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# THE EFFECT OF TASK COMPLEXITY ON WRITING PRODUCTION

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**Abstract**

Task-based language teaching (TBLT) and learning is a growing area in SLA research. It has gained its rightful place in language teaching. TBLT suggests sequencing tasks from simple to complex in order to design a syllabus. However; research on the effects of task-complexity on written productions is rare. This study intends to examine the effects of manipulating task complexity along resource-directing factors and resource-dispersing ones on L2 learners' written performance. To attain this aim, we collected academic writings from 44 first year students of English at the University of Oum El Bouaghi that participated in a repeated measures experiment. The written data were measured in terms of fluency, accuracy, and complexity. A one-way ANOVA test was used for statistical analysis. We found that task complexity affects students' writing fluency and accuracy, but it does not affect their syntactic complexity.

**Keywords:** task complexity, academic writing, fluency, accuracy, complexity

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**Résumé**

L'enseignement et l'apprentissage des langues basé sur les tâches est un domaine en pleine croissance. Il suggère de séquencer les tâches du plus simple au plus complexe. Les recherches sur les effets que la complexité des tâches a sur les productions écrites sont rares. Alors, cette étude vise à examiner les effets de la manipulation de la complexité des tâches sur les performances écrites des apprenants de L2. Pour atteindre cet objectif, nous avons rassemblé des écrits de 44 étudiants d'anglais de première année à l'Université d'Oum El Bouaghi qui ont participé à une expérience de mesures répétées. Les données écrites ont été mesurées en termes d'aisance, de précision et de complexité. Un test ANOVA unidirectionnel a été utilisé pour l'analyse statistique. Nous avons constaté que la complexité des tâches affecte la fluidité et la précision de l'écriture, mais pas la complexité syntaxique.

**Mots clés:** mot clé 1; mot clé 2; mot clé 3; mot clé 4 ;mot clé 5.

**ملخص**

يمثل تدريس اللغة والتعلم القائم على المهام مجالاً للبحث دائم التطور. هذا المجال يقترح تسلسل المهام من البسيط إلى المعقد من أجل تصميم المنهج الدراسي. ومع ذلك فإن البحث عن آثار تعقيد المهام على الكتابة نادر. تهدف هذه الدراسة إلى التحقيق في آثار معالجة تعقيد المهام على الأداء الكتابي للمتعلمين. لتحقيق هذا الهدف ، جمعنا كتابات أكاديمية من 44 طالبًا من طلاب السنة الأولى في اللغة الإنجليزية بجامعة أم البواقي الذين شاركوا في التجربة. تم تقييم البيانات المكتوبة من حيث الطلاقة والدقة والتعقيد. تم استخدام اختبار ANOVA أحادي الاتجاه للتحليل الإحصائي. لقد وجدنا أن تعقيد المهام يؤثر على طلاقة ودقة كتابة الطلاب ، لكنه لا يؤثر على تعقيدها في بناء الجملة.

**الكلمات المفتاحية:** تعقيد المهام؛ الكتابة الأكاديمية؛ الطلاقة؛ الدقة؛ التعقيد النحوي.

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# 1- Introduction

Task Based Language Teaching (TBLT) is a language teaching approach that uses tasks as its basic units and means for syllabus design, lesson planning and second language research and instruction (Richards & Rodgers, 2001, p. 223). In TBLT, where tasks are sequenced from simple to complex in order to design an analytical syllabus, task complexity affects learners' performance. The rationale behind such supposition is that learners adapt their language to the task cognitive and conceptual demands, i.e., progressively complex tasks incite learners to develop more complex interlanguage (Baralt, Gilabert, & Robinson, 2014, p. 2).

Whether composing an essay for an exam or writing an academic paper, learners are typically asked to integrate information from different sources into their pieces of writing. This type of writing might be daunting and complex for learners, especially those in their first and second year. However, it is a vital skill for academic success. While little research has been investigating the effect of task complexity on writing, less research investigates writing as mediated by reading (Kellogg, 1994).

Based on the assumptions above, the primary research question addressed for this study concerns whether task complexity affects L2 writing performance as mediated by reading. This question is based on the hypothesis that L2 writing performance might be constrained by the increase in task complexity along planning time and the number of elements. Therefore, a repeated measures experiment has been conducted on a sample of 44 first year English students at the University of Oum El Bouaghi.

## I.1. Task Complexity

Task complexity is defined by Robinson (2001, p. 28) as "the result of the attentional, memory, reasoning, and other information processing demands imposed by the structure of the task on the language learner. These differences in information-processing demands, resulting from design characteristics, are relatively fixed and invariant". A large variety of models that estimate task complexity exist in the literature. One of the first of these models is, according to Baralt et al (2014), Prabhu's (1987), which states that tasks should be sequenced by complexity or "reasonable challenge". A succession of models have followed Prabhu's (1987) and emphasised different dimensions in tasks used to define complexity. The two most prominent ones are Skehan and Foster's (2001) model and Robinson's (2001).

The two models agree that the learners' attention is, in one way or another, limited; therefore, any increase in task complexity will induce them to pay attention to L2 meaning first, and this will have a negative effect on their linguistic production. However, opposite to Skehan (2014), Robinson (2001) claims that more complex tasks result in more complex language, for they help learners control their attention. Furthermore, Robinson's (2001) model makes different predictions about different complexity variables depending on the way they influence attention, and it takes the learners' differences as a separate category that influences L2 learning and performance when manipulating task complexity (Kuiken & Vedder, 2007, p. 263-266). This model of task complexity is the one of interest to the present study.

### I.1.1. Robinson's Triadic Componential Framework

Robinson's (2001) Triadic Componential Framework is a remarkably detailed task design model that distinguishes between three categories which are task complexity, task condition, and task difficulty. These categories comprise thirty-six different variables. Task complexity consists of resource-directing variables that affect interlanguage development and resource-dispersing variables which affect learners' performance. The task condition category involves participant variables that affect interaction. The variables of these two categories can be manipulated while those of task difficulty can be respected to design and sequence tasks. The TCF is sophisticated and advanced for it considers learners' differences under the category of task difficulty

and aims at learner-task matching so as to promote learning (Robison, 2001, 2003, 2005, 2007).

