

## Effects of Task Complexity on Narrative Writing Performance among ESL Learners

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**Abstract:** There has been burgeoning interest in investigating the effects of cognitive load on task performance among second and Foreign language learners in the past few decades. Two cognition constructs that have dominated the discussion on the effects of cognitive complexity on language performance are Robinson's cognition hypothesis and Skehan's trade-off hypothesis. While Robinson argued that increasing task complexity levels would result in heightened attention to accuracy and complexity, Skehan posited that more demanding tasks would result in a depletion of attention for certain aspects of language production. The current study investigated the effects of high and low complexity tasks in terms of here-and-now versus there and-then, under pre-task and no pre-task planning conditions on narrative writing performance. The participants were 65 English as a Second Language (ESL) learners. The t-test results indicated that the high complexity task resulted in significantly higher syntactic complexity levels and greater fluency. However, results of the accuracy measure showed that the low-complexity group achieved a significantly higher mean score compared to the high-complexity group. Thus, this study lends partial support to both Robinson's cognition hypothesis and Skehan's trade-off hypothesis. The study also has pedagogical implications in designing and manipulating online materials for use with pedagogical tasks in the language classroom.

**Key words:** Cognitive complexity, narrative writing, Robinson's cognition hypothesis, Skehan's trade-off hypothesis, ESL, high-complexity group

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### INTRODUCTION

The use of tasks as language learning tools has gained popularity in the past few decades. This is largely due to the greater emphasis given on meaning, interaction and communication in second and Foreign language teaching and learning. Tasks play a central role in engaging learners in meaningful communication as pedagogical tasks involve learners in interaction where the primary focus is on conveying meaning, often replicating real world tasks (Nunan, 2001) such as telling stories, giving directions, exchanging information and making purchases.

Oliver (2018) contend that there is potential for the use of tasks for English language teaching as tasks allow for a shift from "synthetic" practices of language teaching to more authentic ways of using English and tasks allow learners to focus on meaning and could help develop their language abilities.

Using tasks in the language classroom requires an understanding of how tasks can be designed, adapted and manipulated to optimise language learning and classroom interaction. One perspective for explaining the relationship between tasks and L2 learning is the information-processing perspective. Task complexity

levels are often manipulated to optimise learning based on cognitive theories that draw on information-processing models. Information processing models can help explain how task manipulation lead to differences in L2 production in terms of accuracy, complexity and fluency, which are the three aspects of language production.

**Underpinning theories:** Two cognition constructs that have dominated the concept of task complexity are Robinson's cognition hypothesis (Robinson 2001a, b, 2005) and Skehan's trade-off hypothesis (Skehan, 2009) which is based on the limited attentional capacity model (Willis, 1996).

**Robinson's cognition hypothesis:** Robinson (2001a, b, 2005) proposed the cognition hypothesis which stipulates that increasing cognitive demands of tasks should be the basis for sequencing and designing tasks in a task-based syllabus. Thus, Robinson (2001a, b, 2005) developed the triadic componential framework for task design which encompasses of cognitive factors (task complexity), interactional factors (task condition) and learner factors (task difficulty) as outlined in Fig. 1. The triadic componential framework consists of three factors that affect task design for the language classroom. These

