undergone extensive evaluation. In this study, a triangulation approach was adopted, incorporating three methods—self-ratings, expert judgments, and dual-task methodology—to assess the cognitive demands of different independent and integrated writing tasks. This approach balanced subjective assessments (self-ratings) with objective measures (dual-task methodology). Additionally, expert judgments were also sought to provide supplementary insights into the efficacy of the task complexity manipulations.

C. Independent Writing and Integrated Writing

The widely recognized definition of integrated writing tasks involves the incorporation of single or multiple source texts into the writer's response. As widely acknowledged by scholars, it is essential for writers to synthesize concepts, ideas, viewpoints, and so on that are derived from the provided sources (Plakans & Gebriel, 2013; Weigle & Parker, 2012). In integrated writing tasks, students are not only required to summarize or paraphrase sources but also to demonstrate their ability to draw meaningful conclusions from those sources. In contrast to integrated writing tasks, independent writing tasks in academic contexts are impromptu essay writing assignments, requiring writers to compose an essay within a predetermined time frame (Plakans, 2008). Additionally, independent writing tasks require learners to

respond to a general prompt based on their personal experiences, whereas integrated writing requires learners to possess not only their writing skills, but also their ability to comprehend, analyze, and synthesize information from the provided resources. According to Payant et al. (2019), to complete an integrated task effectively, participants must engage in higher-order thinking processes, a practice that places substantial cognitive demands on them.

To date, only a handful of studies have examined the cognitive task complexity associated with different task types and their effects on L2/EFL writing performances, particularly focusing on the linguistic complexity of independent and integrated writing tasks. Guo et al. (2013) found notable differences in lexical sophistication and highly-comprehensive syntactic complexity indices between the two types of writing tasks. Similarly, Biber et al. (2016), through the application of two types of writing tasks on the TOEFL exam, discovered that integrated tasks tend to evoke a higher occurrence of lexical and grammatical features associated with academic writing. Abrams (2019) observed improvements in all linguistic features with integrated writing tasks compared to independent writing tasks. Additionally, Golparvar and Rashidi (2021) discovered that integrated writing tasks influenced unit length measures, coordination, and noun phrase complexity. However, further research is needed to explore whether integrated writing tasks might reduce cognitive load or increase cognitive burden during the execution stage of writing and how the cognitive complexity exerted by different writing tasks affects L2/EFL learners' writing performance.

To fill the research gap, the current study addresses the following research questions:

Q1: Compared with independent writing tasks, are integrated writing tasks designed to be more complex and place higher cognitive demands on EFL learners?

Q2: What are the effects of independent writing tasks and integrated writing tasks that add to or take away from cognitive demands on the linguistic complexity of EFL writing performance?

III. METHODOLOGY

A. Research Design

The study is designed to explore the cognitive demands of an integrated writing task in comparison to an independent writing task. This is achieved through triangulation methods, including a dual-task experiment, self-ratings by participants, and expert judgments. There were 35 Chinese college students majoring in English who participated in the study. Each participant completed two computer-based writing tasks, one integrated and one independent, both adapted from the TEM-4 standard test. Following the completion of each writing task, participants immediately engaged in a secondary simple visual task. Next, they were asked to fill out a self-perception questionnaire in which they rated their perceived mental effort and the difficulty of the task using a 100-point numerical scale. Afterwards, seven college English professors were invited to offer their expert opinions on the anticipated mental effort and task difficulty, providing explanations of their ratings via an online questionnaire. Meanwhile, an analysis was conducted using Xiaofei Lu's L2 Syntactic/Lexical Complexity Analyzer to examine the participants' writings in response to both types of tasks and to investigate the language complexity exhibited by writers when performing tasks with varying cognitive demands such as independent and integrated writing tasks.

B. Participants

A voluntary sample of 35 sophomore undergraduate English majors ($n = 35$) from a Chinese university was recruited to take part in the research. Moreover, the sample included eight males and 27 females with an average age of 20 ($M=20$). Although none of the participants had ever lived or studied overseas in an English-speaking nation, they all had eight to ten years of experience acquiring the language. Using the Oxford Placement Tests (OPT) as a method of assessing English proficiency, participants achieved an average score of 65 on the test, indicating they were, on average, at an intermediate level of English proficiency.

C. Instruments

(a). Language Proficiency Test

The language proficiency of the participants was evaluated with the Oxford Placement Test (OPT), a widely recognized measure employed in previous research (e.g., Ahmadian, 2012; Murphy & Roca de Larios, 2010). The OPT is an online English language test created by Oxford University Press for non-native speakers. As a reliable and efficient means of placing students in the appropriate English class level, it is widely used by universities and research institutions worldwide to determine the English proficiency of students. There are two sections on the OPT, namely Language Use and Listening, each scored separately. The Language Use portion of the test focuses on grammar and vocabulary assessment and is more directly correlated with participants' writing performance in the current study. Consequently, only the Language Use score was used as a main inclusion criterion. Test-takers were required to answer 60 questions on their mobile devices within a time limit of 30 minutes. According to the OPT numerical scale, scores in the range of 51-59 and 60-79 are considered intermediate and upper-intermediate levels, respectively.