The 'resource-directing' dimensions and the 'resource-dispersing' ones predict how L2 production and development may be affected (Robinson, 2011, p. xii). The formers are the variables "in which the demands on language use made by increases in task complexity can be met by specific aspects of the linguistic system" (Robinson, 2011, p. 57). In other words, they are dimensions (also called developmental variables) that direct the learner's attention and analytical ability towards a specific form of language (e.g. number of elements, reasoning demands), and they are claimed to foster language acquisition. The resource-dispersing dimensions form the second category of variables (also called performance variables). They are those dividing the learner's attention between the linguistic aspects of the task and its other components. When manipulated, they increase the learner's control over their L2 repertoire, which means that they do not influence learning but affect task performance (e.g. less planning time or familiarity of task or topic). These variables disperses learners' attentional and memory resources (Robinson, 2003, pp. 46-47). For this study, the variables of choice are few vs. many elements as far as resource-directing dimensions are concerned and planning time as a resource-dispersing variable.

Table 1

*The Triadic Componential Framework*

| Task Complexity | Task Condition | Task Difficulty |
|---|---|---|
| a) Resource-directing variables | a) Participation variables | a) Ability variables |
| +/− here and now | +/− open solution | h/l working memory |
| +/− few elements | +/− one-way flow | h/l reasoning |
| −/+ spatial reasoning | +/− convergent solution | h/l task-switching |
| −/+ causal reasoning | +/− few participants | h/l aptitude |
| −/+ intentional reasoning | +/− few contributions needed | h/l field independence |
| −/+ perspective-taking | +/− negotiation not needed | h/l mind/intention-reading |
| b) Resource-dispersing variables | b) Participant variables | b) Affective variables |
| +/− planning time | +/− same proficiency | h/l openness to experience |
| +/− single task | +/− same gender | h/l control of emotion |
| +/− task structure | +/− familiar | h/l task motivation |
| +/− few steps | +/− shared content knowledge | h/l processing anxiety |
| +/− independency of steps | +/− equal status and role | h/l willingness to communicate |
| +/− prior knowledge | +/− shared cultural knowledge | h/l self-efficacy |

*Note*. Adapted from Robinson and Gilabert (2007, p. 164)

### I.1.2. Planning Time

Task planning or planning time is a resource-dispersing variable from Robinson's (2001) TCF. It is a TBLT concept and a procedure that allows learners time to prepare for the task and monitor their production (Ellis, 2005). According to Skehan (1998), the human mind has two linguistic knowledge systems one is rule-based and the other is exemplar-based. These two systems work simultaneously, need and complete each other. The rule-based knowledge system is responsible for innovations in linguistic production based on the grammatical rules. Using this system requires language processing and analysis from learners which makes it cognitively demanding and may cause some lack of fluency, for learners concentrate more on creating new language. On the other hand, the exemplar-based knowledge system is responsible for storing and retrieving a set of lexical items and formulaic chunks of language. It is not

very cognitively demanding to use it, for it includes no linguistic processing or analysis. This system is accountable for learners' fluency, but using it solely may cause a lack of accuracy and complexity in language production. The existence of these two systems explains the importance of planning time in minimizing the cognitive load for learners. When they are asked to produce immediate language, they naturally draw upon the less demanding exemplar-based system. However, when given time, learners also use the rule-based system which results ultimately in more fluent, accurate and complex language.

### I.1.3. Number of Elements

The number of elements is "the number of task-specific items a speaker has dealt with simultaneously during task performance" (Levkina & Gilabert, 2012, p.177). Some examples of these task-specific items might be the number of characters in a narrative or the number of places chosen from when showing a given destination to a friend (Robinson, 2001). According to Robinson (2003), increasing task complexity along such a resource-directing variable leads to more complex and more accurate language but, nonetheless, causes deficient fluency. These predictions are based on the rationale that burdening the learner's cognition has the power of influencing their L2 complexity and accuracy by drawing their attention to form. In simple words, increasing task complexity via the number of elements as a resource-directing dimension results in good performance of this task, for learners put all their focus to meet the challenge. The predictions of the Cognition Hypothesis are not always confirmed by experiments, as argued by Levkina and Gilabert (2012), for many other specifications and variables may interfere, like the relationship between different elements of a task or learners' different levels of proficiency and cognitive abilities.

## I.2. Academic Writing

Flower and Hayes (1981) established a model of writing processes which is the planning-writing-reviewing framework in which writing is defined as a "non-linear, exploratory and generative process whereby writers discover and reformulate their ideas as they attempt to approximate meaning" (Zamel, 1983; as cited in Hyland, 2003, p.11). This writing model emphasizes the cognitive processes that learners engage in rather than their creativity. It approaches writing as a problem solving process in which writers use their intellect to deal with the task complexity.

Writing is decisive for the learners' academic success. According to Murray and Moore (2006), not learning to write is opting for "an academic half-life in which one's legitimate scholarly voice has not been sufficiently exercised or respected" (p. 4). In academia, writing is never writing per se. Academic writing consists mostly in language transforming, for it relies on reading one or multiple texts composed by others and making organizational selective or connective alterations. Before proceeding into generating a text, learners have first to identify whether cultural, linguistic and thematic knowledge is available in memory. It is then automatically activated by the cues provided by the writing task. After that, they have to find meaning in what is new and show understanding. Next, learners have to analyse the text by breaking the concepts into pieces to inspect them and see how they fit together. Finally, they have to interpret what has been read or learned via summarizing, paraphrasing or synthesising it (Irvin, 2010).

Summary writing involves the processes of comprehension, evaluation, condensation, and transformation of ideas. Summarising is described by (Guido & Colwell, 1987) as an invaluable type of integrated writing tasks that is required in academic settings. The ability to summarise in an L2 reflects good understanding, and thus it is closely related to successful learning and communication (Yu, 2008). According to (Johnson, 1983, p. 473), summarising is the task of writing "a brief statement that represents the condensation of information accessible to a subject and reflects the gist of the discourse". It involves condensing the substantial information in one's own words and respecting the overall meaning.