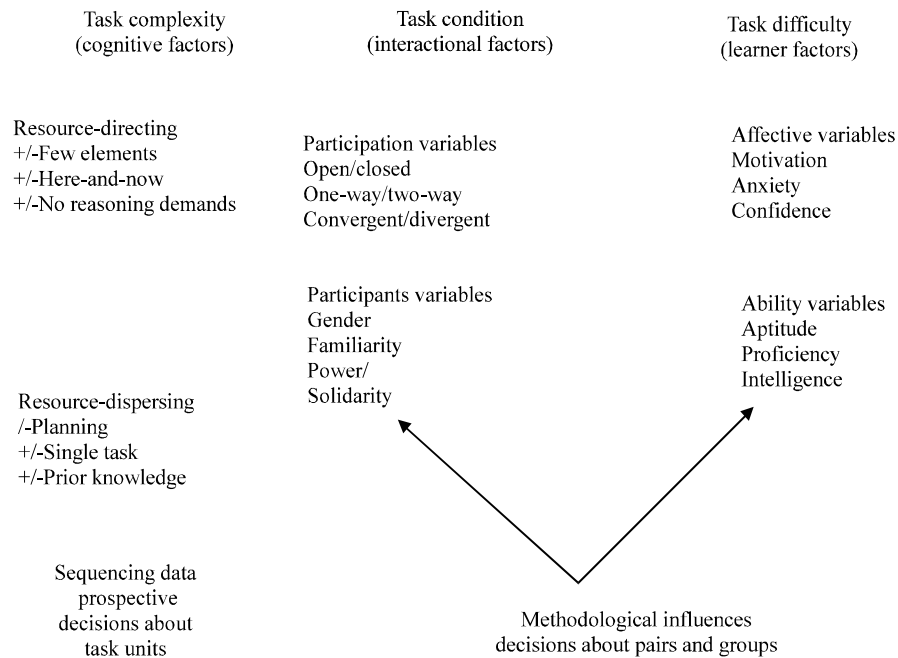


Fig. 1: Task complexity, condition and difficulty (Robinson, 2001 a)

factors are task complexity, task condition and task difficulty. Task complexity which is the factor manipulated in this current research, comprise of resource-directing and resource-dispersing elements. Robinson posits that resource directing elements would pose cognitive demand on language learners. The three variables in this category are few elements, here-and-now, and no reasoning demand. Meanwhile, resource-dispersing variables are those that make procedural demands on learners. These would include planning time, single task and prior knowledge. The cognition hypothesis predicts that “increasing the cognitive demands of tasks will push learners to greater accuracy and complexity in L2 production in order to meet the greater communicative demands faced” (Robinson, 2003).

**Skehan’s trade-off hypothesis:** Skehan (1998) put forth an opposing model to Robinson’s cognition hypothesis. Skehan’s task difficulty model and trade-off hypothesis stipulated that difficult tasks would put a large burden on learner attentional resources, thus, resulting in learner’s prioritising their attention on one particular aspect of language production, hence, leaving little attention to the other aspects of language performance, i.e., accuracy, complexity and fluency. Skehan (1998)’s view is compatible with Levelt (1989)’s speech production model, as shown in Fig. 2.

Levelt (1989)’s speech production model postulates that the conceptualiser delivers the pre-verbal message to the formulator which has to undertake the process of

lemma retrieval which would also involve syntactic encoding. Levelt (1989) posits that learners would prioritise conceptualisation over formulation and articulation. Therefore, increasing cognitive complexity limits the cognitive resources available for accessing available information in the lemma or the syntactic buffer (which is where grammatical information is temporarily held) and it depletes resources for grammatical encoding.

With native speakers, the process of lemma retrieval proceeds smoothly as their lexical and grammatical knowledge is extensive and well-organised (Levelt, 1989). However, the L2 speaker’s pre-verbal message will arrive at the formulator with less grammatical information in the syntactic buffer and with significantly less organisation and elaboration (ibid). Thus, the conditions for smooth parallel processing are not met. This means greater effort will be required to repair and reformulate speech as the automatic process of the operations in the formulator is disrupted. If like Skehan (1998), Skehan and Foster (2001) and Levelt (1989), we view our resources for language learning as having limited capacity, then, attention to accuracy will be limited as attention will be given to message generation and monitoring in the conceptualizer.

**Literature review:** A number of studies has manipulated task complexity variables along the resource-directing dimension with different task conditions to investigate their effects on L2 oral and written production. These