(b). Prime Writing Tasks in Dual-Task Methodology

The integrated writing task instructed students to first summarize a 270-word news report excerpt on environmental pollution caused by plastics. Then they were required to present their suggestions on how to enhance public awareness of environmental protection using the ban on plastic bags as an illustrative example. In contrast, the independent writing task prompted students to provide their commentary on whether social networking has a predominantly positive or negative impact on people's lives. The minimum word requirement for both tasks was set at 200 words. Both writing tasks were computer-based and time-restricted. Participants were required to complete and submit each writing task via the online platform *iWRITE*. In each writing session, the writing time was set at a 40-minute time limit on the computer. To account for and minimize the influence of reading competency, participants were allotted an extra 10 minutes for reading prior to typing their response to the integrated writing task. To assist the researcher in designing writing tasks and to minimize the impact of differences in participants' familiarity with topics on cognitive load during the writing process, a pilot study was conducted prior to the main writing session. The findings suggest that participants possessed an equal level of familiarity with both topics.

(c). Secondary Task in Dual-Task Methodology

The secondary task of the current study was designed based on prior research and involved changing the color of the capital letter "A" (either red or green) displayed on a computer screen at brief and random intervals (Sasayama, 2013; Cierniak et al., 2009). After completing the primary writing task, participants were instructed to promptly and accurately identify the red or green letter "A" on the computer screen by pressing the Space key on the computer keyboard. Based on suggestions from some research scholars, secondary tasks should ideally be simple in form, such as assessing responses to visual and auditory stimuli. Moreover, they should be kept independent from the primary task (Brunken et al., 2003; R é v é s z, 2014; R é v é s z et al., 2014), as it is hypothesized that writers are likely to demonstrate prolonged response times and reduced accuracy following the completion of a writing task with higher cognitive demands. Assessing performance on secondary tasks offers a highly objective and direct method for measuring potential differences in the overall cognitive load placed on writers by various writing tasks. Both the response time and accuracy of secondary tasks can specifically serve as indicators of the cognitive demand imposed by the primary task.

(d). Self-Perceived Writing Task Difficulty Questionnaire

First designed by Robinson (2001), subjective self-rating scales have been widely used in recent task-complexity studies (Rahimi, 2019; Robinson, 2007b; Xu et al., 2023). In the current research, a multi-dimensional scale with a combination of mental effort and task difficulty was applied in the pilot study. Additionally, a Self-Perceived Writing Task Difficulty Questionnaire was adopted from Rahimi and Zhang (2018) which consisted of 10 items using a 100-point numerical scale to evaluate various aspects of a writing task such as the level of stress and overall difficulty. To ensure participants' understanding, all items were translated into Chinese, and the online questionnaire was administered immediately after participants completed both integrated and independent writing tasks. Drawing on the precedent set by Rahimi and Zhang (2018) and R é v é s z et al. (2016), the study used only four items (Items 1, 2, 5, and 6) to assess cognitive demands and task difficulty. Items 1-2 assessed participants' feelings of the task difficulty (TD1), and Items 5 and 6 asked about participants' perceptions of their ability to complete the writing, which can also reflect how they feel about the task difficulty (TD2). In addition, the researchers reverse-coded the negatively worded items. Four multiple-choice questions were added to the original survey questionnaire to determine the reasons behind students' perceptions of difficulty in the writing tasks. Based on existing literature, the researchers also compiled a summary of potential causes of cognitive load. A second open-ended question was included at the end, encouraging students to add their own reasons.

D. Linguistic Complexity Measures

In this present study, participants' written responses to two writing tasks are evaluated for linguistic complexity, specifically syntactic and lexical complexity. Syntactic complexity is measured using the T-unit which comprises an independent clause and any dependent clauses attached to it. Norris and Ortega (2009) identified three measurable sub-constructs within syntactic complexity: subordination, as measured by subordinate or dependent clauses; general complexity, assessed by any length-based metric that potentially involves multiple-clausal units of production in the denominator; and phrasal complexity, determined by the mean length of clauses (Norris & Ortega, 2009). In line with the dimensions of syntactic complexity proposed by Norris and Ortega (2009), Xiaofei Lu developed the L2 Syntactic Complexity Analyzer (L2SCA) which contains 14 syntactic complexity indices covering comprehensive syntactic complexity dimensions. The current study applies L2SCA primarily to examine three dimensions: the length of production unit, measured by the mean length of T-unit (MLT); the amount of subordination, measured by the number of coordinate phrases per T-unit (CPT); and the degree of phrasal sophistication, measured by the number of complex nominals per T-unit (CNT).