Summarising benefits language learners in so many ways, but most importantly, it helps developing the ability to restructure texts at a morphological, syntactic, and lexical level. It is, however, important to note that low level learners opt for lexical restructuring by using synonyms, for they do not have the tools to understand an L2 text and properly summarise it (Newfields, 2001). Thus, we can claim that high level proficiency reveals itself better at the level of syntactic complexity.

Synthesis or writing from different sources is a task that is common in academia and used for many purposes like writing literature reviews or research papers. It requires the selection, organization, and connection of content from multiple sources to generate a new text using different words (Spivey, 1997). Synthesising is a reading-to-write task in that it involves both reading and writing. When compared to summarisation, discourse synthesis has been neglected by research until the early 1990s (Segev-Miller, 2007).

Synthesising is similar to summarisation in process but different in cognitive load. While, in summaries, learners construct their propositions from one text, they construct them from different sources when synthesising. These sources might go as far as being contradicting each other in concepts and textual structures. Therefore, when summarising, learners are asked to build a text that is much closer to the original text as compared to the one built when synthesising. Learners base their summaries on intra-textual connection and their synthesis on intertextual connections. Building the latters is much more cognitively demanding (Segev-Miller, 2007).

In this study, we consider summary writing as the simple version of a synthesis task. It is the starting point of a continuum in rhetorical transforming strategies that increase in cognitive demands to reach synthesis writing as the end of this continuum (Ascension Delaney, 2008). The number of texts as task elements is the complexity variable we hypothesise to be involved in this study, and it is what we use to categorise summaries as simple tasks and syntheses as complex ones disposed to be more complex depending on the number of source texts involved.

### I.3. Research Questions and Hypotheses

We presented TBLT as a general framework for our **study** and delved into task complexity as a criterion for sequencing tasks. We based our arguments on both theory and empirical findings that support the Cognition Hypothesis and operationalized them by choosing planning time and the number of elements as the complexity variables. The two variables belong respectively to resource-dispersing and resource-directing dimensions which have different effects on learners' L2 production (Gilabert, 2005). These two kinds of dimensions have rarely been investigated in combination. In this respect, our study tries to fill in this gap and examines the effects of the combined effect of two different dimensions of task complexity on L2 written production. Therefore, our research aims at answering the two following questions:

Does increasing task complexity along planning time and the number of elements affect learners' L2 writing as measured by fluency, accuracy and syntactic complexity?

Based on the literature review, we hypothesise that task complexity may affect learners' performance on writing tasks which are mediated by background information from a reading text.

From this hypothesis, we can derive three sub-hypotheses:

$H_1$: There is a significant effect of task complexity on students' writing fluency, as measured by the number of words per T-unit.

$H_2$: There is a significant effect of task complexity on students' writing accuracy, as measured by the number of errors in syntax, morphology, and lexical choice per T-unit.

$H_3$: There is a significant effect of task complexity on students' writing complexity, as measured by the mean number of clauses per T-unit.

## II – Methods and Materials:

### II.1. Population and Sampling

The population of interest to our research is composed of the first year students at the Department of English at the University of OEB. The first year LMD student

body enrolled during the academic year of 2017-2018 consists of 290 students divided into eight groups. A sample of **44** students was chosen from the already formed by the administration groups. Randomly chosen participants from groups 6 and 8 constitute our sample of the accessible subjects (Mackey & Gass, 2005).

## II.2. Data Collection

The repeated measures design also called the within-group design is an experimental research design in which participants are given all the tasks or treatments in different orders. Tasks or treatments refer to levels of the same independent variable, which was task complexity in this case. The multiple measurements in this kind of design come from each participant which reduces the error variance resulting from individual differences (Mackey & Gass, 2005).

### II.2.1. The Writing Tasks

The tasks for the first experiment consisted of different versions of the same task which was a reading-to-write task. The change between the different versions entailed changing the level of complexity by increasing or decreasing the amount of planning time and the number of elements, i.e., the number of texts a participant was asked to respond to.

#### A. Task Type

In the different levels of our reading-to-write tasks (see Appendix 2), students were asked to write a summary of one text in the simple version with enough planning time, and a synthesis of two texts in the complex version with no planning time. The medium versions of this task consisted of one task in which learners were given just one text to summarise but no planning time and another task in which they were given planning time and two texts to synthesise. The description of the different levels of this task is demonstrated in the following table:

Table 2

*Description of the Different Levels of Reading-to-Write Tasks*

| Version of the task | Planning time | Number of elements |
|---|---|---|
| Simple version | + planning time | One text |
| Medium version 1 | - planning time | One text |
| Medium version 2 | + planning time | Two texts |
| Complex version | - planning time | Two texts |

#### B. Task Topics

The texts for this experiment were taken from the different IELTS practice books for students. The International English Language Testing System or the IELTS is an international proficiency test developed for non-native speakers, and it has been used since 1989. It is based on authentic texts and real life scenarios (Hosseini, Taghizadeh, Abedin & Naseri, 2013). Learners' familiarity with the topic of the text is a variable that accounts for the complexity of the task. To control this variable, we had to choose topics that are familiar to the largest possible number of students. Therefore, we used a familiarity test (see Appendix 1) that measured topic familiarity. We administered it to a randomly chosen first year group of students (of the same level as the experimental groups). The test was adapted from a study conducted by Combs (2008), in which he investigated the effects of topic familiarity and text enhancement on students' acquisition of form in a reading text. The participants in the test were 42 first year students of English at the University of Oum El Bouaghi. It took them five to ten minutes to complete the test. Its aim was to measure the students' familiarity with 11 of the most prominent topics occurring in different IELTS practice books for students.

The results of students' rankings of the topic familiarity on a five-point Likert scale and the percentages of those rankings are reported in Table 3. To determine which topic was the most familiar, we counted the means ($\bar{X}$) for each answer choice. The answer choice with the largest average ranking is the most familiar topic.

