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# Pair Grouping and Resource-dispersing Variables of Cognitive Task Complexity: Effects on L2 Output

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## Abstract

Although a great deal of research has been done to probe the effects of task complexity variables on the specific features of L2 learners' output along the resource-directing dimension of the Cognition Hypothesis (Robinson, 2001a, 2003, 2005), only a few studies (e.g. Gilabert, 2007; Robinson, 2001a, 2001b; Yuan & Ellis, 2003) have explored the effects of the resource-dispersing variables of task complexity on L2 output. Neither is there a rich literature on the effects of mutual interaction of these variables and task condition variables on the output. In addition, few studies have directly involved learners in oral tasks; on the contrary, most of the previous studies have focused on written tasks and the oral production resulting from the performances of those tasks. This study investigated the effects of resource-dispersing variables and task condition variables on the complexity of L2 output. To this end, Preliminary English Test (PET) and an interview were

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administered to 20 EFL learners. After ranking the scores from the highest to the lowest, two expert/expert pairs and two novice/novice pairs were chosen to perform four tasks. The tasks were sequenced from the least to the most complex and the pairs were required to perform each task at a session, one pair after another. Their performances were tape-recorded and transcribed, and the data were subjected to statistical analysis. The results of the study indicated that, no matter whether the pairs were novices or experts, their output became more and more complex as the tasks increased in complexity. This
is incompatible with the claim made by the Cognition Hypothesis that task complexity along the resource dispersing variables does not lead to the complexity of the output (Robinson, 2001a, 2005).

**Keywords:** Task complexity; Task condition; Cognitive Hypothesis; Pair grouping; Mean turn length; Turn taking

## Introduction

The literature has greatly focused on the notion of task and how task-based interaction contributes to language development (Bygate, Skehan, & Swain, 2001; Ellis, 2003; Lee, 2000; Nunan, 2005). Specifically, the idea of how different task types lead to various interaction mechanisms among peer L2 learners is a central theme in the literature (de Guarrero & Villamil, 2000; Doughty & Pica, 1986; Duff, 1986; Foster & Ohta, 2005; Gass & Varonis, 1985; Long, 1981; Ohta, 2001). Different factors are known to affect the interaction between peer L2 learners which result from either the tasks they are involved in or the learners' characteristics. As far as "task" is concerned, task type, task difficulty, and task complexity are considered to be influential in the process of interaction (Robinson, 2001a; Skehan & Foster, 1997). Learners' characteristics such as their background knowledge, status differences, gender, and familiarity have effects on the mechanism of interaction among learners (Pica, 1987; Plough & Gass, 1993; Varonis & Gass, 1985).

More research is needed to illuminate the influence of numerous factors related to task and task-takers on the process of interaction. Among these factors, task complexity and the cognitive load associated with, on the one hand, and the conditions of the task (Robinson, 2001a) such as gender and the task- takers' familiarity with the content of the task and with each other, on the other, are considered to affect the learners' processing capabilities (Izumi, 2003). It is very crucial to determine which elements contribute to task complexity. Two well-known theories in this regard are Skehan's Limited Capacity Model, first introduced in 1996, and Robinson's Cognition Hypothesis (2001a, 2003, 2005). The two theories might be competing in some areas but they cover most of the factors which are supposed to be decisive in making a task more or less complex. Besides, as a task condition, it is very important how peer L2 learners are classified (Robinson, 2001a). The results of the studies in which the learners were paired with partners with the same or different proficiency levels are drastically different in terms of scaffolding, output complexity, accuracy, fluency, and the nature of the interaction (McDonough, 2004; Storch.1999, 2007; Watanabe & Swain, 2007).

However, the majority of the previous studies, except Lee (2002) and Robinson (2007b), have operationalized task complexity dichotomously (i.e. simple versus complex). Because the concept of task complexity is determined on a continuum, it is important to include multiple degrees of task complexity in the research design to provide solid evidence for the Cognition Hypothesis. Moreover, the previous studies have mostly mixed the variables from resource-dispersing with those from resource-directing in designing tasks to be performed. For example, Robinson (2001a) required the participants to perform tasks characterized as [+/-prior information] and [+/- few elements]. Gilabert (2007) operationalized task complexity as [+/- here and now] and [+/- pre-task planning]. It is difficult to decide how the findings of such studies lend support to Robinson's task complexity model because task complexity is operationalized with a resource dispersing factor and a resource-dispersing factor simultaneously.