Lexical complexity has been recognized as a reliable indicator of language assessment in the field of L2/EFL research. In the present study, lexical complexity is assessed using Lu Xiaofei's Lexical Complexity Analyzer (LCA) which is specifically designed to analyze the lexical complexity of written English language samples. To measure lexical diversity, three indices have been employed: lexical sophistication, type-token ratios (TTR), and Measure of Textual Lexical Diversity (MTLD). This method quantifies lexical variety by calculating the ratio of word types to

tokens within a text. In the context of L2/EFL writing performance, lexical complexity pertains to the ratio of advanced word types to total word types (type/type ratio) and the type-token ratio (TTR) which considers word-type variation relative to the total number of words and takes into account the duration of the writing sample (Wolfe-Quintero et al., 1998). TTR is one of the important indicators measuring lexical density. In comparison to TTR, theoretical explanations and preliminary studies have provided support for the reliability of MTLTD as a robust measure of lexical diversity, free from the influence of text length (McCarthy & Jarvis, 2010). In Lexical Complexity Analyzer (LCA), Lu (2010) adapted MTLTD to NDW (Number of Different Words), which specifically targets lexical diversity within a text.

E. Procedures

The current study unfolds in six distinct stages: (1) the initial participant screening for language proficiency; (2) a pilot study to assess task topic familiarity; (3) the completion of primary writing tasks (independent and integrated); (4) the completion of secondary tasks after each primary task; (5) the validation of writing task difficulty and cognitive demands through students' self-perceived questionnaires and expert opinions; and (6) the subsequent collection and analysis of data on writing complexity performance. The participants were asked to separately complete two computer-based writing tasks: an independent writing task and an integrated writing task. Both writing sessions took place in a computer lab where participants had to answer the writing tasks on a computer within a 40-minute time limit. To ensure the participants in the integrated writing task had a good understanding of the reading excerpt in the writing task, they were provided an extra 10 minutes to read the passage before they started writing. This time was allocated to cater to any discrepancies in the participants' reading ability and to ensure comprehension of the task. During this time, students could use an electronic dictionary or ask questions to clarify their understanding of the excerpt. They were not allowed to take any notes during this period. Immediately following each writing task, the participants were required to complete the secondary task. Afterwards, they completed a Self-Perceived Writing Task Difficulty Questionnaire to assess their perception of the task. To mitigate any effects of practice or fatigue, the two writing tasks were counterbalanced and separated by a 6-week interval, which, incidentally, coincided with a winter break.

F. Data Collection and Data Analyses

All writing tasks were completed and submitted through an online platform called *iWRITE*. The syntactic and lexical complexity of the writing samples were measured and analyzed using the web-based tools L2 Syntactic Complexity Analyzer (L2SCA) and Lexical Complexity Analyzer (LCA). Both the questionnaires regarding students' perceptions of task difficulty and the expert opinions on the cognitive load of both independent and integrated writing tasks were collected online. In terms of the secondary task, the participants' response data, including reaction time for correct answers and overall accuracy rate, were displayed immediately after completion. Additionally, the data was analyzed with the SPSS 25.0 software. Additionally, several paired-samples t-tests were conducted to compare the linguistic complexity of writing performance between the independent and integrated writing tasks. Standard diagnostic procedures were also employed to ensure the appropriateness of all statistical models. Finally, the alpha level was set at $p < .05$.

IV. RESULTS

A. Cognitive Demands Evaluation

(a). Self-Rating on Task Difficulty and Mental Effort

Initially, a thorough check for outliers and missing values was conducted across all datasets, revealing the absence of any such values. Simultaneously, normality was assessed to ensure compatibility with the requirements of a paired sample T-test. The results of students' responses to the Task Difficulty and Mental Effort Questionnaire are presented in Table 1, reflecting their perceptions of task difficulty and mental effort after completing both the independent writing task and the integrated writing task. The table illustrates a significant distinction between the two tasks in terms of both task difficulty ($t=4.25$, $p=.000<.05$) and mental effort ($t=3.69$, $p=.001<.05$) as perceived by participants. Regarding task difficulty, participants found the integrated task ($M=11.34$, $SD=2.66$) more challenging than the independent writing task ($M=8$, $SD=3.3$). Similarly, participants indicated that the integrated task ($M=10.69$, $SD=2.8$) required more mental effort compared to the independent task ($M=8.31$, $SD=2.43$).