Table 3
*Students' ranking of topic familiarity*

| | The five-point Likert scale | | | | | | |
|---|---|---|---|---|---|---|---|
| Topic | 5 | 4 | 3 | 2 | 1 | N | $\bar{X}$ |
| The zoo protects animals | 22 | 5 | 7 | 3 | 5 | 42 | 3.714 |
| Women vs, men in jobs | 19 | 10 | 8 | 2 | 3 | 42 | 3.952 |
| The Titanic | 15 | 8 | 11 | 1 | 7 | 42 | 2.83 |
| The scientific method of research | 4 | 6 | 12 | 4 | 16 | 42 | 2.476 |
| Succeeding at interviews | 6 | 7 | 9 | 12 | 8 | 42 | 2.786 |
| Stepwells | 0 | 2 | 6 | 13 | 21 | 42 | 1.738 |
| The psychology of innovation | 0 | 2 | 4 | 17 | 19 | 42 | 1.738 |
| Museums of fine arts and their public | 0 | 5 | 7 | 13 | 17 | 42 | 2 |
| The context, meaning and scope tourism | 0 | 0 | 2 | 14 | 26 | 42 | 1.428 |
| The megafires of California | 0 | 0 | 0 | 3 | 39 | 42 | 1.071 |
| Second nature | 2 | 3 | 5 | 8 | 24 | 42 | 1.833 |

According to the results on Table 3, respondents chose 'Women vs, men in jobs' to be the most familiar topic to them giving it the highest mean (3.952) and claiming, therefore, to know almost everything about it. On the other hand, 'The megafires of California' was the topic they admitted to be least familiar with ($\bar{X}$=1.071). The table shows that the decreasing order of familiarity of the chosen topics is as it follows: 'Women vs, men in jobs', 'Zoo protects animals', 'The Titanic', 'Succeeding at interviews', 'The scientific method of research', 'Museums of fine arts and their public', 'Second nature', 'Stepwells', 'The psychology of innovation', 'The context, meaning and scope tourism', and finally 'The megafires of California'. Accordingly, we have chosen the first three topics with which students are the most familiar to work with.

## C. Readability

According to Klare (1963; as cited in Dubay, 2007, p. 5), readability is: "the ease of understanding or comprehension due to the style of writing." It is also defined as "the ease of reading created by the choice of content, style, design, and organization that fit the prior knowledge, reading skill, interest, and motivation of the audience" (Dubay, 2007, p. 6). Readability is another variable that creates complexity. We tested the texts we used in this study using an on-line readability analyser software ("Readability Analyzer", 2018) and estimated it by the Flesch reading measure formula (1948, as cited in Dubay, 2007). In our study, we focused on words and sentences as elements of style. This is why we used the Flesch tool which determines the reading ease of the text by counting the number of syllables and sentence lengths. Higher scores indicate more easiness to read; lower scores indicate difficulty (Pearson, Barr & Kamil, 1996). The results of readability test are summarised in the following table:

Table 4
*Readability of the Texts for the First Experiment*

| Text | Readability | Flesch-Kincaid Grade Level |
|---|---|---|
| The zoo protects animals | 52.98 | 7.4 |
| Women vs men in job recruitment 1 | 63.06 | 6.36 |

| | | |
|---|---|---|
| Women vs men in jobs recruitment 2 | 60.5 | 6.85 |
| The Titanic 1 | 66.42 | 5.98 |
| The Titanic 2 | 67.18 | 6.05 |

## II.3. Procedure

### II.3.1. Tasks

#### A. The Simple Version

In this simple version of the task, the 44 participants were asked to write a summary of one text (The zoo protects animals). In the pre-task stage, students were introduced to the framework of the writing task through engaging them in revising the steps of writing a summary. In the during-task, participants received the reading text, of which the topic was about the zoo protecting animals, which was estimated common to tackle according to the familiarity questionnaire. This stage was followed by the learners' summaries. In the post-task stage, participants read their pieces and received feedback from their peers and from the teacher. They were given adequate planning time.

#### B. Medium Version 1

In the first medium version of the task, the students were asked to write a summary of a text about the differences between women and men in job recruitment task. Students were given one reading text directly and were asked to write a summary without any time for planning. In the post-task stage, students read their pieces and received feedback.

#### C. Medium version 2

For the second medium version of the task, the participants were asked to synthesis two texts about the differences between men and women in recruitment. The first text was the same given in the second task, and it was an excerpt taken from a long text in the Cambridge IELTS practice book for students (2011). The second text was another excerpt taken from the same text. Its readability was estimated by the Flesch reading measure formula to be 60.5 points, which can be read by the average student in the 6th and 7th grade level.

Participants were first introduced to the framework of the synthesising task through revising its steps in the pre-task stage. They were given adequate planning time. In the during-task, they were given the reading texts. In the post-reading, participants read their pieces and received feedback.

#### D. Complex Version

In the complex version of the task, we asked students to write a synthesis of two texts without any planning time. The topic of the two texts was about the reasons of Titanic sinking. The two were excerpts taken from a text. Students received the reading texts and were asked to synthesise them. This stage was followed by the learners writing their syntheses. After that participants read their pieces and received feedback.

### II.3.2. Measures

In order to assess the fluency, accuracy and complexity of the learners' summaries, we used three measures. The first measure was the number of words per T-unit, where T-unit is the minimal terminable unit that contains an independent clause and its dependent clauses. This measuring tool is used for writing fluency. The second measure, or the accuracy measure, was the ratio of errors to the total number of words. All errors which were syntactic, morphological, and lexical were carefully examined. We disregarded errors that are of spelling and punctuation. The third measure assessing

syntactic complexity is the mean number of clauses per T-unit (Housen & Kuiken, 2009). Lu's (2010) computational system for automatic analysis of L2 writing (L2SCA) was used to measure syntactic complexity ("Web-based L2 Syntactic Complexity Analyzer", 2018).

## III. Results

### III.1.The descriptive statistics

Table 5 displays the descriptive statistics (means: $\bar{X}$ and standard deviations: SD) for the participants to get a first-impression about the impact of manipulating task complexity on students' writing production.