Against this backdrop, this study investigated the effects of [+/-planning time], [+/-single task], and [+/-prior information], as the cognitive factors along the resource-dispersing dimensions contributing to task complexity, and +/-same proficiency, as a task condition on the complexity of the participants' output in four oral tasks. The frequency of turn-taking and the mean turn length were analyzed as indicators of the complexity of the output with the expectation that increasing cognitive complexity along resource-dispersing variables to adversely would affect the complexity of the output (Robinson, 2001a, 2005).

## Background

### Task Complexity

The construct of task complexity defined by Robinson (2001a, p. 29) as "attentional, memory, reasoning and other information processing demands imposed by the structure of the task on the learner" is an important task sequencing criterion. This criterion is used to order tasks from less to more complex or vice-versa (Long, 1985; Robinson, 2001b; Skehan, 1996, 1998). Early task complexity definitions were mostly concerned with activity, text, and learner factors (Brindly, 1987; Candlin, 1987; Nunan, 1989) and were motivated by information processing approaches to L2 learning. However, in more recent studies, Skehan (1996) and Robinson (1995, 2001a) defined new criteria for task complexity specifications in two different theories, namely Limited Capacity Model and the Cognition Hypothesis, respectively.

Dealing with the task complexity framework in Cognition Hypothesis, Robinson (2001a, 2003, 2005) divided task complexity into two dimensions: cognitive/conceptual demands and procedural/performative demands. He called the first one resource-directing and the second one resource-dispersing, arguing that resource-directing variables of task complexity make greater demands on attention and working memory in a way that redirects them to linguistic resources. Thus, increasing task complexity along resource-directing dimensions, for example, by requiring learners to use reasoning skills [+/- reasoning demands], to consider many elements [+/- few elements], and/or to narrate events that are displaced in time and space [+/- here and now], can direct learners' attention to specific, task-relevant features of the language code within the same resource pool.

Resource-dispersing variables make increased performative/procedural demands on participants' attentional and memory resources but do not direct them to any aspect of the language system. According to Robinson (2005), changes in complexity along these dimensions are related to increases in ability to access and deploy knowledge during performance of a complex skill, and increased complexity along these resource-dispersing dimensions is also important since it serves to simulate the processing conditions under which real time language is often used. The three most important dimensions of resource-dispersing variables which have shown to have effects on learners' production are [+/- single task], [+/- prior knowledge], and [+/-planning]. For example, Robinson (2001a) holds that whether learners are asked to perform a *single task or a single and a secondary task* affects their performance.

Task content familiarity and task type repetition have been studied as the variables providing *prior knowledge*. Task type repetition, i.e. performing a particular type of communicative task on a second occasion, is assumed to ease the processing load on learners' processing capability. It is because the experience of handling the task is recorded in the long-term memory and learners are able to deal with it more effectively (Levlet, 1989; Selinker & Douglas, 1985). Task content familiarity which refers to performing the same version of the same task on a second occasion is also viewed to release attentional resources during task performance (Bygate, 1999, 2001).

As far as planning is concerned, Ellis (2003) believes that two types of planning can be distinguished: *online planning*, planning which happens during task performance, and *strategic planning*, planning which occurs prior to task performance. Ellis (1987) and Yuan and Ellis (2003) in their studies found that online planning, operationalized as having no time pressure through task performance, led to greater accuracy and complexity in learners' performance. However, studying the impacts of strategic planning on performance had led to mixed results. While Foster and Skehan (1996), Kawauchi (2005), and Sangarun (2005) have argued that planning time as a task characteristic has positive effects on accuracy, Crookes (1986) and Iwashita et al. (2001) have claimed no or little effect for this variable.

**Research on the Effects of Cognitive Task Complexity on the Complexity of Output**

Cognitive task complexity has been operationalized through its effects on the interaction and negotiation among participants. The total number of Language Related Episodes (LREs) (e.g. Kim, 2009; Kim & McDonough, 2008; Ross-Feldman, 2007), different types of feedback such as clarification requests, confirmation check, and comprehension check (e.g. Gilabert, Barón, & Llanes, 2009), and the mean turn length, and the number of turns taken in performing a task (e.g. Robinson,2007b) are all measures which indicate the relevant degree of complexity of the output which is hypothesized by the Cognition Hypothesis to be affected by the complexity of tasks.

