ELSEVIER

Journal of Second Language Writing 19 (2010) 218–233

JOURNAL OF SECOND LANGUAGE WRITING

Effects of task complexity on the fluency and lexical complexity in EFL students' argumentative writing

Justina Ong, Lawrence Jun Zhang *

English Language and Literature Academic Group, National Institute of Education, Nanyang Technological University, 1 Nanyang Walk, Singapore 637616, Republic of Singapore

Abstract

Based on Robinson's (2001a,b, 2003) Cognition Hypothesis and Skehan's (1998) Limited Attentional Capacity Model, this study explored the effects of task complexity on the fluency and lexical complexity of 108 EFL students' argumentative writing. Task complexity was manipulated using three factors: (1) availability of planning time; (2) provision of ideas and macro-structure; and (3) draft availability. All participants were randomly assigned to the above three factors in which the availability of the planning time factor had 4 levels (extended pre-task, pre-task, free-writing, and control); the provision of the ideas and macro-structure factor had 3 levels (topic, ideas, and macro-structure given; topic and ideas given; and topic given); and the draft availability factor had 2 levels (draft available vs. draft unavailable) using their writing task proficiency scores as a measure. Results showed that: (1) increasing task complexity, with respect to the planning time continuum, produced significantly greater fluency II (mean number of words produced per minute of the total time spent on the task) and lexical complexity; (2) increasing task complexity, through the provision of ideas and macro-structure, produced significantly greater lexical complexity but no effect on fluency I (mean number of words produced per minute of transcription) or fluency II; and (3) increasing task complexity, through draft availability, produced no significant differences in fluency and lexical complexity. Implications of these findings are discussed.

Keywords: Task complexity; Cognitive processing; L2 writing quality; Fluency; Accuracy; Lexical complexity; Chinese EFL student writers

Introduction

Much has been discussed about task complexity in second language acquisition (SLA) research, particularly regarding how tasks hold a place in SLA research and language pedagogy (see Bygate, 1999; Ellis, 2003; Robinson, 2003, 2005; Schmidt, 1993; Skehan & Foster, 2001; Tavakoli & Foster, 2008). However, the question of how task-based research relates to writing theory, research, or pedagogy has yet to be answered given that most task-based research has focused on oral language production.

From a theoretical perspective, a review of several existing writing models such as Flower and Hayes (1980), Bereiter and Scardamalia (1987), and Kellogg (1996) showed that these models made no predictions with regard to the manipulation of cognitive processes (such as planning, transcribing, and revising) on writing quality. This gap in writing research could be partially filled by task-based research, given its focus on the effects of the manipulation of task factors on task performance. More precisely, we believe that task-based research can shed light on what learners allocate their limited attentional and memory resources to, how task manipulation affects the cognitive processing of

* Corresponding author. Tel.: +65 67903474; fax: +65 68949149.
E-mail address: lawrence.zhang@nie.edu.sg (L.J. Zhang).

1060-3743/$ – see front matter © 2010 Elsevier Inc. All rights reserved.
doi:10.1016/j.jslw.2010.10.003

writers, and how this manner of resource allocation may impact the resulting text in terms of writing quality, which are crucial concerns in L1 and L2 writing research. In this respect, the writing models mentioned above posit that writing processes, such as planning, transcribing, and revising, occur in short term memory (Bereiter & Scardamalia, 1987; Flower & Hayes, 1980) or working memory (Hayes & Nash, 1996; Kellogg, 1996). It is also suggested that there is always a control or monitoring of processes component, for example, the ''monitor'' in Flower and Hayes (1980) and the ''central executive'' in Kellogg (1996). However, to date it is far from clear what exactly happens in the central executive during task execution, a gap in research that can be partially filled by task-based research.

The study presented here is framed within current SLA theories of task complexity and it constitutes one further attempt to investigate the effects of manipulating several task factors on task performance in a single experimental study. In order to situate our research, we first review the two recent competing theoretical frameworks on task complexity in task-based SLA research: Robinson's Cognition Hypothesis (2001a, 2001b, 2003, 2005, 2007) and Skehan's Limited Attentional Capacity Model (Skehan & Foster, 1999, 2001).

According to Robinson (2001a, 2001b, 2005, 2007), task complexity refers to the cognitive task features which can be manipulated either to increase or decrease cognitive demands placed on the learners when they perform a task. In Robinson's (2001b) definition, ''task complexity. . .is the result of the attentional, memory, reasoning and other information processing demands imposed by the structure of the task on the language learner'' (p. 29). Robinson (2001b, 2005, 2007; see also Robinson & Gilabert, 2007) identified the features of tasks contributing to task complexity in his Triadic Componential Framework. His Cognition Hypothesis is based on information processing theories proposed by Long (1996), Schmidt (2001), and Wickens (1989, 1992). Task complexity in this Triadic Componential Framework encompasses two key dimensions, resource-directing and resource-dispersing, which are thought to impact task performance and learning differently. The resource-directing dimensions make conceptual demands whilst the resource-dispersing dimensions make procedural demands on learners. In his task complexity framework (Robinson, 2003, 2005), the resource-directing dimensions include 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 the task requires learners to use spatial reasoning. The resource-dispersing dimensions include whether or not planning time is given to learners, whether or not prior knowledge is provided in the task, and whether a single task or multiple tasks are carried out concurrently by learners.

Robinson (2001a, 2005, 2007) claims that an increase in task complexity with respect to the 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, it is posited that an increase in task complexity with respect to the resource-dispersing dimensions (e.g., ± planning, ± prior knowledge, and ± 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. Instead, learners are expected to automatically access their already established interlanguage system (Bialystok, 1991, 1994; Robinson, 2005, 2007). It is argued that increasing task demands with respect to the resource-dispersing 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 (Gilabert, 2007; Michel, Kuiken, & Vedder, 2007; Robinson, 2003, 2005; Robinson & Gilabert, 2007).

Skehan's (1998, 2001, 2003) Limited Attentional Capacity Model is based on theories of working memory proposed by Carter (1998) and Gathercole and Baddeley (1993). The basic assumption of this model is that humans have a limited information processing capacity and that more demanding tasks require more attentional resources from learners, thus resulting in trade-off effects among the three aspects of language production: accuracy, fluency, and complexity (Skehan & Foster, 1999, 2001, 2005). Skehan (1998) claims that an increase in cognitive task complexity will divert learners' attention to the development of the content of the task, instead of focusing their attention on the complexity and accuracy of their language production. In a similar vein, VanPatten (1990) notes that, as learners' working memory is limited, they may have difficulty in attending to both form and meaning concurrently and, accordingly, learners will prioritize content over form. These researchers argue that content will be traded off for accuracy and complexity, and vice versa (Foster & Skehan, 1996; Skehan & Foster, 1997; VanPatten, 1990). However, the accumulation of task-based research studies over the years has pointed to contradictions on which aspects of language production are being traded off (see Yuan & Ellis, 2003, pp. 3–4).

In summary, both Skehan (1998) and Robinson (2001a, 2005, 2007) converge in their predictions of increasing task complexity with respect to the resource-dispersing factors (in Robinson's terminology) in the sense that increasing the cognitive demands of tasks with respect to these factors would have a negative effect on the accuracy, fluency, and complexity of learners' oral language production. However, the difference between Skehan (1998) and Robinson (2007) lies in their theoretical explanations of the same predictions. Whereas Skehan (1998) and Skehan and Foster (2001) argue that learners have limited attentional resources and, consequently, they have to draw upon a capacity-limited pool of resources, Robinson (2001a, 2001b, 2005) asserts that learners' attentional resources are not limited, and that multiple and non-competing attentional pools can be accessed. Skehan (2001) explains that the differential effects of task complexity are due to trade-off effects, whereas Robinson (2007) rejects this idea. In addition, Skehan (1998) and Robinson (2001a, 2005, 2007) diverge in their predictions of the effects of increasing cognitive demands of tasks with respect to resource-directing factors on language production. Whereas Skehan (1998) proposes that increasing task complexity with respect to these factors results in reduced fluency, complexity, and accuracy of oral language production, Robinson (2001a, 2001b, 2003, 2005) argues that increasing task complexity with respect to these factors enhances complexity and accuracy but reduces fluency.