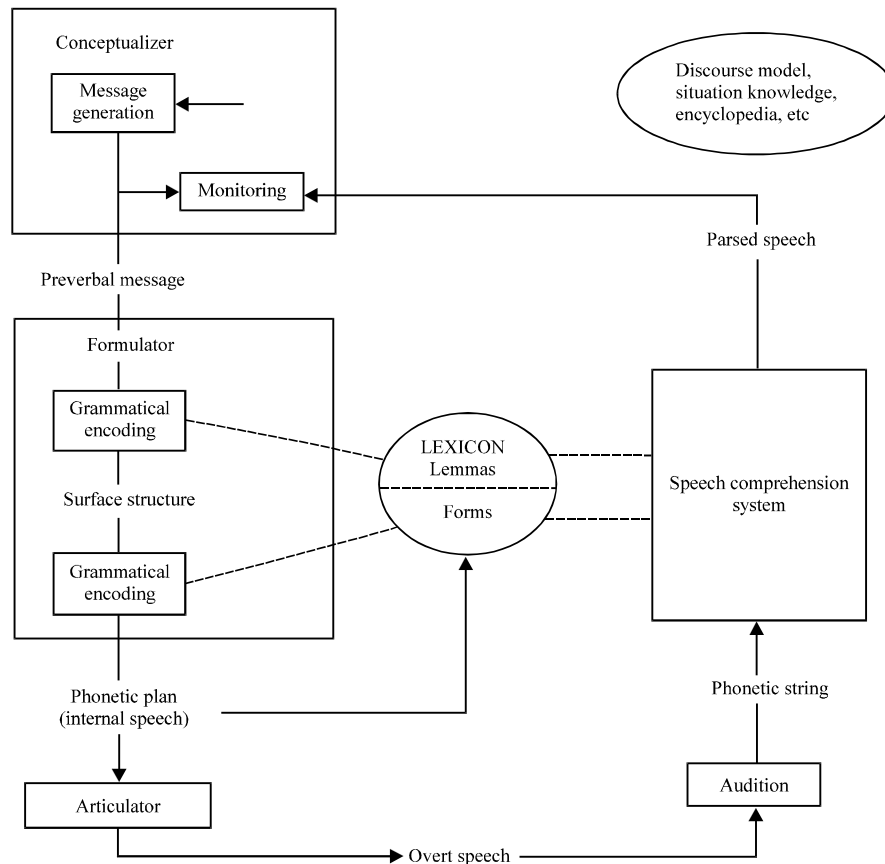


Fig. 2: Levelt's model of language generation (Levelt, 1989)

studies tested Robinson's cognition hypothesis and Skehan's trade-off hypothesis in classroom-based contexts. This section reviews some of the more recent studies on task complexity variables along the resource-directing dimension with different task conditions. The effects these tasks had on oral and written production were assessed based on syntactic complexity, accuracy, fluency and lexical diversity.

A recent study by Vasylets *et al.* (2017) investigated the effects of levels of complexity and mode (written vs. oral) on lexical, syntactic and propositional complexity, accuracy and time on task. The participants were seventy eight Spanish and Catalan ESL students in two universities in Barcelona. They were divided into two groups: an oral group and a writing group. All the participants in both groups engaged in the simple and complex versions of a task (the fire chief task) that were counterbalanced. The oral data were collected from the participants individually while the written data were collected in one group session. Data transcribed from the oral performance and the written essays were analysed for linguistic complexity (mean length of AS

units), propositional complexity, accuracy (total number of errors per 100 words) and time on task. Repeated measures MANOVA was run and results showed that there was significantly higher syntactical and lexical complexity levels produced in the written task compared to the oral task. Results also showed that the complex version of the task produced more sophisticated words, ideas and extended ideas, as opposed to the simple version of the task. Propositional complexity measures found more idea units in the oral data. However, there was a higher ratio of extended ideas in the written essays. There were no significant differences in the accuracy measure for the oral and written tasks in both the complex and simple versions of the task. Finally, the time-on-task scores were higher for the written task which means more time was spent on the written task than the oral task. The researchers concluded that task modality has differential effects on task performance. Also, the different inherent characteristics of the two modes of language production would contribute to L2 learning in unique and complementary ways and teachers and learners should capitalise on these for a balanced approach in language

learning. The study also supported the cognition hypothesis which stipulates that more complex tasks would produce greater complexity levels.

Revesz investigated the effects of using two simple versions and two complex versions of an argumentative task on linguistic output and the frequency and type of learning opportunities that arise as a result of interaction. The participants were forty-three ESL learners in 6 intact classes. Sequence of tasks was counterbalanced to reduce task sequence effects. All classroom interactions were audio-recorded and transcribed. They were then, analysed using speech production measures for linguistic complexity and accuracy and lexical diversity. Interactional measures such as clarification requests, confirmation checks, recasts and metalinguistic talk were also identified. The results indicated that when task complexity was increased, participants produced more lexically diverse and accurate language. Participants were also more likely to show advances in constructions in the more complex task compared to the less complex task. Thus, the researcher argued that enhanced task complexity does not afford less attentional resources to accuracy of language production. Therefore, the results appear to be more compatible with Robinson's cognition hypothesis compared to Skehan's trade-off hypothesis. Results for the interactional measures also showed support for Robinson's cognition hypothesis. There were significantly more Language Related Episodes (LREs) during the enhanced complexity task compared to the less complex tasks.