Robinson’s study (2001a) is a landmark in which he studied the effects of task complexity on the occurrence of feedback, i.e. confirmation checks and clarification requests during pair work. The participants of the study were 44 Japanese university learners forming 22 pairs. He manipulated task complexity with the two variables of [+/- prior knowledge] and [+/-few elements] in two map tasks. The less complex map task required the speaker to give directions from A to B using a map covering a small area which was familiar to the participants. In the more complex version, the map used covered a larger area which was not known to the task performers. Robinson found an effect for task complexity on fluency and on lexical variety, with the speakers in the [+complex] task producing less fluent language and fewer words than during the [-complex] task. There was a trend toward greater accuracy (error-free C-units) in the more complex task, but it was not significant.

In her review of the factors affecting negotiation, Gass (1997) refers to Duff’s (1986) study which investigated the effects of task type on the output and the interaction among L2 learners. Duff used two sorts of tasks: two convergent problem-solving and two divergent tasks which required learners to debate. Using different qualitative and qualitative measures, Duff found more turn taking, questions, and c-unit in the problem-solving tasks.

Gass and Varonis (1985) investigated the effects of one-way versus two-way tasks on the negotiation among task performers. In the first task, a partner was required to give information to the other participant while, in the other one, there was information exchange between the two task-takers. The analysis of the results, contrary to Long’s prediction (1983), showed no significant difference between the two task types.

Long (1983) predicted that two-way tasks resulted in more modified interactions among task performers. In a study focusing on required information exchange and optional information exchange, Doughty and Pica (1986) divided their subjects into three groups: teacher-fronted, small groups, and dyadic and asked them to perform a required information exchange task in which they had to exchange information to get a complete picture of a garden on a board. Then the researchers compared the results of this study with their previous research (Doughty & Pica, 1984), in which they had required their subjects to perform an optional information exchange task. Comparing the results, they found out that the amount of interaction was greater in the required information exchange. In addition, the subjects in groups and dyadic categories were more interactive than those in the teacher-fronted group. This study confirms Long's earlier hypothesis (1983) that the task type affects interaction.

Gass (1997) believes that background knowledge and status difference may contribute to type and amount of negotiation. She refers to a series of studies undertaken by Zuengler (1989) whose subjects were native/non-native dyads. In one of these studies, Zuengler found that one partner in the interaction may dominate the other, which relates more to knowledge status than linguistic knowledge. Yet, in her follow-up study, she confirmed there was evidence in terms of a greater amount of talk. Referring to the amount of negotiation, she concluded that as the status difference increased, the negotiation decreased.

Robinson, Ting, and Urwin (1995) studied the effects of different tasks with different degrees of complexity on the task taker's interaction. They managed to make generalizations about the different factors which might contribute to task complexity, thus defining three dimensions of task complexity and their potential interactions on different phases of a course of language teaching and learning. These three factors are cognitive load, prior information, and background knowledge, the presence (+) or absence (-) of which makes a task more or less complex.

More directly related to the present study is Robinson's (2007b) study in which he paired learners with other learners and required them to perform three interactive tasks with gradually increasing complexity along the resource-directing dimension. A unique feature of this study was that it explored task complexity along a continuum rather than dichotomously. He set out to make sure if increasing cognitive complexity would result in more accurate and complex but less fluent output and if it would result in more interaction and uptake of linguistic forms As far as oral production is concerned, Robinson found no significant difference between the task types (simple, medium, and complex). However, his hypothesis that the complex tasks resulted in significantly more turns was confirmed.

More recently, Kim (2009) explored the effects of task complexity alongside proficiency level on learner-learner interactions. Kim's study focuses on task complexity in relation to the occurrence and resolution of LREs. The complexity features pinpointed were +/-reasoning and +/-few elements which were assimilated into two picture narrative tasks and two picture difference tasks. The participants were classified into low-low (novice-novice) and high-high (expert-expert) proficiency dyads. Kim found that the low-low proficiency dyads produced significantly more LREs during the simple picture narrative task while high-high proficiency dyads produced fewer LREs. Besides, high-high proficiency dyads produced more LREs in the performance of the complex version.

## The Present Study

This study was aimed at investigating how tasks with different degrees of complexity along the resource-dispersing dimension (Robinson, 2001a) interact with one task condition, i.e. task performers' proficiency differences, to affect the complexity of the output. More specifically, finding the answers to the following research questions was the main reason for this study:

1. Is there any significant relationship between the frequency of turn-taking in the performances of novice-novice and expert-expert pairs performing tasks with different degrees of complexity?
2. Is there any significant difference between the mean turn length in novice-novice and expert-expert pairs performing tasks with different degrees of complexity?