Task complexity studies on written production

Many task-based research studies have investigated oral language production and, accordingly, there is a paucity of task-based research on written language production. In reviewing task complexity studies on written language production, we found more studies examining the effects of manipulating the resource-directing factors (e.g., Kuiken & Vedder, 2006, 2007, 2008) than the resource-dispersing factors (Ellis & Yuan, 2004; Kellogg, 1988, 1990; Ojima, 2006) on both first and second language writing performance. For resource-directing factors, the studies which have provided partial empirical support to Robinson's Cognition Hypothesis are Kuiken, Maria and Ineke (2005), Kuiken and Vedder (2006, 2007, 2008), and Ishikawa (2006). A series of studies conducted by Kuiken and his colleagues the effects of increasing cognitive task complexity were examined (with respect to the number of elements the participants had to consider in a task) on syntactic complexity, lexical variation, and accuracy of the letters written by university learners. The general finding from their research is that increasing task complexity enhanced the accuracy of the participants' writing but had no significant effects on syntactic complexity. One contradictory finding was, however, obtained. Whereas Kuiken et al. (2005) and Kuiken and Vedder (2008) found that increasing task complexity had no significant effects on lexical variation, Kuiken and Vedder (2006, 2007) found that increasing task complexity enhanced the lexical variation of the learners' letter writing.

Investigating a different resource-directing factor, Ishikawa (2006) examined the effects of manipulating task complexity with respect to the ± Here-and-Now dimension on 54 Japanese L2 students' written narrative texts. Two differences between the + Here-and-Now and the − Here-and-Now conditions were reported. First, the essay prompt for the first condition was written in the present tense, whereas the prompt for the second condition was written in the past tense. Second, the participants could view a cartoon strip during writing in the first condition, but they could not view it in the second condition. Ishikawa (2006) found that increasing task complexity with respect to the ± Here-and-Now dimension increased the accuracy, complexity, and fluency of written language production.

Only a few studies which examined the effects of resource-dispersing factors (based on the provision of ± planning time) on written language production were found, regardless of whether the written production was in L1 or L2, and none of them were based on the Cognition Hypothesis postulated by Robinson (2001a, 2001b, 2005, 2007). With respect to L1 writing, Kellogg (1988) examined the effects of outlining, no outlining, and mental outlining on the fluency and text quality of 20 college L1 students' persuasive writing. The students working under the outlining condition were instructed to plan an outline for 5–10 minutes before writing, whereas the students in the no outlining condition were asked to write immediately. Kellogg found that outlining (or planning) did not improve fluency but it did have an effect on certain aspects of the quality of the text. In a follow-up study, Kellogg (1990) examined three planning conditions (clustering, outlining, and control) and three sub-planning conditions (topic given condition, topic plus ideas given condition, and topic plus ideas plus organization given condition) in 207 college L1 students' argumentative writing. The control group was instructed to write immediately. The outlining group was instructed to plan their ideas hierarchically. The clustering group was instructed to plan by linking related ideas using a visual network. Kellogg (1990) found that fluency, as measured by the amount of writing time, was the greatest in the outlining condition; however, fluency, as measured by the total time on task, was the greatest in the control condition.

With respect to L2 writing, Ellis and Yuan (2004) examined the effects of pre-task planning, on-line planning, and no planning on the fluency, complexity, and accuracy of 42 EFL Chinese learners' narrative writing. They found that pre-task planning resulted in increased fluency and syntactical variety, on-line planning resulted in increased accuracy, and no availability of planning time had negative consequences on fluency, complexity, and accuracy. Using a case study approach, Ojima (2006) examined the effect of concept planning, a form of pre-task planning, on three ESL Japanese students' written performance. Each writer wrote four essays: two pre-planned and two unplanned essays. Fluency was measured by the type-token ratio, which is commonly regarded as a measure of lexical complexity. Ojima (2006) reported that pre-task planning produced greater fluency and complexity, but did not improve accuracy.

The preceding review of the literature shows that there are no L1 or L2 task-based research studies that have investigated the effects of progressively increasing task complexity with respect to both the resource-dispersing and the resource-directing factors on written language production in a single experimental study. In addition, whereas planning time was incorporated in Robinson's (2001a, 2001b, 2005, 2007) Triadic Componential Framework, no factor related to the manipulation of the revision task environment was included. In view of these issues, our study set out to examine a new factor (draft availability), which involved allowing the learners to revise with or without their drafts during revision. This decision was based on the assumption that revising with or without drafts is a form of manipulation of the revision task environment which would fit well in Robinson's Triadic Componential Framework. The inclusion of this new factor was inspired by the work of Galbraith and Torrance (2004), who found that the quality of writing (as measured by the fluency of language, coherence of the overall argument, originality, and the appropriateness of style of writing) improved when the participants revised without having access to their first drafts and when they wrote without planning.

The present study

Our study explored the effects of increasing task complexity on Chinese EFL learners' argumentative writing using three factors: (1) The amount of time allocated to planning and writing (± planning time); (2) the type of writing assistance given to the learners (± ideas and macro-structure); and (3) the availability of first drafts during revision (± draft availability) in a single experiment. As mentioned above, two key reasons motivated the focus and orientation of our research. The first reason was the contrasting explanations and claims made by Skehan and Foster's (2001) Limited Attentional Capacity and Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis. The second reason was a scarcity of task-based research studies on written language production. It is hoped that our study will shed light on the contrasting theoretical explanations and claims for increasing task complexity as proposed by Skehan and Foster and Robinson, and fill in the gap in task-based SLA research with its focus on written language production.

Research questions

Two research questions guided the study:

1. What are the effects of increased task complexity, manipulated with respect to the dimensions of (a) ± planning time, and (b) ± ideas and macro-structure, on fluency I (mean number of words produced per minute of transcription), fluency II (mean number of words produced per minute of the total time spent on the task), and lexical complexity of Chinese EFL learners' *first drafts* of argumentative writing?
2. What are the effects of increased task complexity, manipulated with respect to the dimensions of (a) ± planning time, (b) ± ideas and macro-structure, and (c) ± draft availability conditions on the fluency and lexical complexity of Chinese EFL learners' *revised drafts* of argumentative writing?

Methods

A schematic diagram of the experimental research design is shown in Fig. 1.