TABLE 1
RESULTS OF STUDENTS' SELF-RATING ON TASK DIFFICULTY AND MENTAL EFFORT

	Task Types	N	M	SD	95% CID (low, high)	<i>t</i>	<i>df</i>	<i>p</i>
Task Difficulty	Independent Task	35	8	3.3	1.75 (low)	4.25	34	.000**
	Integrated Task	35	11.34	2.66	4.94 (high)			
Mental Effort	Independent Task	35	8.31	2.43	1.06 (low)	3.69	34	.001**
	Integrated Task	35	10.69	2.8	3.68 (high)			

Note: * $p < 0.05$, ** $p < 0.01$; 95% CID= 95% Confidence Interval Differences

(b). *Expert Opinions*

The findings from Table 2 illustrate a consensus between experts and students regarding their perceptions of writing task difficulty and mental effort. Both cohorts perceive integrated writing tasks as more demanding in terms of difficulty and mental exertion compared to independent writing tasks. However, experts suggest that there is little difference in students' perceptions of perceived difficulty or mental effort between an integrated writing task and an independent writing task. In the independent task, the mean score for task difficulty is $M=5.14$ ($SD=1.34$), while in the integrated task, the score is slightly higher at $M=6.79$ ($SD=1.15$). The mean score for mental effort for the independent task is $M=5.57$ ($SD = 1.51$), while the mean score for the integrated task is $M=7.21$ ($SD = 1.22$). According to these results, both experts and participants report a consistent perception that the integrated writing task is more cognitively demanding than the independent writing task.

TABLE 2
RESULTS OF EXPERT OPINIONS ON TASK DIFFICULTY AND MENTAL EFFORT

	N	Independent Task			Integrated Task		
		M	SD	95% CID (low, high)	M	SD	95% CID (low, high)
Task Difficulty	7	5.14	1.34	-3.46 (low) 0.47 (high)	6.79	1.15	-3.46 (low) 0.47 (high)
Mental Effort	7	5.57	1.51	-3.47 (low) 0.47 (high)	7.21	1.22	-3.47 (low) 0.47 (high)

(c). *Results of Dual-Task Experiment*

As part of the dual-task method, participants were assessed regarding their secondary-task performance measured by both reaction times (RT) and accuracy rates (ACC) across both an independent writing task and an integrated writing task (see Table 3). The first significant difference was observed in the reaction time (RT) ($t=3.31$, $p=.002<.05$). As compared to the integrated task condition ($M = 939.83$, $SD = 83.63$), participants exhibit significantly faster reaction times for the independent writing task ($M = 884.57$, $SD = 77.87$) indicating a greater cognitive load resulted in slower responses for the integrated task. However, participants demonstrate comparable accuracy rates in both the independent task ($M=0.87$, $SD=0.84$) and the integrated task ($M=0.85$, $SD=0.8$), as no significant difference was found between the two writing task conditions ($t=-1.65$, $p=0.108>.05$). It can be inferred that despite the increased cognitive load in the integrated task, participants maintained similar levels of accuracy in their secondary task performance. The findings indicate that different types of primary writing tasks resulted in a statistically significant increase in participants' reaction time for the secondary task. However, the designed primary tasks, whether integrated or independent, do not yield a statistically significant effect on the accuracy rate. Overall, the findings partially support the hypothesis that the integrated writing task exerted a higher cognitive load on the learners.

TABLE 3
RESULTS OF SECONDARY-TASK ACROSS TWO WRITING TASKS CONDITIONS

	N	Independent Task		Integrated Task		<i>t</i>	Sig.(2-tailed)
		M	SD	M	SD		
RT (ms)	35	884.57	77.87	939.83	83.63	3.31	.002**
ACC (%)	35	0.87	0.84	0.85	0.8	-1.65	.108

B. *Effects on Writing Complexity*(a). *Results of Lexical Complexity*

The results of lexical complexity performance responses to two distinct writing tasks exhibited in Table 4 focused mainly on three key lexical complexity indices: Lexical Sophistication (LS), Number of Different Words (NDW), and Type-Token Ratio (TTR). Regarding Lexical Sophistication (LS), a significant difference was observed between the two tasks ($t=4.60$, $p=.000<0.05$). Participants demonstrated higher lexical sophistication in their responses to the integrated writing task ($M=0.30$, $SD=0.059$) compared to the independent writing task ($M=0.23$, $SD=0.053$), indicating a notable variation in lexical richness between the tasks. Similarly, in terms of Number of Different Words (NDW), a statistically significant difference was also found ($t=2.54$, $p=.016<.05$), suggesting a higher average NDW in responses to the integrated writing task ($M=137.26$, $SD=17.58$) compared to the independent writing task ($M=125.97$, $SD=20.50$). However, no significant difference emerged in the Type-Token Ratio (TTR) between the two tasks ($t= -0.95$, $p=.327>.05$), with participants exhibiting comparable TTR values for both the independent writing task ($M=2.44$, $SD=10.53$) and the integrated writing task ($M=1.67$, $SD=0.80$). These results suggest that the integrated writing task prompts higher lexical sophistication and a greater variety of words in participants' responses compared to the independent writing task.

TABLE 4
RESULTS OF LEXICAL COMPLEXITY IN RESPONSE TO TWO WRITING TASKS

LC Indices	Task	M	SD	<i>t</i>	<i>df</i>	<i>Sig.</i> (2-tailed)
LS	ID	0.23	.053	4.60	34	.000**
	IT	0.30	.059			
NDW	ID	125.97	20.50	2.54	34	.016*
	IT	137.26	17.58			
TTR	ID	2.44	10.53	-.95	34	.327
	IT	1.67	0.80			

Note: LS= Lexical Sophistication; NDW=Number of Different Words; TTR=Type-Token Ratio; ID=independent writing task; IT=integrated writing task.