In this study, the independent variables were the two types of dyads, and the dependent variables were measures of the complexity of the output, i.e. the total number of turns in the first research question and the mean turn length of the utterances in the second research question.

## Method

### Participants

The participants of this study were two pairs of novice/novice and expert/expert freshmen at Allameh Tabataba'i University majoring in Arabic. They were between 19 and 23 years old, and, at the time of this study, they were taking a university course in general English. They were chosen out of 22 female students. To form novice-novice and expert-expert pairs, their scores in a proficiency test of English as a foreign language and an interview were ranked from the highest to the lowest. Two subjects from amongst those who were the highest were chosen as an expert-expert pair. In the same vein, two subjects among those who were ranked lowest were chosen as a novice-novice pair.

**Instrumentation**

To address the research questions, three types of instruments were used. A language proficiency test and an interview were used to classify the participants into novice-novice and expert-expert dyads. Four oral tasks ranging from the least to most complex ones were also developed for the purpose of this study.

**Language Proficiency Test:** To properly classify the participants into two distinct groups, i.e. novice and expert, a recent version of the Preliminary English Test (PET) was administered. The test consisted of four parts: Listening, Reading, Writing, and Speaking. Each part amounted to 25% of the total score. The explanations accompanying the test specified the materials and tasks to be used at any part and clearly described the scoring procedure.

**Interview:** The participants' oral proficiency, which was vital in performing the tasks, was the determining factor in classifying them into different dyads. Thus, to have a better estimate of their oral proficiency, in addition to the PET, they were interviewed on a range of general topics such as air pollution, transportation, and their hobbies. To ensure the reliability of the scores, two interviewers using Ur's (1996) scale for Oral Proficiency Interview (OPI) (see Appendix A) scored every participant's performance, and a mean score of the two interviewers was taken as the participant's final interview score. Then, the scores from the interviews were scaled up to one hundred to be equal to the scale of the PET. The two scores were added up and divided by two and a mean score of the two was taken as the basis for classifying a participant as novice or expert. The results were ranked from the highest to the lowest and divided into three sections. For the purpose of this study, the two highest and the two lowest scores were chosen as an expert-expert and a novice-novice pair, respectively.

**Oral Tasks:** After reviewing many relevant studies on task-based language teaching, interaction, scaffolding, and the discourse of interaction (Dahl, 2004; Foster, 1998; Foster & Skehan, 1996; Richards & Rodgers, 2001; Robinson, 2001a, 2005, 2007a; Robinson, Ting, & Urwin, 1995; Skehan & Foster, 1999), four tasks were chosen to gratify the demands of increasing complexity defined for this study. Many of these researchers believe that cognitive load, planning time, and prior information contribute to the complexity of a given task. The cognitive load here is manifested in whether the task is single or dual, with a dual task being more cognitively complex than a single one. An allowable amount of time, as Oxford (2006) puts it, or planning time has a reverse relation to the complexity of a task, i.e. the more the time for thinking up the process of performing a task, the less complex it becomes. Prior information or background knowledge also has a reverse relation to the complexity, as planning time does. Other task factors such as one-wayness or two-wayness and openness or closeness were kept invariable in the tasks so that they might not contribute to the complexity.

Following the procedure developed by Robinson et al. (1995) for ascribing (+) to the presence characteristic and (-) to the absence of a feature, Table 1 was developed to find tasks which conformed to these specificities:

**Table 1**
Task features

| |
|---|
| 1. ***single***/open/two-way/+prior information/+ planning time (the least complex task) |
| 2. ***dual***/open/two-way/+prior information/+planning time (a less complex task) |
| 3. dual/open/two-way/+prior information***/-planning time*** (a more complex task) |
| 4. dual/open/two-way***/-prior information/-planning time*** (the most complex task) |

Four oral tasks were selected in this study to match the complexity mentioned in the table (Appendix B).

**Data Collection Procedure**

Each of the two pairs involved in this study was required to perform a task at a separate time while they were being tape-recorded. In order not to let the participants share the contents of the tasks and keep the tasks novel for each pair, immediately after one pair performed the task, the other pair was required to perform it. The whole treatment was done in four weeks, with one session per week. Every session was divided into equal halves and each half was devoted to a pair. Although tape-recording was the primary method to elicit data, observational notes were taken of the participants' behavioral gestural communication which would contribute to the proper interpretation of the interactions.