Independent variables

We manipulated the amount of planning time given to the participants for factor one: Extended Pre-task, Pre-task, Free-writing, and Control Group. In the extended pre-task condition, the participants were given 20 minutes for planning

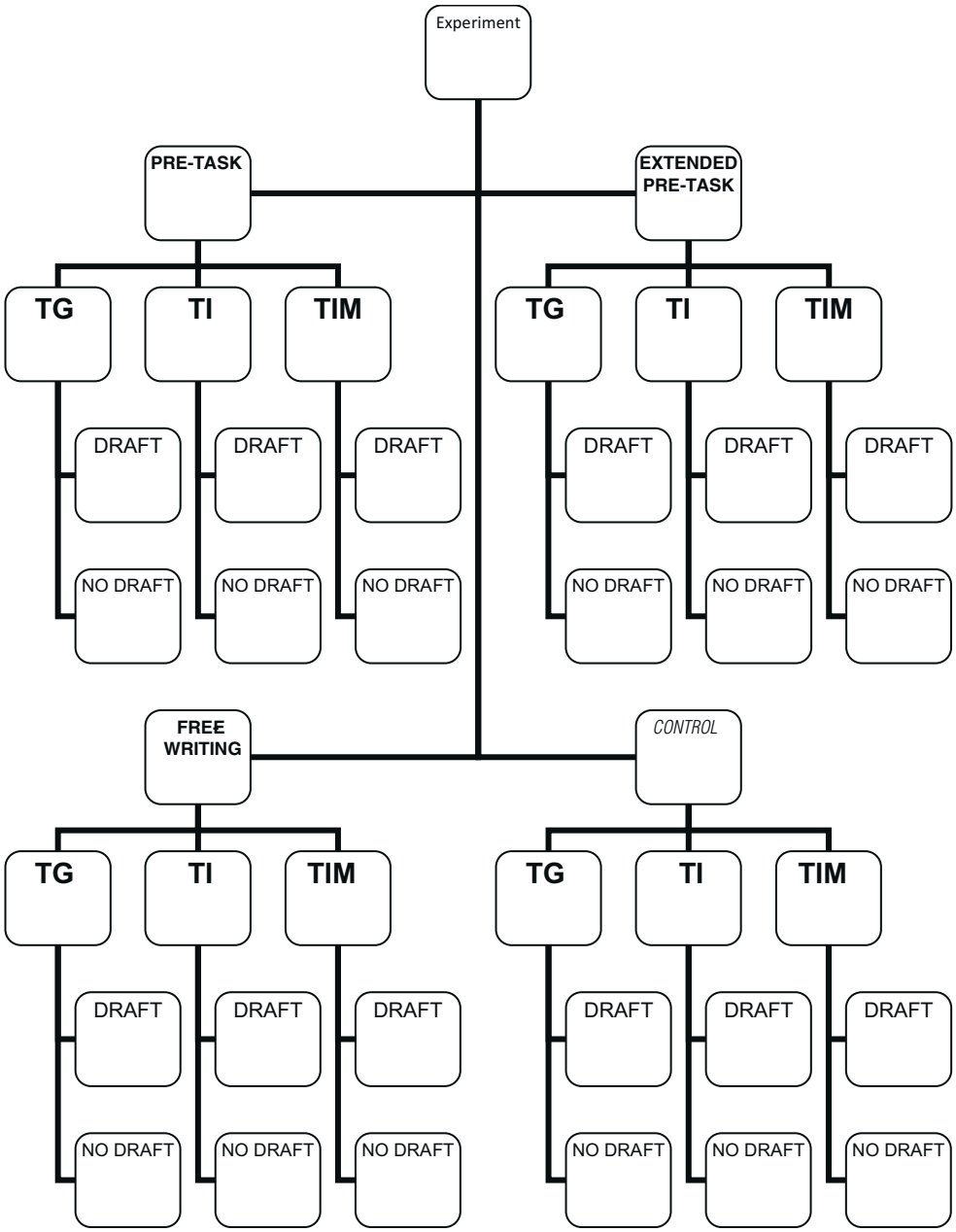

Fig. 1. A schematic diagram of experimental research design.

before they were asked to write for 10 minutes. In the pre-task condition, the participants were allowed 10 minutes to plan before they were instructed to write for 20 minutes. Finally, in the free-writing condition, the participants were instructed not to plan, but to write immediately and continuously for 30 minutes. The instructions of the free-writing condition were modelled closely after Elbow (1973, 1981) and Galbraith and Torrance (2004). The participants in the control group were instructed to produce the first draft of their essays within 30 minutes. The participants in the control group wrote in their own usual style. Based on Robinson's (2001a, 2001b, 2005, 2007) Triadic Componential Framework, we hypothesized that task complexity would increase progressively from the extended pre-task planning condition, to the pre-task condition, and then to the free-writing condition. In other words, the most complex task would be the free-writing condition, which did not allow the participants to plan before writing, whereas the least complex task would be the extended pre-task condition, which allowed the participants to plan for the longest time.

We also manipulated the amount of writing assistance given to the participants in terms of three conditions: (1) Topic, ideas, and macro-structure given; (2) topic and ideas given; and (3) topic given. The topic, ideas, and macro-structure given condition provided the participants with the topic, ideas, and macro-structure of the essay. The topic and ideas given condition provided the participants with the topic and ideas of the essay. The topic given condition provided the participants with the topic of the essay only. Based on the Triadic Componential Framework, we hypothesized that task complexity would increase incrementally from the topic, ideas, and macro-structure given, topic and ideas given, to topic given conditions. In other words, the most complex task would be the one that had no writing assistance given to the learners (Topic given), and the least complex task would be the one that had the most writing assistance given to the learners (Topic, ideas, and macro-structure given).

Based on previous research (Galbraith & Torrance, 2004), we also manipulated the revision task environment resulting in the Draft available and No draft available conditions. The draft condition allowed the participants to revise and rewrite their second drafts with the availability of their first drafts. The no draft condition removed from participants their first drafts during revision. We hypothesized that the no draft condition was cognitively more demanding than the draft condition because the participants in the no draft condition were required to manage more cognitive processes in their working memory, specifically those involved in retrieving the content, organization, and language aspects of their first drafts. Thus, the + draft available condition represented the less complex task, whereas the − draft available condition represented the more complex task.

Based on the Componential Framework Robinson (2001a, 2001b, 2005, 2007), the ± planning time factor was conceptualized as a resource-dispersing dimension. We regarded the ± ideas and ± macro-structure factors as the resource-dispersing dimensions given that Robinson had also categorized ± prior knowledge under this dimension. Finally, we regarded the ± draft availability factor during revision as a resource-directing dimension. The no draft available condition was postulated to direct more of the learners' attentional resources to certain aspects of the essays, such as content, organization and language, as compared to the ± draft available condition.

Dependent variables

In task-based research, task performance is generally measured by examining changes in fluency, complexity, and accuracy (e.g., Ellis, 1987, 2005; Ellis and Yuan, 2004; Skehan & Foster, 1997, 1999; Yuan and Ellis, 2003). According to Skehan (1996) and Mehnert (1998), fluency, complexity, and accuracy are the three main goals in foreign language learning and are independent of one another. Although many of the studies that have employed these measures examined oral production, L2 writing research has also used all or some of these measures to assess text quality (Suzuki, 2006; Wolfe-Quintero, Inagaki, & Kim, 1998). In our study we examined two measures of fluency (fluency I and fluency II) following Kellogg (1990). Fluency I referred to the mean number of words produced per minute of transcription, whereas fluency II referred to the mean number of words produced per minute out of the total time spent on the task. The reason for using these two measures was that Kellogg (1990) found contrasting results on the effects of planning on fluency when fluency was operationalized as the writing time versus when it was operationalized as the total time on the task. We used the formula WT^2/W (word types squared divided by the total number of words) to calculate lexical complexity, as this formula takes into account the length of texts produced by the learners.

Participants

One hundred and eight Chinese EFL tertiary students enrolled in the Communication Skills Programme at a comprehensive university in Singapore volunteered to participate in this study (for a detailed description of the programme, see Zhang, 2008). Their ages ranged from 16 to 19 (mean age = 18 years old) and there was an almost equal percentage of males (49%) and females (51%). There were no statistically significant differences in the experimental and control conditions for either gender or age at the onset of the experiment.

Tasks and procedures

Pre-writing tasks

Before the experiment, we devised three pre-writing tasks, of argumentative, descriptive, and letter writing genres, to obtain writing proficiency task scores for all the participants (see Appendix A). The average of the writing

proficiency task scores was used to randomly stratify the participants into the experimental and control groups so as to prevent this variable from confounding the results of the experiment and to allow greater generalization of our findings by not limiting them to one proficiency level. The argumentative and descriptive pre-writing tasks were of 1-hour duration and the letter-writing task was of half an hour duration. The pre-writing tasks were rotated to ensure that the order of the tasks would not affect the results. The 313 pre-writing tasks were rated by two independent raters using Jacob, Zinkgraf, Wormuth, Hartfiel, and Hughey's (1981) analytical scoring scheme, after they were trained in using the scheme. Interrater reliabilities, computed using Cronbach's alpha, were high for the argumentative pre-writing tasks (.89), the descriptive pre-writing tasks (.96), and the letter-writing tasks (.94).