(b). Results of Syntactic Complexity

The results presented in Table 5 indicate that the syntactic complexity measures display a notable pattern in response to writing tasks with varying cognitive demands, namely the independent writing task and the integrated writing task. First, when examining the Mean Length of T-unit (MLT), a significant distinction emerged between the tasks ($t=3.53$, $p=.001<.05$). Notably, participants exhibited a higher MLT for the integrated writing task ($M=12.24$, $SD=2.64$) than for the independent writing task ($M=10.48$, $SD=1.52$), suggesting enhanced syntactic complexity in the integrated task. Similarly, the analysis reveals a significant variance in the number of Complex Nominals per T-unit (CNT) between the tasks ($t=1.99$, $p=.045<.05$). Participants exhibited a higher number of complex nominals per T-unit in responses to the integrated writing task ($M=4.61$, $SD=2.08$) compared to the independent writing task ($M=3.41$, $SD=1.82$), suggesting an increased level of syntactic complexity in the integrated task. Despite a similar significant difference being observed ($t=-2.04$, $p = .048<.05$) in terms of the number of Coordinate Phrases per T-unit (CPT), participants showcased a greater average CPT for the independent writing task ($M=1.69$, $SD=0.97$) in contrast to the integrated writing task ($M=1.35$, $SD=0.53$). These findings indicate that participants exhibited significant differences in syntactic complexity when completing different writing tasks, yet the results regarding the variations in each indicator are inconsistent. While the integrated writing task prompts greater mean length of T-unit and more complex nominal structures, the independent writing task fosters a higher occurrence of coordinate phrases per T-unit.

TABLE 5
RESULTS OF SYNTACTIC COMPLEXITY IN RESPONSE TO TWO WRITING TASKS

SC Indices	Task	M	SD	<i>t</i>	<i>df</i>	<i>Sig.</i> (2-tailed)
MLT	ID	10.48	1.52	3.53	34	.001**
	IT	12.24	2.64			
CPT	ID	1.69	0.97	-2.04	34	.048*
	IT	1.35	0.53			
CNT	ID	3.41	1.82	1.99	34	.045*
	IT	4.61	2.08			

Note: MLT= mean length of T-unit; CPT= the number of coordinate phrases per T-unit; CNT= the number of complex nominals per T-unit.

V. DISCUSSION

A. Evaluation of Cognitive Demands

In examining the cognitive demands between independent and integrated writing tasks, participants perceived the integrated task as significantly more difficult and requiring greater mental effort than the independent task. Both experts and students agreed on the heightened demands of the integrated task, though experts perceived a slightly lesser disparity between two types of tasks.

The findings are based on a summary of responses from both students and experts to the open-ended question posed after the questionnaire: Why are there differences in task difficulty and the mental effort required between the independent task and the integrated task?. In accordance with Robinson's perspective on task features, responses to this question are categorized into two dimensions: task characteristics and learner factors. Concerning task characteristics, the integrated writing task necessitates that participants address issues presented in the reading text rather than expressing opinions on banning plastics. This task requires summarizing problems from the reading text, referring to the given information, and engaging various cognitive abilities including summarizing, addressing posed questions, reorganizing language, and applying higher-order thinking skills. Thus, the cognitive demands for outlining, organizing viewpoints, and language production are higher. In contrast, the independent writing task has fewer restrictions, allowing writers to construct outlines, organize ideas, and produce language more conventionally. The unique features of the integrated task contribute to a perception of greater difficulty. Beyond challenges related to higher-order thinking and information synthesis, differences in students' background knowledge can contribute to increased mental effort. Because specific solutions are required for issues, students' preparedness in the relevant knowledge area influences their cognitive load. Additionally, in the independent writing task, students only need to retrieve words and expressions from

familiar linguistic resources. On the other hand, the integrated writing task requires organizing language responses to the content of the reading material, which adds cognitive demands when accessing unfamiliar linguistic resources.