**Data Analysis**

The focus of analysis was on the interactive spoken discourse among peer L2 learners. For this purpose, eight protocols of audio-recordings of the discourse was transcribed and analyzed based on the transcription conventions developed by Garden and Wagner (2004). Then, the number of turns taken in a task was identified and counted. The reason was twofold. Primarily, the frequency of turn-taking was taken as a measure showing how pair-grouping as a task condition affected the interaction among peers in performing tasks with different degrees of complexity. Second, the number of words at any turn was counted and divided by the total number of turns at any task to come up with a mean turn length of the utterances which signified the complexity of the output. This was computed by dividing the total number of words at a turn by the total number of turns at a task performance. The two measures, i.e. the number of turns taken and the mean turn length, have ironically contrasting functions. That is, as the number of the turns increases, the amount of mean turn length decreases because the total number of words at any interaction is divided by the number of turns, i.e. MTL= Total number of words / Total number of turns (Robinson, 2007a). Thus, the more the turns are, the less the amount of the mean turn length becomes.

Next, the raw data were subjected to SPSS data analysis. To this end, a chi-square test for independence was run to find out the significance of the differences in the frequency of turns taken by any pair performing task I-IV and between the two pairs performing tasks I-IV. Further, chi-square was run to probe the possible meaningful relationship between the mean turn length of the utterances as a measure of the complexity of the output in intra- and intergroup task performances. In all cases, the chi-square requirements were met because at least 80 per cent of cells had expected frequencies of 5 or more.

## Results

The main purpose of this study was to investigate how tasks with different degrees of complexity in terms of the resource-dispersing dimension (Robinson, 2001a), in conjunction with one task condition, i.e. task performers' proficiency differences, would affect the complexity of the output. The relevant results are reported below.

### Frequency of Turn-taking in Novice-novice and Expert-expert Pairs

The first research question concerned the relationship between the frequency of turn-taking in the interaction between the novice-novice (N-N) and expert-expert (E-E) pairs performing Tasks I, II, III, and IV.

Based on Table 2, the N-N pair produced more turns (80 turns) in the performance of the four tasks than the E-E pair (69 turns). The comparison of the number of turns produced in performing each task showed that, while the E-E pair produced steadily more turns as the tasks got more complex, there was a sharp decline in the number of turns produced in performing task II by the N-N pair. This might be attributed to the similarities in the contents of the two tasks.

**Table 2**

Frequencies and percentages of turn-taking in novice/novice and expert/expert groups

| | | | TASKS | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | TASK I | TASK II | TASK III | TASK IV | |
| GROUPS | Novice-Novice | Count | 14 | 6 | 21 | 39 | 80 |
| | | %within group | 17.5% | 7.5% | 26.2% | 48.8% | 100% |
| | Expert-Expert | Count | 2 | 6 | 18 | 43 | 69 |
| | | %within group | 2.9% | 8.7% | 26.1% | 62.3% | 100% |
| Total | | Count | 16 | 12 | 39 | 82 | 149 |
| | | %within groups | 10.7% | 8.1% | 26.2% | 55.0% | 100% |

Figure 1 offers a graphic account of turn-taking percentages in the two pairs.