An average of the three pre-writing tasks scores for each participant was obtained. This final writing proficiency score was used to categorize the participants according to three levels of writing proficiency, high (24 participants), average (64 participants), and low (14 participants). We did a random stratification of the participants of three levels of writing proficiency into factor one (extended pre-task, pre-task, free-writing, and control), factor two (topic, ideas, and macro-structure given, topic and ideas given, and topic given), and factor three (draft available and no draft available). In other words, there were almost equal numbers of participants from each writing proficiency group in all experimental conditions. A three-way ANOVA, with the three factors as the independent variables, showed that there were no statistically significant differences between the conditions, nor were the interactions statistically significant on their writing proficiency scores.

Experimental essay prompts

All participants wrote a topic about ''International Sports Competition'' for the experiment task (Appendix B). The experimental essay prompts were distinguished by the ± ideas, ± macro-structure, and ± draft availability conditions. We designed a total of six prompts. One of the essay prompts showing the topic, ideas, and macro-structure and draft available conditions is given in Appendix B.

Experimental instructions

Instructions on how much planning and writing time the participants had in the experiment were given verbally in separate classrooms by four research assistants. The participants in all groups were told not to read, edit, or revise their essays during the first part of the writing session. This was intended as a measure to ensure that all forms of revision took place only in the second part of the writing session. Before the revision stage, the participants in all groups, except the control group, were given five minutes to read, evaluate, and summarize what they had written on their first drafts. They were instructed to select the main and relevant points that they would like to include in their second drafts. The rationale for doing so was to focus the participants' attention on the content and organization development of their first drafts in such a way that they would possess a clear mental state to revise their second drafts. As summarizing was unlikely to be a strategy used by the participants, the control group were not instructed to do so. The first drafts were produced in 30 minutes and the revised drafts were produced in 25 minutes.

Results

Effects of increased task complexity on first drafts

Our first research question asked: What are the effects of increased task complexity, manipulated with respect to the dimensions of (a) ± planning time and (b) ± ideas and macro-structure on fluency I (mean number of words produced per minute of transcription), fluency II (mean number of words produced per minute of the total time spent on the task), and lexical complexity of Chinese EFL learners' *first drafts* of argumentative writing?

A 4 × 3 between subject factorial ANOVA on fluency I, fluency II, and lexical complexity was conducted on 107 first drafts of the essays written by our participants. Table 1 shows the means and standard deviations for fluency and lexical complexity of the learners' first drafts for the experimental and control conditions.

With respect to our first research question, there were no interaction effects of task complexity (manipulated with respect to the dimensions of ± planning time and ± ideas and macro-structure) on fluency I (mean number of words produced per minute of transcription), [$F(6, 95) = 0.73$, n.s.], fluency II (mean number of words produced per minute of the total time spent on the task), [$F(6, 95) = 0.32$, n.s.], and lexical complexity, [$F(6, 95) = 0.54$, n.s.]. There were no significant differences in fluency I of the learners' first drafts of argumentative essays when task complexity was

Table 1
Means and standard deviations of fluency and lexical complexity of the writers' first drafts.

	Extended pre-task			Pre-task			Free-writing			Control		
	TIM	TI	TG	TIM	TI	TG	TIM	TI	TG	TIM	TI	TG
Fluency I	15.86	14.73	13.05	12.38	13.24	14.04	13.08	12.50	13.12	12.71	13.50	13.41
	(4.51)	(4.02)	(4.01)	(3.45)	(2.65)	(3.77)	(3.78)	(2.43)	(3.18)	(3.01)	(3.10)	(2.06)
Fluency II	5.29	4.91	4.35	8.25	8.83	9.36	13.08	12.50	13.18	11.22	11.29	11.24
	(1.50)	(1.34)	(1.34)	(2.30)	(1.77)	(2.52)	(3.78)	(2.43)	(3.25)	(2.53)	(2.48)	(2.09)
Lexical complexity	56.32	54.63	57.00	74.65	89.59	88.72	94.39	98.71	96.61	80.35	93.83	91.86
	(9.67)	(13.20)	(9.78)	(15.96)	(19.10)	(17.52)	(24.84)	(18.85)	(20.64)	(18.12)	(18.51)	(16.37)

Note. TIM = Topic, ideas, and macro-structure given; TI = Topic and ideas given; TG = Topic given. Standard deviations are given in parentheses.

manipulated with respect to the ± planning time dimension, [$F(3, 95) = 1.22$, n.s.], and when task complexity was manipulated with respect to the dimensions of ± ideas and macro-structure, [$F(2, 95) = 0.01$, n.s.].

As for fluency II, there was a significant difference when task complexity increased with respect to the ± planning time dimension, [$F(3, 95) = 56.34$, $MSE = 5.72$, $p < 0.001$, $\eta^2 = .064$]. The effect size was medium. Post hoc Tukey test results indicate that the learners in the free-writing condition scored significantly higher for fluency II than the learners in the pre-task condition ($p < 0.001$) and the extended pre-task condition ($p < 0.001$), and nearly significantly higher for fluency II than the learners in the control condition ($p = 0.054$). The learners in the control group scored significantly higher for fluency II than the learners in the extended pre-task ($p < 0.001$) and pre-task ($p = 0.002$). The learners in the pre-task condition scored significantly higher for fluency II than the learners in the extended pre-task condition ($p < 0.001$). There was, however, no significant difference in fluency II of the learners' first drafts of argumentative essays when task complexity increased with respect to ± ideas and macro-structure, [$F(2, 95) = 0.04$, n.s.].

As for lexical complexity, there was a significant difference when task complexity increased with respect to ± planning time, [$F(3, 95) = 26.93$, $MSE = 302.91$, $p < 0.001$, $\eta^2 = 0.460$]. The effect size well exceeded the 0.14 criterion for a large effect size (Kirk, 1995). Post hoc Tukey tests showed that the texts written in the free-writing condition showed a significantly higher lexical complexity than those written in the pre-task condition ($p = 0.049$), and the texts written in the free-writing condition showed significantly higher lexical complexity than the texts written in the extended pre-task condition ($p < 0.001$). Post hoc Tukey tests further indicated that the essays written by the learners in the control group had a significantly higher lexical complexity than those written in the extended pre-task condition ($p < 0.001$), and the texts written in the pre-task condition had a significantly higher lexical complexity than those written in the extended pre-task condition ($p < 0.001$). There was, however, no significant difference in lexical complexity of the learners' first drafts of argumentative essays when task complexity increased with respect to ± ideas and macro-structure, [$F(2, 95) = 2.15$, n.s.] (see Table 2.).

Table 2
Main effects of factor one and factor two on fluency and lexical complexity of the writers' first drafts.

Dependent variables	Factor One (Extended pre-task, pre-task, free-writing, and control)				Factor Two (Topic, ideas, and macro-structure given, topic and ideas given, and topic given)			
	F	df	p	η^2	F	df	p	η^2
Fluency I	1.223	3	.306	.037	.009	2	.991	.000
Fluency II	56.339	3	.000	.640*	.037	2	.964	.001
Lexical complexity	26.925	3	.000	.460*	2.150	2	.122	.043

* $p < .05$.