The results from the dual-task method indicate significantly longer reaction times for integrated tasks, suggesting a higher cognitive load, while accuracy rates remained similar across task types. Findings suggest that the integrated task imposed higher cognitive demands, influencing participants' secondary task performance. Overall, the study partially supports the hypothesis regarding increased cognitive load in integrated writing tasks. This finding is consistent with previous research (Xu et al., 2021; R ́ev ́esz et al., 2016; Sasayama, 2016) and partially supports the basic principles of the dual-task paradigm: the accuracy of the secondary task is expected to decrease and the response time is expected to increase when the cognitive demand imposed by the primary task increases. In the current study, the integrated writing task, serving as the primary task, led to longer reaction times for participants in the secondary task. This occurs because the increased cognitive demands of the primary task restrict mental resources available for the secondary task, thereby intensifying the competition for reaction time. However, no significant decrease in accuracy rate was observed for the secondary task when students completed the hypothesized, more cognitively complex, primary integrated writing task compared to the less complex independent writing task. This could be attributed to the differing nature of the primary tasks. Previous research has primarily focused on oral tasks (Sasayama, 2016; R ́ev ́esz et al., 2016), which may impose different demands on learners compared to written tasks. Another explanation could be the competition between cognitive resources; moreover, allocating more attention to accuracy in the secondary task may reduce reaction time, and vice versa (Xu et al., 2021).

B. Linguistic Complexity of Writing Production

The objective of the current study was to examine how task cognitive complexity influences writing complexity across various types of writing tasks. In the study, both independent and integrated writing tasks significantly affected the writing products of participants, although mixed results were also found. To be specific, in terms of lexical complexity, the lexical sophistication (LS) and the number of different words (NDW) of the integrated tasks were significantly higher than those of the independent tasks. However, no significant difference was found in the type-token ratio (TTR). Furthermore, syntactic complexity showed a noticeable difference between integrated and independent tasks: integrated tasks produced longer mean lengths of T-units (MLT) and more complex nominals per T-unit (CNT), indicating an increase in the complexity of writing. Interestingly, the independent task yielded a greater number of coordinate phrases per T-unit (CPT).

In the present study, both lexical and syntactic linguistic complexity increased, which aligns with previous findings indicating that integrated tasks result in greater linguistic complexity (e.g., Abrams, 2019; Biber et al., 2016; Golparvar & Rashidi, 2021; Guo et al., 2013). Furthermore, these findings are in line with Robinson's Cognition Hypothesis (CH) which states that learners can achieve improved language outcomes in terms of complexity when task complexity and cognitive demands are increased along the resource-directing dimension. Writing integrated tasks requires writers to retrieve, comprehend, synthesize, and reorganize information from a reading source. In the current study, participants were asked to summarize problems presented in the reading text provided and suggest solutions to the problems. A complex problem-solving and decision-making process is involved in this cognitive process which also places greater demands on working memory and executive function. Consequently, writers engaged in the integrated writing task may use more sophisticated words and a wider variety of vocabulary to express their ideas and arguments effectively. To convey their argument clearly and persuasively, they may also employ more complex sentence structures, such as longer sentences with subordinate clauses and embedded phrases. Additionally, alternative explanations may include the findings of Cumming et al. (2005), which suggest that integrated writing tasks may reduce content biases and promote the use of syntactically complex language. An investigation by Gebriel and Plakans (2016) discovered that participants' lexical diversity increased following the practice of borrowing texts through integrated writing tasks.

Regarding the minor deviant results observed in this study, one example is that there was an absence of significant findings in lexical complexity indicators such as the type-token ratio (TTR). Furthermore, students demonstrated better performance in the independent writing task when considering the number of coordinate phrases per T-unit (CPT) in terms of syntactic complexity. Several aspects could account for these disparate outcomes. Unlike previous research, which involved separate groups of participants engaged in independent and integrated writing tasks, respectively, the present study involved the same group participating in different writing activities. Having a homogeneous level of language proficiency may affect different types of writing tasks. In addition, to minimize the impact of topic familiarity, both writing tasks were assigned relatively familiar topics based on the results of a pilot study. Because of this, high topic familiarity might impede the effects of cognitive load induced by different writing tasks on participants' writing performance, potentially resulting in inconsistent results.

VI. CONCLUSION

In the present research, a comprehensive investigation was conducted on the differences in cognitive demands associated with two types of writing tasks—the independent writing task and the integrated writing task—as well as their effects on the outcomes of linguistic complexity in EFL learners. The study first examined the cognitive demands imposed by both independent writing and integrated writing tasks. Using triangulated methods such as learner ratings,

expert judgments, and dual-task measures, it was found that learners encountered higher cognitive demands when performing an integrated writing task. Subsequently, the research investigated the effects of these different writing tasks, which varied in cognitive demands, on the linguistic complexity of EFL writing performance. According to the findings of the present study, Robinson's Cognitive Hypothesis (CH) is partially supported. This suggests that a higher degree of language complexity in the writing produced by EFL learners may be caused by a higher degree of cognitive complexity in the writing task as well as the resource-directing factor. The results, which demonstrated the impact of the integrated writing task on learners' writing complexity, highlighted the nuanced influence of task design on the cognitive processes involved in writing.