In a similar vein, Ishikawa (2008) investigated the effects of manipulating intentional reasoning on fluency, complexity and accuracy. The study set out to test whether the complex intentional reasoning task would result in higher accuracy and complexity levels as predicted by Robinson's cognition hypothesis. The participants were twenty-four Japanese students who were either majoring in English or taking English for Academic Purposes (EAP). Each participant underwent the experiment individually with the researcher. Each participant carried out three tasks the simple reasoning task, complex reasoning task and no reasoning task with the order of the tasks counterbalanced using a latin-square design. Fluency was measured using un-pruned and pruned speech rate and disfluency measures. Complexity and accuracy were measured using S-nodes per T-unit, Guiraud 2000 and percentage of error-free T-units. Results of the fluency measure using pruned and un-pruned speech rate measures went against Robinson's cognition hypothesis as the means for the three levels of reasoning tasks showed no significant difference. However, the disfluency measure showed a

significant difference with the highest mean for disfluency recorded by the complex task, thus, confirming the prediction of Robinson's cognition hypothesis. Results also supported Robinson's contention that the complex task would result in greater syntactic complexity as the S-nodes per T-unit measure showed a significant difference of means between the no reasoning task and complexity task with a higher mean score recorded by the complex reasoning task. Similarly, the means for the Guiraud 2000 measure showed that the complex reasoning task produced significantly enhanced lexical complexity as opposed to the no reasoning task which would support Robinson's cognition hypothesis. The accuracy measure also supported Robinson's claims as the complex reasoning task and simple reasoning task produced significantly greater accuracy levels compared to the no complexity task. In short, the results largely support Robinson's cognition hypothesis and increasing task complexity levels would enhance lexical and syntactic complexity in language production.

Task complexity variables were also manipulated by Rahimi and Jun Zhang (2018) who investigated the effects of using a cognitively simple task (which required participants to allocate funding to three competing projects) and a cognitively complex task (which required participants to allocate a larger amount of funding across six competing projects) on argumentative writing performance. The participants were eighty upper intermediate L2 English learners in Iran and they were randomly assigned to four groups. Each group was subjected to a different combination of pre-task planning (absent/present) and cognitive complexity (simple/complex). The participant's written production was measured for complexity using three measures, mean length of clauses, phrasal coordination and T-unit. Accuracy was measured by calculating the ratio of error-free T-units to the total number of T-units and the number of errors per T-unit. Lexical diversity was also measured using the vocd in CLAN computer program, type-to-token ratio and to measure academic vocabulary use, range 32 software was used. To measure fluency, the total number of words produced by each participant was divided by the total number of minutes spent on the writing task. ANOVA and Wilcoxon signed rank tests showed that syntactic complexity was significantly enhanced with the cognitively complex task in pre-task planning condition. This would be in line with Robinson's prediction in his triadic componential framework. Meanwhile, L2 accuracy dropped significantly when task complexity increased in both the pretask and no-pre-task planning conditions. There were no effects on lexical complexity or diversity in any of the groups.

However, the cognitively complex task had a negative effect on writing fluency under both the pre-task and no-pre-task planning conditions. This result would be in support of both Robinson's cognition hypothesis and Skehan's trade-off hypothesis.

The interactional effects of task complexity and L2 proficiency on written performance were the focus of Lee (2018) study. The researcher set out to test the hypothesis in Robinson's cognition hypothesis and Skehan's trade-off hypothesis. The study examined the main and interactional effects of task complexity and L2 proficiency on syntactic complexity, lexical diversity and accuracy in L2 writing. Forty-one EFL learners in a university in South Korea were the participants of the study. Participants carried out a venue task which was manipulated in terms of number of elements. The complex version of the task had many elements in terms of number of locations to choose from, amount of information and requirements needed to be fulfilled. The written output in the form of letters for imaginary hosts were assessed in terms of syntactic complexity based on number of subordinate clauses by total number of T-units. Lexical diversity was measured using Giraud's Index of Richness (1954) and accuracy was measured in terms of the proportion of TLU of articles. Repeated measures ANOVA results showed that there were significant interactional (L2 proficiency x task complexity) effects on lexical diversity and syntactic complexity. More specifically, significantly higher scores were found in the high proficiency groups. The cognitively complex task was found to lead to greater lexical variety in all groups (low, mid and high proficiency), especially, the high proficiency group. However, it also led to lower accuracy in all groups and lower syntactic complexity in the high-proficiency group. The results of this research provided evidence in support of Robinson's cognition hypothesis particularly in terms of lexical diversity.