Effects of increased task complexity on revised drafts

Our second research question asked: What are the effects of increased task complexity, manipulated with respect to the dimensions of (a) ± planning time; (b) ± ideas and macro-structure; and (c) ± draft availability conditions on fluency I (mean number of words produced per minute of transcription) and lexical complexity of Chinese EFL

learners' *revised drafts* of argumentative writing? In order to answer this question, a 4 × 3 × 2 between subject factorial ANOVA on fluency I and lexical complexity was conducted on the 108 revised drafts of the essays. Table 3

Table 3
Means and standard deviations of fluency and lexical complexity of the writers' revised drafts.

	Extended pre-task						Pre-task					
	TIM		TI		TG		TM		TI		TG	
	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND
Fluency I	13.94	14.70	15.20	15.82	17.23	13.76	15.99	15.84	12.88	15.37	15.87	15.40
	(4.72)	(1.00)	(2.38)	(3.79)	(4.37)	(6.76)	(4.02)	(2.67)	(2.45)	(1.53)	(4.32)	(2.66)
Lexical complexity	88.86	83.68	81.01	87.89	77.73	75.19	83.21	100.79	83.07	96.07	79.72	81.20
	(15.77)	(7.25)	(8.55)	(13.11)	(15.40)	(11.88)	(17.13)	(14.80)	(14.21)	(7.46)	(11.56)	(22.46)
	Free-writing						Control					
	TIM		TI		TG		TIM		TI		TG	
	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND
Fluency I	15.01	18.23	15.11	17.27	13.68	12.87	16.19	13.54	16.48	13.01	13.30	14.37
	(3.04)	(4.56)	(3.75)	(3.64)	(2.31)	(2.93)	(2.02)	(5.81)	(2.37)	(2.55)	(2.44)	(2.84)
Lexical complexity	90.74	88.32	87.24	93.16	76.35	84.17	106.96	79.49	87.33	96.24	79.08	79.31
	(21.15)	(25.23)	(11.79)	(22.93)	(10.83)	(6.37)	(17.60)	(13.32)	(11.31)	(20.36)	(19.45)	12.74

Note. TIM = Topic, ideas, and macro-structure given; TI = Topic and ideas given; TG = Topic given. D = Draft available and ND = No draft available. Standard deviations are given in parentheses.

shows the means and standard deviations for fluency I and lexical complexity of the learners' revised drafts for the experimental and control conditions.

With respect to our second Research Question, neither the effects of two-way interaction manipulated with respect to the dimensions of ± planning time and ± ideas and macro-structure, nor the three-way interaction manipulated with respect to the dimensions of ± planning time, ± ideas and macro-structure, and ± draft availability, on fluency I (mean number of words produced per minute of transcription) and lexical complexity, were significant (all Fs < 1). There was no significant difference in fluency I of the learners' revised drafts of argumentative essays when task complexity increased with respect to the dimensions of ± planning time, [$F(3, 84) = 0.33$, n.s.], ± ideas and macro-structure, [$F(2, 84) = 0.55$, n.s.], and ± draft availability, [$F(1, 84) = 0.007$, n.s.] (see Table 4).

Table 4
Main effects of factor one, factor two, and factor three on fluency and lexical complexity of the writers' revised drafts.

Dependent variables	Factor One (Extended pre-task, pre-task, free-writing, and control)				Factor Two (Topic, ideas, and macro-structure, topic and ideas, and topic given)				Factor Three (Draft available and no draft available)			
	F	df	p	η^2	F	df	p	η^2	F	df	p	η^2
Fluency I	.327	3	.806	.012	.546	2	.581	.013	.007	1	.932	.000
Lexical complexity	.639	3	.592	.022	5.05	2	.009	.107*	.411	1	.523	.005

* $p < .05$.

As for lexical complexity, there was no significant difference when task complexity increased with respect to ± planning time, [$F(3, 84) = 0.64$, n.s.], but significant differences were found regarding the same dependent variable when task complexity increased with respect to ± ideas and macro-structure, [$F(2, 84) = 5.05$, $p = 0.009$, $\eta^2 = .107$]. Post hoc Tukey tests showed that the text written in the topic and ideas given condition had a significantly higher lexical complexity than the texts written in the topic given condition ($p = 0.017$), and the ones written in the topic, ideas, macro-structure condition had a significantly higher lexical complexity than the texts in the topic given

condition ($p = .008$). There was no significant difference in lexical complexity of the learners' revised drafts when task complexity increased with respect to ± draft availability, [$F(1, 84) = 0.41$, n.s.].

Discussion

Our study investigated the effects of manipulating task complexity with respect to the resource-dispersing and resource-directing dimensions in relation to fluency and lexical complexity of 108 Chinese EFL writers' argumentative essays. Based on Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis, we predicted that, as we increased task complexity progressively from extended pre-task planning, to pre-task planning, and to free-writing, fluency and lexical complexity would be reduced correspondingly. The same predictions were made for progressively increasing task complexity with respect to the topic, ideas, and macro-structure given, topic and ideas given, and topic given conditions.

With respect to our first research question, we found that the amount of planning time given to learners had an effect on fluency I (measured by the total time on the task) and the lexical complexity of their first drafts. With respect to fluency II (mean number of words produced per minute of the total time spent on the task), the free-writing condition resulted in the participants scoring significantly higher than the control, the pre-task, and the extended pre-task conditions. With respect to lexical complexity, the free-writing condition appeared to help the participants to score nearly significantly higher than the pre-task condition, and the free-writing condition also assisted the participants in scoring significantly higher than the extended pre-task condition. The learners in the control group and the pre-task condition scored significantly higher on lexical complexity compared to the learners in the extended pre-task condition.

Kellogg (1988, 1990) found that the participants who wrote in the planning condition produced significantly greater fluency I (measured by writing time) compared to the no planning condition. However, he found no significant effect on fluency II (measured by total time on task). Our study and those of Kellogg (1988, 1990) displayed a similar reverse direction of the effects of manipulating planning time on both aspects of fluency. Although our study found no significant difference in the effects of planning on fluency I (measured by writing time), this measure of fluency was, in fact, the highest in the extended pre-task condition, followed by the pre-task condition, the control group, and the free-writing condition. As for fluency II (measured by total time on task), a reverse direction was identified; this fluency level was significantly higher in the free-writing condition than in the control group, the pre-task condition, and the extended pre-task condition. In other words, when fluency was measured in terms of writing time, a more complex task, such as free-writing, resulted in less fluency than the less complex tasks, such as extended pre-tasks and pre-tasks. When fluency was measured in terms of the total time spent on the task, a more complex task resulted in greater fluency than the less complex ones. However, the observed benefits of planning in enhancing fluency (documented in other studies) require further verification, as pointed out by Kellogg (1990) and Hayes and Nash (1996).

There are at least two possible explanations as to why free-writing allowed learners to produce greater fluency II (measured by the total time on task) as compared to pre-task and extended pre-task conditions. The first reason may be that this measure of fluency improved incrementally with a corresponding increase in writing time, as shown in both the free-writing and the control conditions having 30 minutes to plan and write, the pre-task condition having 20 minutes to write, and the extended pre-task condition having only 10 minutes to write. As transcription time is required to produce words, the first two groups (in the free-writing and control conditions respectively) obtained the benefit. Secondly, we suspect that the writers in the complex task, free-writing, may have not been engaged in deliberate and conscientious planning during the formulation process, given that they were encouraged to write without planning, write continuously, and write whatever came to their minds in this experiment. This lack of no-online planning behaviour during the transcription process may have promoted greater fluency in the free-writing condition. In this study, the online planning referred to the planning that takes place as one is engaged in the process of text generation.

These findings contrast with the results obtained in studies of oral language production, which showed that pre-task planning improved fluency compared to no planning conditions (Mochizuki & Ortega, 2008; Ortega, 1999; Yuan & Ellis, 2003). A theoretical explanation for this difference can be suggested. It has been argued that planning helps to reduce cognitive demands placed on the participants during oral task execution. Underlying this argument is the belief that planning is partitioned from the speech execution process in the pre-task planning condition. Unlike the oral production studies, we suspect that our participants in the planning conditions continued to plan during the task

execution and that this quantity of planning exceeded that of the participants who were instructed not to plan. If our speculation is correct, then the planning conditions are, in fact, cognitively more demanding than the free-writing condition. In other words, too much planning and continuous planning during task execution may have negative effects on fluency in written task performance.