Table 5

*Descriptive Statistics on Students' Performance in the Four Tasks*

| Tasks | Fluency(N=44) | | Accuracy(N=44) | | Complexity(N=44) | |
|---|---|---|---|---|---|---|
| | $\bar{X}$ | SD | $\bar{X}$ | SD | $\bar{X}$ | SD |
| Simple version | 16.07 | 9.372 | 1.551 | 1.327 | 1.959 | 1.151 |
| Medium version 1 | 20.869 | 11.293 | 1.174 | 1.163 | 2.382 | 2.099 |
| Medium version 2 | 18.003 | 7.625 | 1.015 | 0.429 | 1.824 | 0.522 |
| Complex version | 16.217 | 4.17 | 1.137 | 0.649 | 1.742 | 0.446 |

The results of the descriptive analyses show that the participants produced more fluent (20.8694) language in the medium version 1 of the task than they did in the simple version (16.07). When provided with less planning time, students produced more language but with considerable variation in the scores (11.293). However, this did not happen with the more complex versions of the task. In the medium version 2 where students were given planning time and two texts to synthesise, they were less fluent (18.003); and they were even lesser fluent in the complex version (16.217). As for accuracy, participants performed their best in the medium version 2 (1.015) of the task and their worst in the simple version (1.551). They performed less poorly in the most complex task (1.137). On another hand, the complexity scores of the second version (2.382) were the highest with a great variation (2.099), and those of the complex version were the lowest (1.742). It is noticed that learners' performance declines when the task is most complex and so did the differences between learners' scores.

The descriptive statistics comparing the means of fluency, accuracy and complexity in the four tasks show significant differences among students' performances. To infer the significance of those results and test our hypothesis, inferential statistics (ANOVA) had to be conducted.

### III.2. Inferential Statistics

A repeated measure one-way ANOVA (Jackson, 2014) was conducted to investigate whether the differences between the scores as detected by the preliminary analysis were statistically significant. The F-ratio is formed by dividing the between-tasks variance by the within-tasks variance. Consequently; an F-ratio that is greater than 1 indicates effect. We have also chosen statistical significance (p) of 5% means that the observed difference between statistical results (such as means) is unlikely to have occurred by chance at a level of confidence of 95%.

#### A. The Effect on Fluency

To investigate whether the differences between the measures of fluency for all students were significant, a one-way ANOVA for treatment type was performed. Fluency was measured for the four tasks of different complexity levels. This showed significant effect for the treatment type (F-ratio value is 3.389. The p-value is 0.0201 which is significant at $p < 0.05$) suggesting that one or more treatments are significantly

different. A post-hoc test (Jackson, 2014) would likely identify which of the pairs of treatments are significantly different.

- **The Post-Hoc Test**

We chose to use the Tukey's honestly significant difference (HSD) test. This test compares each of the groups in the study to each of the other groups and identifies the smallest difference between any two means (Jackson, 2014). It "allows a researcher to make all pairwise comparisons among the sample means in a study while maintaining an acceptable alpha (usually 0.05, but possibly 0.01)" (Jackson, 2014, p.235).

Table 6
*Results of the Tukey HSD Test for Fluency*

| Treatments Pair | Tukey HSD Q statistic | Tukey HSD p-value | Tukey HSD Inferfence |
|---|---|---|---|
| Task 1 vs 2 | 3.733 | 0.0445 | * p<0.05 |
| Task 1 vs 3 | 1.326 | 0.7594 | insignificant |
| Task 1 vs 4 | 0.114 | 0.8999 | insignificant |
| Task 2 vs 3 | 2.406 | 0.3259 | insignificant |
| Task 2 vs 4 | 3.618 | 0.0547 | insignificant |
| Task 3 vs 4 | 1.212 | 0.8045 | insignificant |

We have, therefore, been able to prove the hypothesis $H_1$ and reject the null hypothesis $H_0$:
$H_1$: There is a significant effect of task complexity on students' writing fluency.
$H_0$: There is no significant effect of task complexity on students' writing fluency.

The effect, in our case, lies mostly between the simple version of the task and the medium version where students had no planning time and one text to summarise.

## B. The Effect on Accuracy

A one-way ANOVA for treatment type was performed to examine whether the differences between the measures of accuracy for all students for the four tasks of different complexity were significant. The statistical calculations showed that the effect is not significant for the accuracy measure (F-ratio value is. 2.6406 while the p-value is 0.05222 which is not significant at $p < .05$). However, this does not mean that all treatments are not significantly different. Therefore, we chose to do a post-hoc test in order to identify which of the pairs of task results are significantly different.

- **The Post-Hoc Test**

We chose to use the Tukey's honestly significant difference (HSD) test for the accuracy measure too so as to compare the sample accuracy means.

Table 7
*Results of the Tukey HSD Test for Accuracy*

| Treatments Pair | Tukey HSD Q statistic | Tukey HSD p-value | Tukey HSD Inferfence |
|---|---|---|---|
| Task 1 vs 2 | 2.589 | 0.263 | insignificant |
| Task 1 vs 3 | 3.688 | 0.048 | * p<0.05 |
| Task 1 vs 4 | 2.844 | 0.188 | insignificant |
| Task 2 vs 3 | 1.099 | 0.849 | insignificant |
| Task 2 vs 4 | 0.255 | 0.899 | insignificant |
| Task 3 vs 4 | 0.844 | 0.899 | insignificant |

We have, therefore, been able to prove the hypothesis and reject the null hypothesis $H_0$:
$H_2$: There is a significant effect of task complexity on students' writing accuracy.
$H_0$: There is no significant effect of task complexity on students' writing accuracy.

The effect, in our case, lies mostly between the simple version of the task and the medium version where students had planning time and two texts to synthesise (p-value is 0.048).

### C. The Effect on Complexity

The differences between participants' measures of writing performance in the four tasks were examined using a one-way ANOVA for treatment type to prove they were significant. The statistical calculations revealed that the effect is not significant (F-ratio value is 2.35722 while the p-value is 0.07478 which is insignificant at $p < 0.05$). Like for accuracy, we chose to run a post-hoc test to prove that not all treatments are insignificant and identify which of the pairs of treatments are significantly different.