In the current research, task complexity is operationalised as "here and now" versus "there and then". "Here and now" refers to the use of present references with information available to the learner at the time or speaking or writing and is deemed less cognitively demanding while "there and then" refers to past references for instance when pictures and prompts are taken away from learners and they have to narrate a story in the past tense. This task would make demands on the learner's memory. The task condition for the current study is the absence or presence of pre-task planning. Pre-task activities can be used to introduce topics, present useful vocabulary or target specific language forms (Hawkes,

2015). Planning can help reduce cognitive demands of a task (Foster and Skehan, 1996; Ellis, 2003). Thus, the high-complexity task would require learners to engage in a "there and then" task without pre-task planning and the low complexity task requires learners to engage in a "here and now" task with pre-task planning which includes vocabulary and picture description activities relevant to the tasks.

## MATERIALS AND METHODS

**Research questions:** Due to the mixed-results obtained in the studies on task complexity and to contribute to the body of research in the area, the current study sought to answer the following research question.

Are there significant differences in the mean scores for grammatical accuracy, syntactic complexity and fluency among participants in the high and low complexity groups?

**Participants:** The participants were 65 English as Second Language (ESL) learners of upper-intermediate level who were enrolled in the Education Faculty of a university in Peninsular Malaysia. They were in two intact classes and their ages ranged from 21-25. They were male and female students who spoke Malay or Chinese as a first language and English as a second language. Their proficiency levels were determined by the Malaysia University Entry Test (MUET) which is a national English proficiency test all students have to sit for before entry into Malaysian public universities. All the participants scored band 4 and 5 for the test (upper intermediate).

**Research design and procedures:** A 10 min short film from YouTube was used in this study. The video was in a foreign language (Thai). The participants in the high-complexity group (n = 30) were required to watch the film, and then write a narrative essay based on the film using the past tense. The time given was 30 min. Participants in the low-complexity group (n = 35), engaged in pre-task planning in the form of pictures and exercises related to the film, prior to watching the film (+planning) and they were allowed to write their essays in the present tense (+here and now) as they were watching the short film. They were then also given 30 min to continue writing the essay after watching the short film. A short film was chosen as the task as short films are readily available online and they have the potential of being effective tools for language learning. The video had to be short to help retain learner interest and the content was carefully

**Table 1: Inter-rater reliability**

| Coding categories                           | Percentage agreements | Correlation coefficient (r) |
|---|-----------------------|-----------------------------|
| No. of error-free T-units per total T-units | 82                    | 0.97                        |
| No. of clauses per T-units                  | 80                    | 0.96                        |

chosen to ensure that it is suitable for the participant’s age-range and interest and to ensure that it does not contain any offensive language or provocative and inappropriate images and actions.

**Measures for rating the narrative essays:** The narrative essays were rated for grammatical accuracy, syntactic complexity and fluency. Grammatical accuracy was measured using the proportion of error free T-units to T-units. A T-unit is often but not always a sentence as it is “a main clause plus any other clauses which are dependent on it” (Foster *et al.*, 2000). Syntactic complexity was measured using the average number of clauses per T-unit. Finally, fluency was measured using the mean number of words produced per minute of the total time spent on task.

**Reliability of data:** To ensure inter-rater reliability of the data, 30% or 20 of the total scripts were subjected to inter-rater scoring. The scores from the researcher and the second rater were entered into SPSS. Using the bivariate correlations option in SPSS, the data were analysed and the Pearson correlation coefficients were produced. Table 1 shows the reliability percentage and correlation coefficients for the continuous data which included the number of error-free T-units per total T-units (grammatical accuracy score) and the number of clauses per T-unit (syntactic complexity score).

The results in Table 1 show high correlations for both measurements of accuracy ( $r = 0.97$ ) and syntactic complexity ( $r = 0.96$ ). This would indicate high reliability of the data.

**RESULTS AND DISCUSSION**

Descriptive and inferential statistical analyses were run using SPSS. Results of the descriptive statistics are shown in Table 2.

Table 2 shows that the high-complexity group obtained higher mean scores for syntactic complexity and fluency, compared to the low-complexity group. However, the low-complexity group achieved a higher mean score for accuracy compared to the high-complexity group. This would indicate that the participants found that directing their attentional resources to producing a narrative essay with higher levels of syntactic complexity and greater

fluency resulted in less attention given to grammatical accuracy. This would be compatible with Skehan’s trade-off hypothesis which hypothesised that accuracy, complexity and fluency will be in competition with each other in a cognitively complex task. Thus, certain aspects, such as accuracy, would not be prioritised.