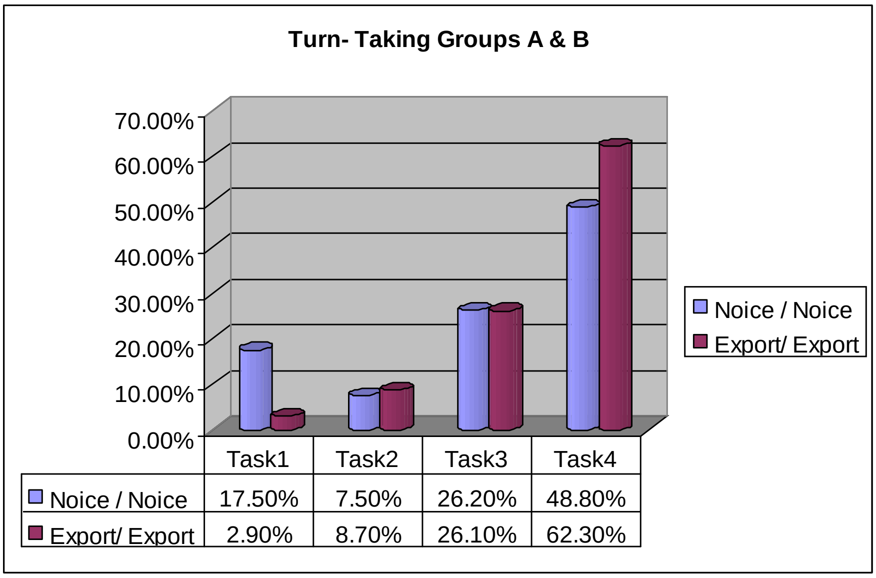


**Figure 1:** Percentages of turn-taking in novice-novice and expert-expert pairs

An analysis of chi-square was run to probe the significance of the difference in the frequencies of turn-taking in the two pairs. The chi-square observed value is 8.66 (Table 3). This amount of chi-square value is higher than the critical value of 7.82 at 3 degrees of freedom. Based on these results, it can be concluded that there is a meaningful difference between the frequency of turn-taking in the interaction between the N-N and E-E pairs performing tasks. Thus, the novice-novice pair used significantly more turns than the expert-expert pair.

**Table 3**

Chi-square for the frequency of turn-taking in novice-novice and expert-expert pairs

| | Value | df | p |
|---|---|---|---|
| Pearson Chi-Square | 8.661[a] | 3 | .034 |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.56.

## Mean Turn Length in Novice-Novice and Expert-Expert Pairs

The second purpose of the study was to investigate the relationship between the mean turn length (MTL) in the performances of the participants in N-N and E-E pairs performing tasks I to IV. First, the number and percentages of turns were calculated. The results are displayed in Table 4.

**Table 4**
Frequencies and percentages of mean turn length in novice-novice and expert-expert pairs

| | | | TASKS | | | | |
|---|---|---|---|---|---|---|---|
| | | | TASK I | TASK II | TASK III | TASK IV | Total |
| PAIRS | Novice-Novice | Count | 7 | 17 | 10 | 7 | 41 |
| | | %within group | 17.1% | 41.5% | 24.4% | 17.1% | 100% |
| | Expert-Expert | Count | 48 | 7 | 10 | 8 | 73 |
| | | %within group | 65.8% | 9.6% | 13.7% | 11.0% | 100% |
| Total | | Count | 55 | 24 | 20 | 15 | 114 |
| | | %within groups | 48.2% | 21.1% | 17.5% | 13.2% | 100% |

These results will be better interpretable if the two variables of the number of turns and MTL are used to compute the number of words in each task performance. This was tabulated and presented in Table 5.

**Table 5**
The number of words used by novice-novice and expert-expert pairs to perform tasks

| | TASK I | TASK II | TASK III | TASK IV | Total number of words produced |
|---|---|---|---|---|---|
| Novice-Novice | 98 | 102 | 210 | 273 | 683 |
| Expert-Expert | 96 | 42 | 180 | 344 | 662 |

In light of the information given in Table 5, it is clear that, as far as the total number of words used in the performance of the tasks is concerned, the N-N pair outperformed the E-E pair and consequently the mean turn length of the N-N pair was greater.

Figure 2 depicts the differences between the two pairs' mean turn lengths by percentages.

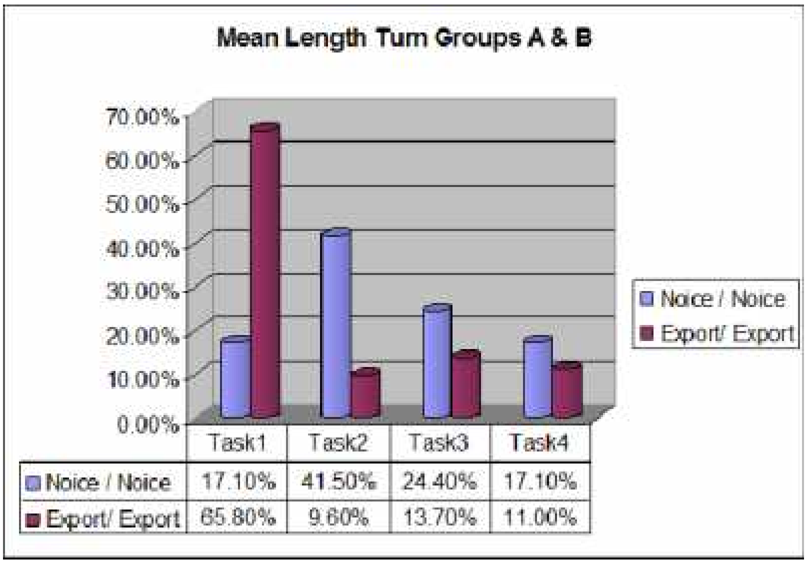


**Figure 2:** Percentages of mean turn length in novice/novice and expert/expert pairs

The chi-square analysis to explore if there was any meaningful difference between the MTL in the performances of the two pairs resulted in the value of 28.02 (Table 6), which is higher than the critical value of 7.82 at 3 degrees of freedom. From this finding, it can be concluded that there is a meaningful difference between the mean turn length in the performances of the two pairs performing tasks I to IV.