There are three possible reasons to explain the higher lexical complexity of the texts written in the free writing condition compared to the planning conditions. First, the writers in the free-writing condition were encouraged to write immediately and without planning. These instructions may have automatically prompted lexical retrieval, which resulted in higher lexical complexity. We speculate that the writers in both planning conditions were more engaged in online planning than the writers in the free-writing condition during writing. This online planning in the pre-task and extended pre-task conditions may have impeded lexical retrieval. Second, the enhanced fluency observed in the free-writing condition may have further contributed to improved lexical complexity in the texts produced. This enhanced fluency reduced the cognitive demands placed on the writers during writing in such a way that they could engage in the retrieval of a wider variety of words. Third, writing in the free-writing condition may be cognitively less demanding than writing in the pre-task or extended pre-task conditions, as Chinese EFL learners seemed to possess greater automaticity in the simultaneous management of planning and writing processes (Wang & Wen, 2002; see also DeKeyser, 1997; Zhang, 2010). If this is the case, then the free-writing condition may not be regarded as the most complex task, which we had hypothesized to be the case based on Robinson's Cognition Hypothesis.

Our findings in this respect were also contrary to those obtained in oral language production research on task complexity. Crookes (1989), Mehnert (1998), Ortega (1999), Foster and Skehan (1996), Skehan and Foster (1997, 1999), Wigglesworth (1997), and Yuan and Ellis (2003) found that pre-task planning resulted in greater complexity in oral language production. It is likely that our earlier theoretical explanation for the difference in fluency between oral and written language production applies here as well.

We found that the topic, ideas, and macro-structure given, the topic and ideas given, and the topic given conditions had no significant effects on fluency I (measured by writing time), fluency II (measured by time on task), and lexical complexity of the first drafts. With fluency I and fluency II, our results corroborate those of Kellogg's (1987) study, which found no significant difference in the effects on fluency of the low and high topic knowledge that writers had. With lexical complexity, the highest scores were observed in the topic, ideas, and macro-structure given condition, followed by the topic and ideas given condition, and the topic given condition, respectively. This is in line with Glynn, Britton, Muth, and Dogan (1982), who found no significant differences in the number of sentences generated when they reduced the cognitive load of the tasks through instructing their writers to write in conditions such as ''polished sentences,'' ''mechanics-free sentences,'' ''ordered propositions,'' and ''unordered propositions,'' which were tasks of decreasing cognitive demands.

With respect to our second research question, we found that the amount of planning time given to the learners in the formulation stage of the writing process had no significant effects on fluency I (mean number of words produced per minute of transcription) and lexical complexity of the revised drafts. Fluency I was, however, predicted in accordance to the direction postulated by Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis. It was the highest in the revised drafts written by the planning groups, followed by those written in the control and free-writing conditions. The effects of increasing task complexity with respect to the provision of ± planning time on fluency I was, in fact, the same for the first and revised drafts of learners' writing. Lexical complexity was, however, not observed along the direction postulated by Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis in the sense that the beneficial effects of free-writing on lexical complexity in the first drafts were not observed in the revised drafts.

We found that the topic, ideas, and macro-structure given, topic and ideas given, and topic given conditions had significant effects on lexical complexity but not on fluency I (measured by the writing time). Significantly lower lexical complexity was found in the texts written in the topic given condition in comparison with those written in the topic and ideas given condition, and in the topic given condition in comparison with the topic, ideas, and macro-structure given condition. Although there was no significant reduction in fluency I when task complexity was manipulated with respect to the provision of ± ideas and macro-structure, it was marginally reduced from the topic, ideas, and macro-structure given condition to the topic and ideas given condition and the topic given condition.

Based on Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis, we predicted that a complex task (− draft available) would produce significantly reduced fluency I (i.e., the mean number of words) and improved lexical complexity compared to a less complex task (+ draft available). We found that the provision of ± draft availability had no significant effects on fluency I and lexical complexity. There was a reverse direction of marginally enhanced fluency

I in the complex task (− draft available) compared to the non-complex task (+ draft available). This result is similar to Ishikawa (2006), who found that increasing task complexity, with respect to the ± Here and Now factor, significantly increased fluency in written language production. However, our findings contradicted Robinson's (2001a, 2001b, 2005) predictions regarding the potential effects of resource-directing factors on fluency. Two likely reasons for this divergence may be offered. First, the effects exerted by the manipulation of different task factors may have yielded different results. Second, the mediating effects of task manipulation on learners' attentional focus and how they allocated the remaining limited working memory capacity resources to what critical aspects of solving the task may have differed.

Finally, there was marginally higher lexical complexity in the no draft available condition than the draft available condition. This result is in line with Kuiken and Vedder (2006, 2007), who found that increasing task complexity, with respect to the resource-directing factors, enhanced lexical variation. However, our findings contrast with those of Kuiken et al. (2005), and Kuiken and Vedder (2008), who found no significant results, with respect to the same factors, on the lexical variation in their participants' writing. Our overall results on the effects of ± draft availability on fluency and lexical complexity seemed to converge with Galbraith and Torrance (2004), who found better text quality among the writers who revised without their first drafts compared to those who revised with the availability of their first drafts. We can, therefore, tentatively conclude that there appears to be a potential in improving the quality of revised drafts among writers who revised without their drafts.

We further observed that Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis posited that fluency would be reduced whether one manipulated the resource-dispersing or resource-directing factors. We raised a question: Under what condition would fluency of written language production be enhanced in task-based research? Our results seemed to point to the free-writing condition as having a good potential of enhancing fluency or promoting content generation in written text production.

Conclusion and recommendations

Given the paucity of task complexity research on written language production, our study intended to fill this gap by examining the effects of manipulating both the resource-dispersing and the resource-directing factors, according to Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis, in the same experiment. In manipulating ± planning time, our study controlled for the total amount of time on task given to the learners by varying the amount of planning and transcription time in the formulation process. We argued that the true effects of planning versus no planning could be determined this way. The varying time on the task given to planning versus no planning groups in other studies (e.g., Ellis & Yuan, 2004; Kellogg, 1988, 1990; Mochizuki & Ortega, 2008; Ojima, 2006; Ortega, 1999; Yuan & Ellis, 2003) may form a confounding variable influencing the true effects of planning on language production. In addition, our study was the first to highlight the absence of the revision component in Robinson's (2001a, 2001b, 2005, 2007) Triadic Componential Framework. This factor is particularly crucial in task-based research on written text production, as writing performance is heavily dependent on the revision process. The absence of a revision component in Robinson's Triadic Componential Framework suggests that this model may have greater applicability in the study of oral language production than in the analysis of writing, an issue worth considering in future task-based research.

In summary, our results did not lend support to the predictions of Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis and Skehan and Foster's Limited Attentional Capacity regarding the effects of increasing task complexity with respect to ± planning time factor on reducing fluency and lexical complexity. First, our results showed that a complex task (free-writing) produced significantly greater fluency II (measured by total time on task) and lexical complexity than the less complex tasks (pre-task and extended pre-task). Second, our results partially supported Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis and Skehan's Limited Attentional Capacity's predictions on the effects of increasing task complexity, with respect to the provision of ± ideas and ± macro-structure of text, on reducing fluency and lexical complexity. Our results clearly showed that a complex task resulted in lower lexical complexity than a non-complex one. Third, our results did not seem to support Robinson's Cognition Hypothesis regarding the effects of increasing task complexity, with respect to ± draft availability, on the characteristics of the revised drafts. However, it is important to note that our results showed that increasing task complexity with respect to this factor did result in marginally higher fluency and lexical complexity, which is in line with the direction of increase predicted by Robinson's Cognition Hypothesis.