T-tests were run to determine whether levels of task complexity would have a significant effect on accuracy, complexity and fluency. Table 3 shows the results of the t-tests.

Table 3 shows that there is a statistically significant difference ( $p < 0.05$ ) in the mean scores for grammatical accuracy, syntactic complexity and fluency between the high and low-complexity groups.

The study intended to investigate the effects of manipulating a task complexity variable (here and now) and a task condition (pre-task planning) on narrative writing performance. The results of the study indicated that the high complexity task with the use of there-and then and the absence of pre-task planning resulted in significantly higher syntactic complexity levels and greater fluency in the narrative writing production. This would be in line with Robinson’s predictions in his cognition hypothesis that more complex tasks would result in heightened attention to syntactic complexity. However, results of the accuracy measure is more compatible with Skehan’s trade-off hypothesis as the low-complexity group achieved a significantly higher mean score compared to the high-complexity group. As the task demands greater amounts of attention from the learners, accuracy suffers as greater attention was given to complexity and fluency. Skehan (1998, 2009) suggested that decreasing task demands would free attention from procedural demands, thus, allowing more attention to accurate language use. Thus, in terms of theoretical implications, this study lends partial support to both Robinson’s cognition hypothesis and Skehan’s trade-off hypothesis. The research hypothesis of the current study that predicts that the more complex task would result in significantly greater accuracy and syntactic complexity in writing performance compared to the less complex task was proven to be partially true with a significantly higher syntactic complexity mean score recorded for the syntactic complexity measure in the high-complexity group.

Table 2: Descriptive statistics for accuracy, complexity and fluency scores

|                   |    | Measures for writing performance |      |            |      |         |      |
|-------------------|----|----------------------------------|------|------------|------|---------|------|
|                   |    | Accuracy                         |      | Complexity |      | Fluency |      |
| Variables         | N  | M                                | SD   | M          | SD   | M       | SD   |
| High-c-complexity | 30 | 0.42                             | 0.25 | 1.46       | 0.15 | 15.46   | 4.22 |
| Low-complexity    | 35 | 0.56                             | 0.21 | 1.39       | 0.18 | 11.88   | 2.92 |

Table 3: T-test results for accuracy, complexity and fluency

| Variables       | Accuracy |    |         | Complexity |    |         | Fluency  |    |         |
|-----------------|----------|----|---------|------------|----|---------|----------|----|---------|
|                 | t-values | df | p-value | t-values   | df | p-value | t-values | df | p-value |
| High-complexity | 9.30     | 29 | 0.00    | 54.11      | 29 | 0.00    | 20.09    | 29 | 0.00    |
| Low-complexity  | 15.61    | 34 |         | 46.79      | 34 |         | 24.06    | 34 |         |

\*p<0.05

### CONCLUSION

This study also has pedagogical implications. Readily available materials online such as short films could be manipulated in terms of task complexity levels and task conditions to suit different levels of learners and achieve different purposes to optimise learning. An understanding of how different levels of task complexity and different task conditions affect language performance could help teachers, curriculum developers and textbook writers to design tasks for effective use in the ESL classroom. Teachers can include pre-task activities that would familiarize learners with the content of the task or language required for successful task completion. The current study shows that pre-task planning in the form of vocabulary exercises and describing pictures relevant to the short film to be viewed helped learners in terms of fluency and accuracy of their narrative writing, compared to the group of learners that did not engage in pre-task planning activities.

As in any classroom-based research with intact groups, the current study has several limitations. Though there is homogeneity among the two groups in the study in terms of language proficiency, there might be other learner factors that could act as extraneous variables that could potentially affect the results of the study. It would be suggested that future studies adopt a counter-balanced design. Also, due to the absence of random sampling, the results of the study could not be generalized to the population of ESL learners. Nonetheless, the study does provide some insights into the effects of manipulating task complexity variables and pre-task planning conditions on writing performance. Future research could investigate the main and interaction effects of various task complexity variables and task conditions on ESL learner’s speaking and writing

performance. Also, as suggested by Birjandi and Ahangari (2008), categories of analysis of language production could go beyond complexity, accuracy and fluency and be extended to discursal feature, lexical selection and collocations of speech. Further studies on the area of task complexity variables and task conditions could help contribute to the body of knowledge on factors and considerations for a task-based syllabus and pedagogical practices in a task-based syllabus.

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