- **The Post-Hoc Test**

We used the Tukey's honestly significant difference (HSD) test which compares each of the groups in the study to each of the other groups.

Table 8
*Results of the Tukey HSD Test for Complexity*

| Treatments Pair | Tukey HSD Q statistic | Tukey HSD p-value | Tukey HSD inferfence |
|---|---|---|---|
| Task 1 vs 2 | 2.251 | 0.387 | insignificant |
| Task 1 vs 3 | 0.719 | 0.899 | insignificant |
| Task 1 vs 4 | 1.156 | 0.826 | insignificant |
| Task 2 vs 3 | 2.970 | 0.157 | insignificant |
| Task 2 vs 4 | 3.407 | 0.079 | insignificant |
| Task 2 vs 4 | 0.437 | 0.899 | insignificant |

We have, therefore, not been able to prove the hypothesis:
$H_3$: There is a significant effect of task complexity on students' writing complexity.
Instead we proved the null hypothesis:
$H_0$: There is no significant effect of task complexity on students' writing complexity.

## VI. Discussion:

After conducting a repeated measures experiment, we found that task complexity affects students' writing fluency and accuracy, but it does not affect their syntactic complexity. Our findings firstly suggest that task complexity as manipulated through planning time and the number of texts which learners have to process affects students' writing fluency as measured by the mean length of T-units. This effect was mostly apparent in the simplest versions of the administered tasks, especially the one where no planning time was allowed, and only one text was summarised. As for the tasks where learners were asked to synthesise two texts with or without planning time, they produced less fluent language. At this low level of L2 proficiency, complexity in planning time affects learners' fluency the most. The explanation may be the fact that learners felt pressured to produce language without planning. They wrote as they thought and thus produced more at the expense of either accuracy or complexity or both.

Skehan and Foster's (1999) study reported that pre-planning resulted in no significant change in fluency. Ten years after, however, Ellis (2009) came to the conclusions that strategic planning has positive effects on fluency, and in respect to accuracy and complexity, the effects of planning are more variable. Those results are not consistent with our study. We found that increasing task complexity by providing no planning time produced more fluency. This result is consistent with that of Ong and Zhang (2010) in that omitting the pre-planning time led to significantly greater fluency of writing. Regarding online-planning, a study conducted by Ellis and Yuan (2005) found that learners given greater time to plan achieved no significant improvement at

the level of fluency. However, by closely observing our results, we can see that the number of elements also influenced fluency. In the tasks which learners had to work with two texts, they produced less fluency. The number of elements; thus, influenced fluency negatively but not significantly. According to Sasayama's (2015) research synthesis, the effect of ±few elements factor as a resource-directing variable on fluency was the most consistent across studies. Robinson (2001), Michel, Kuiken and Vedder (2007, 2012), Michel (2011), all investigated the effects of task complexity (±few elements).The results confirmed that the effects on fluency were negative. Michel et al. (2007, 2012) and Michel (2011) increased the cognitive demands of two argumentative tasks, and found consistent results.

Our findings secondly show that task complexity as manipulated through planning time and the number of texts that learners must summarize or synthesise affects students' writing accuracy as measured by the ratio of errors to the total number of words. This effect was substantial in the second medium version where they had planning time and two texts to synthesise. We have also noted that accuracy decreased when no planning time was granted to students, but the decrease was not significant. Contrary to fluency, the effect of task complexity was more significant when the number of elements increased. This suggests that complex elements that direct learners' attention towards form affect accuracy more than planning time.

According to Ellis (2003), using planning time allows learners to compensate for their limited processing capacities and perform better in language tasks. However, they prioritize meaning over form (Ellis, 2009). Skehan and Foster (1999) found that pre-planning resulted in no significant change in accuracy. The study conducted by Ahangari and Abdi (2011) also revealed that pre-task planning has no positive effect on accuracy. This was explained by the fact that strategic planning does not insure the availability of the linguistic information for a long time due to working memory limitation. Thus, accuracy is not affected. These results are contradicted by Guará-Tavares (2008, 2011) and Salimi et al. (2012). The latter study showed that students' L2 written accuracy improved due to the interference of task structure which was inquired too in their study. The results were, thus, contrasting depending on the other task conditions that were manipulated. Yuan and Ellis's (2003, 2004) studies concluded that online planning has a substantial effect on accuracy while strategic planning has more effect on fluency. In another study Ellis and Yuan (2005) found that learners given greater time to online plan produced more accurate and syntactically complex speech and written language. Our study, however, shows that planning time has no significant effect on accuracy. Research on task complexity has succeeded, till now, to prove that fluency is negatively affected by the large number of elements in a task but failed to agree on the nature of its effect on complexity and accuracy (Levkina & Gilabert, 2012). Robinson (2001) showed that increasing task complexity along the number of elements does not affect accuracy, measured by the number of errors, in an oral interactive task. A similar study was led by Gilabert (2007) and found that manipulating task complexity along the number of elements resulted in increased lexical complexity at the expense of fluency and syntactic complexity, and accuracy measured by self-repairs was positively affected. Kuiken and Vedder (2007) conducted a study in which they investigated the effects of the number of task elements on L2 written production and found that accuracy increases as the Cognition Hypothesis predicts. Manipulating the number of elements in a task seems to draw learners' attention toward linguistic forms which results in more accuracy.

Thirdly, our findings were unable to demonstrate that task complexity as manipulated through planning time and the number of texts affects students' writing complexity as measured by the mean number of clauses per T-unit. However, we observed that learners performed better when they had no planning time and just one text to summarise, and they performed the worst when they had to synthesise two texts. Having more time allows learners to concentrate on few elements to produce more complex language. As Foster and Skehan (2001) argue, learners have traded a one linguistic ability for another. They have traded complexity for accuracy.