The study contributed to a more comprehensive understanding of the cognitive demands inherent in integrated and independent writing tasks within Robinson's Triadic Componential Framework. An implication for educators is the importance of integrating considerations of cognitive complexity into the design and sequencing of writing tasks in Task-Based Language Teaching (TBLT) settings. This understanding is crucial for educators to tailor their teaching methods to the specific needs of English as a Foreign Language (EFL) learners. However, the study has several limitations. Firstly, the use of the same group of participants may limit the applicability or generalizability of the findings to broader teaching scenarios due to homogeneity in language proficiency and working memory, among other factors. Secondly, the process of learning to write in a foreign language is influenced by a combination of cognitive, psychological, and sociocultural differences, which were not fully explored in this study. Furthermore, the research primarily relied on quantitative methods, focusing solely on the writing products generated by tasks with varying cognitive demands. Additional qualitative research is necessary to gain deeper insights into learners' cognitive processes and perceptions across diverse task types. Specifically, qualitative inquiry would provide valuable insights into the development of EFL learners' writing abilities.

REFERENCES

- [1] Biber, D., Gray, B., & Staples, S. (2016). Predicting patterns of grammatical complexity across language exam task types and proficiency levels. *Applied Linguistics*, 37(5), 639-668.
- [2] Brown, J. D., Hudson, T., Norris, J. M., & Bonk, W. (2002). *An investigation of second language task-based performance assessments (Technical Report No. 24)*. University of Hawaii, Second Language Teaching & Curriculum Center.
- [3] Brunken, R., Plass, J. L., & Leutner, D. (2003). Direct measurement of cognitive load in multimedia learning. *Educational Psychologist*, 38(1), 53-61.
- [4] Cierniak, G., Scheiter, K., & Gerjets, P. (2009). Explaining the split-attention effect: Is the reduction of extraneous cognitive load accompanied by an increase in germane cognitive load? *Computers in Human Behavior*, 25(2), 315-324.
- [5] Cumming, A., Lai, C., & Cho, H. (2016). Students' writing from sources for academic purposes: A synthesis of recent research. *Journal of English for Academic Purposes*, 23, 47-58.
- [6] Declerck, M., & Kormos, J. (2012). The effect of dual task demands and proficiency on second language speech production. *Bilingualism: Language and Cognition*, 15, 782 – 796.
- [7] DeKeyser, R. (1997). Beyond explicit rule learning: Automatizing second language morphosyntax. *Studies in Second Language Acquisition*, 19, 195 – 221.
- [8] Frear, M. W., & Bitchener, J. (2015). The effects of cognitive task complexity on writing complexity. *Journal of Second Language Writing*, 30, 45-57.
- [9] Golparvar, S. E., & Azizsahra, M. (2023). The effect of graph complexity and planning on graph writing performance and descriptive strategies. *Foreign Language Annals*, 56(1), 117-143.
- [10] Golparvar, S. E., & Rashidi, F. (2021). The effect of task complexity on integrated writing performance: The case of multiple-text source-based writing. *System*, 99, 102524, 1-14.
- [11] Guo, L., Crossley, S. A., & McNamara, D. S. (2013). Predicting human judgments of essay quality in both integrated and independent second language writing samples: A comparison study. *Assessing Writing*, 18(3), 218-238.
- [12] Johnson, M. D. (2017). Cognitive task complexity and L2 written syntactic complexity, accuracy, lexical complexity, and fluency: A research synthesis and meta-analysis. *Journal of Second Language Writing*, 37, 13–38.
- [13] Kuiken, F., & Vedder, I. (2011). Task complexity and linguistic performance in L2 writing and speaking. In *Task-based Language Teaching* (pp. 91-104). Cambridge University Press.
- [14] Lee, J. (2021). Task closure and task complexity effects on L2 written performance. *Journal of Second Language Writing*, 50, 100777, 1-17.
- [15] Lu, X. (2010). Automatic analysis of syntactic complexity in second language writing. *International Journal of Corpus Linguistics*, 15(4), 474-496.
- [16] Lu, X. (2011). A corpus-based evaluation of syntactic complexity measures as indices of college-level ESL writers' language development. *TESOL Quarterly*, 45(1), 36-62.
- [17] McCarthy, P. M., & Jarvis, S. (2010). MTL, vocd-D, and HD-D: A validation study of sophisticated approaches to lexical diversity assessment. *Behavior Research Methods*, 42(2), 381-392.
- [18] Murphy, L., & de Larios, J. R. (2010). Searching for words: One strategic use of the mother tongue by advanced Spanish EFL writers. *Journal of Second Language Writing*, 19(2), 61-81.
- [19] Norris, J. M., & Ortega, L. (2009). Towards an organic approach to investigating CAF in instructed SLA: The case of complexity. *Applied Linguistics*, 30(4), 555-578.
- [20] Ong, J., & Zhang, L. J. (2010). Effects of task complexity on the fluency and lexical complexity in EFL students' argumentative writing. *Journal of Second Language Writing*, 19(4), 218-233.