**Table 6**

Chi-square of mean turn length in novice-novice and expert-expert pairs

| | Value | df | p |
|---|---|---|---|
| Pearson Chi-Square | 28.023[a] | 3 | .000 |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.39.

## Discussion

Due to their role in SLA studies, tasks have received increasing attention over the past few decades (e.g. Adams, 2007; Kim, 2009; McDonough, 2004; Robinson, 2007a; Samuda & Bygate, 2008; Swain & Lapkin, 1998, 2001). Most of these studies have built on resource-directing variables of Robinson’s Cognition Hypothesis (2001a, 2003, and 2005) and the interactive features of tasks. This signifies the importance of exploring the effects of task complexity along other dimensions interacting with task conditions which are also part of Robinson’s triadic componential framework developed on the basis of his cognitive hypothesis.

To find out if participants have developed their language capabilities or if language development has happened, researchers either have focused on the development between pre-test and post-test or have analyzed different features of language output during task performance. They have measured accuracy and fluency of the output by counting specific language forms (e.g. Garcia & Asension, 2001; Kuiken & Vedder, 2008) or the overall complexity of the output determined by the number of LREs produced by the interlocutors (e.g. Gass & Mackey, 2007; Kim, 2009; Storch, 2007). However, in few studies, except (Robinson, 2007a), the number of interlocutors’ turn-takings has been considered as a measure of output complexity. Besides, the mean turn length of the utterances has not been probed as a measure of output complexity. Finally, almost all studies on task complexity have focused on the resource-directing variables of task complexity characterization.

This study, however, has taken the number of turns as a measure indicating the extent to which the interlocutors have been interactive and the mean turn length of the utterances as a measure of the complexity of the output, coupled with the resource-dispersing variables of task complexity interacting with one aspect of task condition, i.e. language proficiency. Whereas Robinson (2001a, 2005) has predicted that increasing complexity in the resource-dispersing dimension will neither increase linguistic accuracy and complexity nor promote negotiation and interaction work that facilitates attention since it creates problems for learners attempting to access their current repertoire of L2 knowledge, the results of this study indicate that irrespective of the participants being paired in novice-novice or expert-expert dyads, the number of turns increases as the tasks get more cognitively complex. That is, as tasks gradually get more complex, the output becomes, by and large, increasingly more complex.

Yet, a detailed analysis of the turns taken in each task shows participants took fewer turns in performing task II, which was hypothetically more complex than task I due to being dual and hence requiring the pairs to take a further step in its performance. Both of the tasks were map tasks, i.e. they had the same nature and the participants' familiarity with the process of performing task I was possibly transferred to their performance of task II. Therefore, it can be argued that familiarity or having background knowledge on a task (Plough & Gass, 1993; Skehan, 1996) overrides the complexity produced by the single/dual nature of a task. In other words, content familiarity (Ellis, 2003) with a task is so influential that it can resolve the complexity resulting from the single versus dual demands of a task.

Moreover, in performing task IV which required the participants to persuade each other how long an accused doctor should stay in prison and to defend their decision, the expert pairs took more turns than the novices. This necessitated both high attentional resources and enough language knowledge to perform the task. Evidently, the expert pair, who were linguistically and thus attentionally more competent that their novice counterparts, took more turns to confirm or disconfirm each other's ideas to come to a conclusion. While the idea that more complex tasks along resource-directing dimensions lead to more complex output is predicted (Robinson, 2001a, 2005) and well-documented (e.g. Gilabert et al., 2009; Kim, 2009; Robinson, 2007a), this study confirms that along resource-dispersing dimensions, also, more complex tasks leads to more negotiations and turn-takings. Further, the fact that the novice-novice pairs took more turns in performing task I than the expert-expert pair confirms Kim's (2009) finding that in the least complex task the low-low proficiency dyads produced more LREs than the high-high proficiency dyads. It is because, as Kim suggested, less complex tasks permit the use of more attentional resources with which learners can monitor their partners' output and provide feedback and hence produce more LREs or turns.