Finally, no trade-off effects [as suggested by Foster and Skehan, 1996, and Skehan and Foster, 1997] were observed in this study. Fluency did not suffer as a result of increased lexical complexity when we manipulated these task factors. Formulation as a whole did not seem to compete on a single pool, but on multiple pools of resources, as predicted by Robinson (2001a, 2001b, 2005). During their composing process, the writers in the free-writing condition appeared to be able to attend to content generation and to retrieve a wider variety of words in comparison to the writers in the pre-task and extended pre-task conditions.

Despite the potential contribution of this study to task-based writing research, we have to acknowledge some limitations inherent in our research. First, it is possible that we were not able to detect higher order interaction effects in our experiment because the number of participants per cell was small. Future research may increase the sample size per cell to confirm the presence or lack of the higher order interaction effects. Second, we did not consider the accuracy of L2 writers' language production in the various experimental conditions. Without examining the accuracy of language production, we cannot verify Robinson's (2001a, 2001b, 2005, 2007) Cognition Hypothesis in full. Third, learner factors such as working memory capacity, aptitude, interest level, and motivation, which might have significantly moderated the effects of task complexity in relation to fluency and lexical complexity, were not adequately addressed in our study. Fourth, our speculation that the writers spent more time in online planning in the planning conditions compared to the writers in the free-writing condition is in need of further verification. In short, many open questions still exist. Specifically, we need an answer to the crucial question of ''who benefits from what types of planning and when and in what aspects'' (Manchón & Roca de Larios, 2007, p. 556), as this piece of critical information could shed light on the learners' attentional focus and explain various aspects of L2 writers' task performance (Ellis, 2009; Manchón & de Haan, 2008; Manchón & Roca de Larios, 2007). Lastly, our experimental task manipulations, ± planning time, ± ideas, and macro-structure, and ± draft availability, were simulations of the actual writing task situation, which may not model real writing contexts.

Acknowledgements

We are deeply indebted to John Bitchener and Catherine Walter for their very helpful comments on an earlier version of this paper. We are equally grateful to the Editors for their incisive and meticulous attention to all the details. Without their constructive feedback, the paper would not have achieved this level of clarity. Any lack of clarity remains our responsibility.

Appendix A. Instructions on the writing experiment

General instructions

This is a test of your writing ability. You are not allowed to consult any papers, books, dictionaries, or other materials. You will have **one hour** for pre-writing tasks 1 and 2 and **half an hour** for pre-writing task 3. This includes the time to plan and to revise your work.

Your essay will be evaluated on the overall communicative effectiveness. The rating will be based on 5 main components: Content (30 marks), Organization (20 marks), Vocabulary (20 marks), Language use (25 marks), and Mechanics (5 marks).

Pre-writing Task 1: argumentative genre

Some people argue that the internet has caused a lot of harm to young people. Others argue that the internet has brought a lot of benefits to young people. What is your opinion? Use specific reasons and examples to support your answer.

Audience: Your Teacher and Fellow Students

Pre-writing Task 2: descriptive genre

Describe the ways/measures one can take to stay healthy and fit in these busy and stressful days.

Audience: Your Teacher and Fellow Students

Pre-writing Task 3: letter-writing genre

Your friend overseas is coming to tour the province where you stay next month. Write a letter to introduce to him one tourist attraction in the province. You may describe the tourist attraction or the activities that he can do at the place.

Audience: Your friend who is a tourist

Appendix B. Writing tasks for the experiment

Conditions: Topic, Ideas, & Macro-structure Given, Do not Turn in Draft Conditions

General instructions

This is a writing experiment designed to test your writing ability. Please follow the instructions given to you closely. You are not allowed to consult any papers, books, dictionaries, or other materials.

Some people argue that international sports and competition games bring many benefits to the countries/sportsmen/individuals, and they support such events fully. Others argue that international sports and competition games cause a lot of harm to the countries/sportsmen/individuals and say that such events should be abolished. What is your opinion? Use specific reasons and examples to support your answer.

Audience/Readers: Your Teacher and Fellow Students

References

Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition*. Hillsdale, NJ: Erlbaum.

Bialystok, E. (1991). Metalinguistic dimensions of bilingual language proficiency. In E. Bialystok (Ed.), *Language processing in bilingual children*. New York: Cambridge University Press. pp. 113–140.

Bialystok, E. (1994). Analysis and control in the development of second language proficiency. *Studies in Second Language Acquisition, 16*, 157–168.

Bygate, M. (1999). Quality of language and purpose of task: Patterns of learners' language on two oral communication tasks. *Language Teaching Research, 3*, 185–214.

Carter, R. (1998). *Mapping the mind*. London: Weidenfeld and Nicolson.

Crookes, G. (1989). Planning and interlanguage variation. *Studies in Second Language Acquisition, 11*, 367–383.

DeKeyser, R. (1997). Beyond explicit rule learning: Automatizing second language morphosyntax. *Studies in Second Language Acquisition, 19*, 195–211.

Elbow, P. (1973). *Writing without teachers*. Oxford: Oxford University Press.

Elbow, P. (1981). *Writing with power*. New York: Oxford University Press.

Ellis, R. (1987). Interlanguage variability in narrative discourse: Style in the use of the past tense. *Studies in Second Language Acquisition, 9*, 12–20.

Ellis, R. (2003). *Task-based language learning and teaching*. Oxford: Oxford University Press.

Ellis, R. (2005). *Planning and task performance in a second language*. Amsterdam: John Benjamins.

Ellis, R. (2009). The differential effects of three types of task planning on the fluency, complexity and accuracy in L2 oral production. *Applied Linguistics, 30*, 474–509.

Ellis, R., & Yuan, F. (2004). The effects of planning on fluency, complexity and accuracy in second language narrative writing. *Studies in Second Language Acquisition, 26*, 59–84.

Flower, L. S., & Hayes, J. R. (1980). The dynamics of composing: Making plans and juggling constraints. In L. W. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 31–50). Hillsdale, NJ: Erlbaum.

Foster, P., & Skehan, P. (1996). The influence of planning and task type on second language performances. *Studies in Second Language Acquisition, 18*, 299–323.

Galbraith, D., & Torrance, M. (2004). Revision in the context of different drafting strategies. In Allal, L., Chanquoy, L., & Largy, P. Eds. *Revision: Cognitive and instructional processes*. Vol. 13 (pp.63–85). Netherlands: Kluwer.

Gathercole, S. E., & Baddeley, A. D. (1993). *Working memory and language*. Hillsdale, NJ: Erlbaum.

Gilabert, R. (2007). Effects of mainupulating task complexity on self-repairs during L2 oral production. *International Review of Applied Linguistics, 45*, 215–240.

Glynn, S. M., Britton, B. K., Muth, K. D., & Dogan, N. (1982). Writing and revising persuasive documents: Cognitive demands. *Journal of Educational Psychology, 74*, 557–567.

Hayes, J. R., & Nash, J. D. (1996). On the nature of planning in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences and applications* (pp. 29–55). Hillsdale, NJ: Erlbaum.

Ishikawa, T. (2006). The effect of manipulating task complexity along the (±Here-and −Now) dimension on L2 written narrative discourse. In C. M. García-Mayo (Ed.), *Investigating tasks in formal language learning* (pp. 136–156). Clevedon, UK: Multilingual Matters.

Jacobs, H. L., Zinkgraf, S. A., Wormuth, D. R., Hartfiel, V. F., & Hughey, J. B. (1981). *Testing EFL composition: A practical approach*. Rowley, MA: Newbury House.

Kellogg, R. T. (1987). Effects of topic knowledge on the allocation of processing time and cognitive effort to writing processes. *Memory and Cognition, 15*, 256–266.