Skehan and Foster (1997), Mehnert (1998), Ortega (1999) found that pre-task planning had positive effects on fluency and syntactic complexity. A more recent study conducted by Ahangari and Abdi (2011) revealed that pre-task planning has a positive effect on complexity but no positive effect on accuracy. Yuan and Ellis (2003, 2004) studied both pre-planning and within-task planning and found the effect of the second to be positive on complexity. In Rahimpour and Safari's (2011) investigation, however, the complexity and accuracy of the texts did not differ when adding planning time. Another contrasting result was the one of Mohammadzadeh Mohammadabadi, Dabaghi, and Tavakoli (2013) who found positive effect of planning time on accuracy but not on fluency and complexity. As for the current study, the effect of planning time on syntactic complexity was not significant. When investigating task complexity along the number of elements, Robinson (2001) found that increasing them does not affect syntactic complexity which is the same result we found. A study led by Gilabert (2007), however, does not support these results. Syntactic complexity has decreased. The same happened in Kuiken and Vedder's (2007) study which was concerned with the written modality. According to Sasayama's (2015) synthesis of research, the effects of increasing task complexity along the number of elements on syntactic complexity varied from one study to another. It was positive, null or negative across studies.

## Conclusion

The most direct pedagogical implication of this study is for task sequencing as far as academic writing is concerned. Robinson (2001) argues that sequencing decisions can be based on task complexity for its "robust and manipulable influence on learners' production" (p. 51). Moving from simple to more complex tasks might incite learners to produce better language. It solves the problem Task-based Language Teaching and syllabus designing to determine a valid criterion for grading and sequencing tasks along planning time and the number of elements. Therefore, the findings of the study can be used as a basis for grading and sequencing academic writing tasks and match them with the aimed for results. Task complexity also has implications for exams since different outcomes can be predicted depending on the type of the task given. Using this strategy also informs testing, for teachers will be more informed about what fits different students and allow them to demonstrate learning without extra burden; thus, balance test expectations and test design.

## Appendices:

### Appendix 1: The Topic Familiarity Test

How much do you know about the topic?

Directions:

- A number 5 means that you know almost everything about the topic.
- A number 4 means you know a lot about the topic.
- A number 3 means that you know something about the topic.
- A number 2 means that you know a little about this topic.
- A number 1 means that you do not know anything about the topic.

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|---|---|---|---|---|---|
| 1) The zoo protects animals | 1 | 2 | 3 | 4 | 5 |
| 2) Women vs, men in jobs | 1 | 2 | 3 | 4 | 5 |
| 3) The Titanic | 1 | 2 | 3 | 4 | 5 |
| 4) The scientific method of research | 1 | 2 | 3 | 4 | 5 |
| 5) Succeeding at interviews | 1 | 2 | 3 | 4 | 5 |
| 6) Stepwells | 1 | 2 | 3 | 4 | 5 |
| 7) The psychology of innovation | 1 | 2 | 3 | 4 | 5 |
| 8) Museums of fine arts and their public | 1 | 2 | 3 | 4 | 5 |
| 9) The context, meaning and scope tourism | 1 | 2 | 3 | 4 | 5 |
| 10) The megafires of California | 1 | 2 | 3 | 4 | 5 |
| 11) Second nature | 1 | 2 | 3 | 4 | 5 |

**Appendix 2: Writing Tasks**

***Simple Version: SUMMARISATION TASK 1***

Name: …….. Group: …….

There are simple steps to summarization.

- Read the text first to understand the author's intent.
- Pick out important details that are necessary/ Highlight the important details using keywords.
- Delete extraneous descriptors, details, and examples.
- List keywords in the order they appeared in the passage.
- Trim the list of keywords down to one topic sentence.
- In your own words, write the thesis and main ideas in point form (change only the changeable keywords).
- Reread the original work to ensure that you have accurately represented the main ideas in your summary.

***ZOO CONSERVATION PROGRAMMES***

One of London Zoo's recent advertisements caused me some irritation, so patently did it distort reality. Headlined "Without zoos you might as well tell these animals to get stuffed", it was bordered with illustrations of several endangered species and went on to extend the myth that without zoos like London Zoo these animals "will almost certainly disappear forever". With the zoo world's rather mediocre record on conservation, one might be forgiven for being slightly sceptical about such an advertisement.

Zoos were originally created as places of entertainment, and their suggested involvement with conservation didn't seriously arise until about 30 years ago, when the Zoological Society of London held the first formal international meeting on the subject. Eight years later, a series of world conferences took place, entitled "The Breeding of Endangered Species", and from this point onwards conservation became the zoo community's buzzword. This commitment has now been clearly defined in The World Zoo Conservation Strategy (WZGS, September 1993), which although an important and welcome document does seem to be based on an unrealistic optimism about the nature of the zoo industry.

***SUMMARY:***

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***Medium Version 1: SUMMARIZING TASK 2***

Name: …….. Group: …….

Read the following text carefully, and then try to summarise it.

**Recruitment**

The course is tougher but women are staying the distance, reports Andrew Crisp. Women who apply for jobs in middle or senior management have a higher success rate than men, according to an employment survey. But of course far fewer of them apply for these positions. The study shows that while one in six men who appear on interview shortlists get jobs, the figure rises to one in four for women.

The study concentrated on applications for management positions and found that women are more successful than men in both the private and public sectors. Dr. Elisabeth Marx from London-based NB Selection described the findings as encouraging for women, in that they send a positive message to them to apply for

interesting management positions. But she added, “We should not lose sight of the fact that significantly fewer women apply for senior positions in comparison with men.”

Reasons for higher success rates among women are difficult to isolate. One explanation suggested is that if a woman candidate manages to get on a shortlist, then she has probably already proved herself to be an exceptional candidate. Dr. Marx said that when women apply for positions they tend to be better qualified than their male counterparts, but they are more selective and conservative in their job search. Women tend to research thoroughly before applying for positions or attending interviews. Men, on the other hand, seem to rely on their ability to sell themselves and to convince employers that any shortcomings they have will not prevent them from doing a good job.

**SUMMARISE:**

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***Medium Version 2: SYNTHESIS TASK 1***

Name: …….. Group: …….