- [21] Payant, C., McDonough, K., Uludag, P., & Lindberg, R. (2019). Predicting integrated writing task performance: Source comprehension, prewriting planning, and individual differences. *Journal of English for Academic Purposes*, 40, 87-97.
- [22] Plakans, L. (2009). Discourse synthesis in integrated second language writing assessment. *Language Testing*, 26(4), 561-587.
- [23] Plakans, L., & Gebril, A. (2017). Exploring the relationship of organization and connection with scores in integrated writing assessment. *Assessing Writing*, 31, 98-112.
- [24] Rahimi, M. (2019). Effects of increasing the degree of reasoning and the number of elements on L2 academic writing. *Language Teaching Research*, 23(5), 633-654.
- [25] Rahimi, M., & Zhang, L. J. (2018). Effects of task complexity and planning conditions on L2 argumentative writing production. *Discourse Processes*, 55(8), 726-742.
- [26] R ́e ́sz, A. (2012). Working memory and the observed effectiveness of recasts on different L2 outcome measures. *Language Learning*, 62(1), 93-132.
- [27] R ́e ́sz, A., Kourtali, N. E., & Mazgutova, D. (2017). Effects of task complexity on L2 writing behaviors and linguistic complexity. *Language Learning*, 67(1), 208-241.
- [28] R ́e ́sz, A., Sachs, R., & Hama, M. (2014). The effects of task complexity and input frequency on the acquisition of the past counterfactual construction through recasts. *Language Learning*, 64(3), 615-650.
- [29] Robinson, P. (2001). Task complexity, task difficulty, and task production: exploring Interactions in a componential framework. *Applied Linguistics*, 22(1), 27-57.
- [30] Robinson, P. (2001a). Task complexity, cognitive resources, and syllabus design: A triadic framework for examining task influences on SLA. In *Cambridge University Press eBooks* (pp. 287-318).
- [31] Robinson, P. (2003). The cognitive hypothesis, task design, and adult task-based language learning. *Second Language Studies*, 21(2), 45-105.
- [32] Robinson, P. (2005b). Cognitive complexity and task sequencing: Studies in a componential framework for second language task design. *International Review of Applied Linguistics in Language Teaching*, 43(1), 1-32.
- [33] Robinson, P. (2007). Task complexity, theory of mind, and intentional reasoning: Effects on L2 speech production, interaction, uptake and perceptions of task difficulty. *International Review of Applied Linguistics in Language Teaching*, 45(3), 193-213.
- [34] Robinson, P. (2011a). Task Based Language Learning: A review of issues. *Language Learning*, 61(s1), 1-36.
- [35] Sasayama, S. (2016). Is a 'complex' task really complex? Validating the assumption of cognitive task complexity. *The Modern Language Journal*, 100(1), 231-254.
- [36] Skehan, P., & Foster, P. (1996). Task type and task processing conditions as influences on foreign language performance. *Language Teaching Research*, 1(3), 185-211.
- [37] Skehan, P., & Foster, P. (1998). The influence of task structure and processing conditions on narrative retelling. *Language Learning*, 49(1), 93-120.
- [38] Weigle, S. C., & Parker, K. (2012). Source text borrowing in an integrated reading/writing assessment. *Journal of Second Language Writing*, 21(2), 118-133.
- [39] Xu, W., Zhao, P., Yao, Y., Pang, W., & Zhu, X. (2023). Effects of self-efficacy on integrated writing performance: A cross-linguistic perspective. *System*, 115, 103065.
- [40] Zhang, J. (2018). The effect of strategic planning training on cohesion in EFL learners' essays. *Reading & Writing Quarterly*, 34(6), 554-567.
- [41] Zhang, Y., & Ouyang, J. (2023). Linguistic complexity as the predictor of EFL independent and integrated writing quality. *Assessing Writing*, 56, 100727, 1-12.



Ziming Zhao is currently a Ph.D. candidate majoring in English Language in Universiti Putra Malaysia. She completed her master's degree of English Language and Literature at Northeast Normal University, China. She taught at the School of English at Jilin International Studies University. By integrating her teaching practice with scientific research, Ziming has published four empirical research papers in Chinese journals. Furthermore, she co-authored a book and contributed to the creation of two textbooks.



Vahid Nimehchisalem completed his Ph.D. in Teaching English as a Second Language at the Faculty of Educational Studies, UPM, Serdang, Malaysia. He was a postdoctoral fellow at the same faculty in 2012 before joining Universiti Malaya as a research fellow the following year. He's currently an Associate Professor at the Faculty of Modern Languages and Communication, UPM, and an Adjunct Professor at Asia e University (AeU), Malaysia. Dr. Nimehchisalem is the founding and chief editor of the International Journal of Education and Literacy Studies, managing editor of the Journal of Language and Communication, and a board member of several other scientific journals in the area. His main area of teaching and research interest is language assessment.



Mei Yuit Chan obtained her PhD in Linguistics from the University of Malaya, Malaysia. She is currently an associate professor at the Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia. Her research interests include investigation of language in social interactions, language learning and language for specific purposes. Orcid ID: <https://orcid.org/0000-0002-4726-9117>