Kellogg, R. T. (1988). Attentional overload and writing performance: Effects of rough draft and outline strategies. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 14*, 355–365.

Kellogg, R. T. (1990). Effectiveness of prewriting strategies as a function of task demands. *American Journal of Psychology, 103*, 327–342.

Kellogg, R. T. (1996). A model of working memory in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences and applications* (pp. 57–72). Mahwah, NJ: Erlbaum.

Kirk, R. E. (1995). *Experimental design: Procedures for the behavioral sciences* (3rd ed.). Pacific Grove, CA: Brooks/Cole.

Kuiken, F., & Vedder, I. (2006). Cognitive task complexity and linguistic performance in French L2 writing. In M. García-Mayo (Ed.), *Investigating tasks in formal language learning* (pp. 117–135). Clevedon, UK: Multilingual Matters.

Kuiken, F., & Vedder, I. (2007). Task complexity and measures of linguistic performance in L2 writing. *International Review of Applied Linguistics, 45*, 261–284.

Kuiken, F., & Vedder, I. (2008). Cognitive task complexity and written output in Italian and French as a foreign language. *Journal of Second Language Writing, 17*, 48–60.

Kuiken, F., Maria, M., & Vedder, I. (2005). Cognitive task complexity and second language writing performance. In Foster-Cohen, S. H., García-Mayo, M., & Cenoz, J. Eds. *Eurosla yearbook*. Vol. 5 (pp.195–222). Amsterdam: Benjamins.

Long, M. (1996). The role of the linguistic environment in second language acquisition. In W. Ritchie & T. Bhatia (Eds.), *Handbook of second language acquisition* (pp. 413–468). San Diego, CA: Academic Press.

Manchón, R. M., & de Haan, P. (2008). Writing in foreign language contexts: An introduction. *Journal of Second Language Writing, 17*, 1–6.

Manchón, R. M., & Roca de Larios, J. (2007). On the temporal nature of planning in L1 and L2 composing. *Language Learning, 57*, 549–593.

Mehnert, U. (1998). The effects of different lengths of time for planning on second language performance. *Studies in Second Language Acquisition, 20*, 83–108.

Michel, M. C., Kuiken, F., & Vedder, I. (2007). The influence of complexity in monologic versus dialogic tasks in Dutch L2. *International Review of Applied Linguistics, 45*, 241–259.

Mochizuki, N., & Ortega, L. (2008). Balancing communication and grammar in beginning-level foreign language classrooms: A study of guided planning and relativization. *Language Teaching Research, 12*, 11–37.

Ojima, M. (2006). Concept mapping as pre-task planning: A case study of three Japanese ESL writers. *System, 34*, 566–585.

Ortega, L. (1999). Planning and focus on form in L2 oral performance. *Studies in Second Language Acquisition, 21*, 108–148.

Robinson, P. (2001a). Task complexity, cognitive resources, and syllabus design: A triadic framework for investigating task influences on SLA. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 287–318). New York: Cambridge University Press.

Robinson, P. (2001b). Task complexity, task difficulty, and task production: Exploring interactions in a componential framework. *Applied Linguistics, 22*, 27–57.

Robinson, P. (2003). The cognition hypothesis, task design, and adult task-based language learning. *Second Language Studies, 21*, 45–105.

Robinson, P. (2005). Cognitive complexity and task sequencing: A review of studies in a Componential Framework for second language task design. *International Review of Applied Linguistics, 43*, 1–33.

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, 45*, 193–213.

Robinson, P., & Gilabert, R. (2007). Task complexity, the cognition hypothesis and second language learning and performance. *International Review of Applied Linguistics, 45*, 161–176.

Schmidt, R. (1993). Awareness and second language acquisition. *Annual Review of Applied Linguistics, 13*, 206–226.

Schmidt, R. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language learning* (pp. 3–32). Cambridge: Cambridge University Press.

Skehan, P. (1996). A framework for the implementation of task-based instruction. *Applied Linguistics, 17*, 38–62.

Skehan, P. (1998). *A cognitive approach to language learning*. Oxford: Oxford University Press.

Skehan, P. (2001). Tasks and language performance assessment. In M. Bygate, P. Skehan, & M. Swain (Eds.), *Researching pedagogic tasks: Second language learning, teaching and testing* (pp. 167–185). Harlow: Pearson Education Longman.

Skehan, P. (2003). Task-based instruction. *Language Teaching, 36*, 1–14.

Skehan, P., & Foster, P. (1997). Task type and task processing conditions as influences on foreign language performance. *Language Teaching Research, 1*, 185–211.

Skehan, P., & Foster, P. (1999). The influence of task structure and processing conditions on narrative retellings. *Language Learning, 49*, 93–120.

Skehan, P., & Foster, P. (2001). Cognition and tasks. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 183–205). New York: Cambridge University Press.

Skehan, P., & Foster, P. (2005). Strategic and on-line planning: The influence of surprise information and task time on second language performance. In R. Ellis (Ed.), *Planning and task performance in a second language* (pp. 193–218). Amsterdam: John Benjamins.

Suzuki, M. (2006). Negotiation processes and text changes in Japanese learners' self revisions and peer revisions of their written compositions in English. Unpublished doctoral dissertation, University of Toronto, Canada

Tavakoli, P., & Foster, P. (2008). Task design and second language performance: The effect of narrative type on learner output. *Language Learning, 58*, 439–473.

VanPatten, B. (1990). Attention to form and content in the input: An experiment in consciousness. *Studies in Second Language Acquisition, 12*, 287–301.

Wang, W., & Wen, Q. (2002). L1 use in the L2 composing process: An exploratory study of 16 Chinese EFL writers. *Journal of Second Language Writing, 11*, 225–246.

Wickens, C. D. (1989). Attention and skilled performance. In D. Holding (Ed.), *Human skills* (pp. 71–105). New York: John Wiley.

Wickens, C. D. (1992). *Engineering psychology and human performance*. New York: Harper Collins.

Wigglesworth, G. (1997). An investigation of planning time and proficiency level on oral test discourse. *Language Testing, 14*, 85–106.

Wolfe-Quintero, K., Inagaki, S., & Kim, H.-Y. (1998). *Second language development in writing: Measures of fluency accuracy and complexity.* Honolulu, HI: University of Hawai'i Press.

Yuan, F., & Ellis, R. (2003). The effects of pretask planning and on-line planning on fluency, complexity and accuracy in L2 monologic oral production. *Applied Linguistics, 24*, 1–27.

Zhang, L. J. (2008). Constructivist pedagogy in strategic reading instruction: Exploring pathways to learner development in the English as a second language (ESL) classroom. *Instructional Science, 36*, 89–116.

Zhang, L. J. (2010). A dynamic metacognitive systems account of Chinese university students' knowledge about EFL reading. *TESOL Quarterly, 44*, 320–353.

Justina Ong, PhD, a part-time tutor at the National Institute of Education, Nanyang Technological University (NTU), Singapore, has earned her BA (Sociology and Geography) and MA (English Studies) Degrees from the National University of Singapore and her PhD (Applied Linguistics) from NTU. She was also the recipient of the Dean's Commendation for Research Award from NTU in 2010. Her research interests include cognitive psychology in writing, second language acquisition, second language writing, and psycholinguistics.

Lawrence Jun Zhang, PhD, is Associate Professor in English and applied linguistics at the National Institute of Education, Nanyang Technological University, Singapore. He has published widely on topics related to language education in *British Journal of Educational Psychology*, *Journal of Psycholinguistic Research*, *Language Awareness*, *Language and Education*, *Instructional Science*, *Perceptual and Motor Skills, and TESOL Quarterly,* among others. His interests lie mainly in metacognition in second language reading and writing development and representations of lexical and syntactic knowledge in bilingual/second language acquisition.