To synthesise follow these steps:

- Read each text very carefully, several times if necessary.
- Identify the type of text.
- Identify the text's topic and purpose.
- Identify the author's main idea or argument.
- Identify the reasons and evidence the author uses to support or explain the main idea.
- Clarify any unknowns about the text.
- Jot down some notes. Then repeat the process with the second text.
- A systematic preliminary comparison will help.
- Begin by summarizing briefly the points, themes, or traits that the texts have in common.
- Explore different ways to organize the information depending on what you find or what you want to demonstrate.

**TEXT 1: Recruitment**

The course is tougher but women are staying the distance, reports Andrew Crisp. Women who apply for jobs in middle or senior management have a higher success rate than men, according to an employment survey. But of course far fewer of them apply for these positions. The study shows that while one in six men who appear on interview shortlists get jobs, the figure rises to one in four for women.

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employers that any shortcomings they have will not prevent them from doing a good job.

**TEXT 2: Women Are Less Likely to Apply for Executive Roles If They've Been Rejected Before**

Although women make up 40% of the global workforce, they hold only 24% of senior management roles around the world, a figure that has not changed significantly over the past decade. Of chief executive officers of 500 firms, only about 5% are women. Why aren't more talented women moving up? Researchers have pointed to an array of reasons, from explicit discrimination to promotion processes that quietly favour men, but one of the most perplexing is that women themselves aren't as likely as men to put themselves forward for leadership roles. The reason, many assume, is because women are risk averse or lack confidence, or maybe because they have different career preferences. But our research suggests another reason.

We recently conducted a study of more than 10,000 senior executives who were competing for top management jobs in the UK. We found that women were indeed less likely than men to apply for these jobs, but here's the interesting part: We found that women were much less likely to apply for a job if they had been rejected for a similar job in the past. The implications here are not trivial, because rejection is a routine part of corporate life. To reach the top of the organization, people need to keep playing the game, over and over again, even after repeated disappointments. So even small differences between how men and women respond to rejection could lead to big differences over time. Men are less likely to take rejection as a signal that they do not belong in the corner offices, and therefore such disappointments had less of a negative impact on their willingness to apply again.

Study by Raina Brands and Isabel Fernandez-Mateo FEBRUARY 07, 2017

**SYNTHESIS**

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**Complex Version: SYNTHESIS TASK2**

Name: …….. Group: …….

**Text 1: A Disaster of Titanic Proportions**

At 11:39 p.m. on the evening of Sunday, 14 April 1912, lookouts Frederick Fleet and Reginald Lee on the forward mast of the Titanic sighted an eerie, black mass coming into view directly in front of the ship. Fleet picked up the phone to the helm, waited for Sixth Officer Moody to answer, and yelled "Iceberg, right ahead!" The greatest disaster in maritime history was about to be set in motion.

What or who was responsible for the scale of this catastrophe? Explanations abound, some that focus on very small details. Due to a last-minute change in the ship's officer line-up, iceberg lookouts Frederick Fleet and Reginald Lee were making do without a pair of binoculars that an officer transferred off the ship in Southampton had left in a cupboard on board.

Less than an hour before the Titanic struck the iceberg, wireless operator Cyril Evans on the California, located just 20 miles to the north, tried to contact operator Jack Philips on the Titanic to warn him of pack ice in the area. "Shut up, shut up, you're jamming my signal," Philips replied. "I'm busy." Philips was clearing a backlog of personal messages that passengers had requested to be sent to family and friends in the USA.

Captain Smith had maintained the ship's speed of 22 knots despite multiple earlier warnings of ice ahead. It has been suggested that Smith was under pressure to make headlines by arriving early in New York, but maritime historians such as Richard Howell have countered this perception, noting that Smith was simply following common procedure at the time, and not behaving recklessly.

One of the strongest explanations for the severe loss of life has been the fact that the Titanic did not carry enough lifeboats for everyone on board. Furthermore, with lifeboats being lowered less than half full in many cases; more lifeboats would not have guaranteed more survivors in the absence of better training and preparation. Many passengers were confused about where to go after the order to launch lifeboats was given; a lifeboat drill scheduled for earlier on the same day that the Titanic struck the iceberg was cancelled by Captain Smith in order to allow passengers to attend church.

**Text 2: Lessons from the Titanic**

With limited communication facilities, and shipping technology still in its infancy in the early nineteen hundreds, we consider ocean travel to have been a risky business. But to the people of the time it was one of the safest forms of transport. At the time of the Titanic's maiden voyage in 1912, there had only been four lives lost in the previous forty years on passenger ships on the North Atlantic crossing. And the Titanic was confidently proclaimed to be unsinkable. But still she did sink on April 14, 1912, taking 1,517 of her passengers and crew with her. It was largely as a result of this confidence in the ship and in the safety of ocean travel that the disaster could claim such a great loss of life.

The lack of formal procedures for dealing with information from a relatively new piece of technology, the wireless, meant that the danger was not known until too late. This was not the fault of the Titanic crew. Procedures for dealing with warnings received through the wireless had not been formalised across the shipping industry at the time.

Captain Smith's seemingly casual attitude in increasing the speed on this day to a dangerous 22 knots or 41 kilometres per hour, can then be partly explained by his ignorance of what lay ahead. But this only partly accounts for his actions, since the spring weather in Greenland was known to cause huge chunks of ice to break off from the glaciers. Captain Smith knew that these icebergs would float southward and had already acknowledged this danger by taking a more southerly route than at other times of the year. So why was the Titanic travelling at high speed when he knew of the general risk of icebergs in her path? It was simply standard operating procedure at the time. He believed, wrongly as we now know, that the ship could turn or stop in time if an iceberg was sighted by the lookouts.

After the Titanic sank, investigations were held in both Washington and London. In the end, both inquiries decided that no one could be blamed for the sinking. However, they did address the fundamental safety issues which had contributed to the enormous loss of life. As a result, international agreements were drawn up to improve safety procedures at sea. The new regulations covered 24 hour wireless operation, crew training, proper lifeboat drills, lifeboat capacity for all on board and the creation of an international ice patrol.

**SYNTHESIS**

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