Regarding the frequencies and percentages of the MTL of the utterances, there was a significant difference between the mean turn lengths of the utterances in the two pairs. With respect to the MTL for the N-N pair in performing tasks I to IV, the values were almost equal, except for Task 2 in which it was higher. This was owing to the fact that the number of turns in the performance of this task was relatively fewer than those for the other three tasks. Considering the way MTL is computed, it can be inferred that with an increase in the complexity of tasks, the

MTL found a higher value. Although the value of MTLs for task I and task IV were equal, they should be interpreted differently because, as the tasks get more complex, the number of turns and the number of words used in the performance of the two tasks increase. In other words, in task II, the total number of words and the number of turns were relatively smaller than those in task IV, so the increase in the total number of words in task IV was accompanied by an increase in the number of turns which ultimately led to an MTL equal to Task 2.

The MTL in the utterances of the E-E pair shows more drastic fluctuations. Again, it is directly related to the words and turns in the performance of the tasks. Specifically, the high value of the MTL in the performance of task I is the result of few turns taken in performing this task. However, the MTLs in the performance of the other three tasks manifest approximately similar values. With this conception in mind that tasks get more complex and the number of turns increases progressively, these three values each shows a slight increase in the MTL as the tasks become increasingly more complex. That is, the MTLs in tasks II and IV were computed to be 7. Yet, due to the number of turns and words exploited, the MTL in task IV indicates a much greater complexity of the output than the complexity of the output in task II. Thus, the results of the current study suggest that reasoning demands provide more learning opportunities through language output and interaction (Long, 1996; Swain, 1995). While justifying and explaining their reasons for making different decisions, learners were pushed to produce more complex language to meet the greater functional and conceptual communicative demands.

## Conclusion

The primary purpose of the study was to investigate the predictions of the Cognition Hypothesis (Robinson, 2001a, 2001b, 2003, 2005, 2007a), particularly examining the relationship among task complexity and pair grouping as a task condition variable and their mutual effects on the complexity of output. The Cognition Hypothesis claims that complex tasks that require more cognitive/conceptual demands induce more interaction (Robinson, 2007b). However, Robinson's (2001a, 2005) Cognition Hypothesis predicts that increasing complexity in the resource-dispersing dimension will not increase linguistic accuracy and complexity; nor will it promote negotiation and interaction work that facilitates attention since it creates problems for learners attempting to access their current repertoire of L2 knowledge.

So far, studies concerning these claims have produced mixed results. Concerning variables contributing to task complexity, Robinson and Ha (1993) found single versus dual demands on L2 production to have no effects on the accuracy and complexity of the output. However, Skehan and Foster (1997) suggest that single task demands lead to more complex language use. Prior knowledge and planning time, as the other components of task complexity along the resource-dispersing variables have also been investigated to determine their effects on the complexity of the output. Specifically, comparing the impact of strategic and on-line planning on oral narrative tasks, Yuan and Ellis (2003) found that the more there were opportunities for online planning, the more accurate and complex the output became.

The current study adopted a somewhat similar method of assessing the complexity of the output as Robinson’s (2007a) research, in which output complexity was operationalized in the number of turns during interactive tasks. The findings of this study, with few minute exceptions, disapproved the prognosis of Robinson’s (2001a, 2003, 2005, 2007b) Cognition Hypothesis that more complex tasks lead to less complex output. On the other hand, findings of this study support Ellis's (2003) claim that "cognitively demanding tasks may promote more meaning negotiation than cognitively less demanding tasks as learners will need to engage discourse management and repair strategies more frequently to prevent or cope with non-understanding" (p. 93).

However, this might be the result of other variables of the study such as pair-grouping and task types, which are classified as task conditions. These variables are considered to contribute to the overall performance of the participants in performing tasks. Previous studies (e.g. Iwashita, 2001; Watanabe & Swain, 2007) have demonstrated that pair grouping based on learner proficiency may play an important role in the occurrence of learning opportunities during learner-learner interaction.

Pedagogically, the findings of this study suggest that using tasks such as those for which the performers lack prior knowledge or are not given time to plan in advance, i.e. are cognitively more demanding, would result in more interaction and elicit more interactional features. Thus, the task performers are exposed to more and variable instances of language use. Overall, while the findings of the current study ran counter to Robinson's (2001a) standpoint regarding the relationship between task complexity variables along the resource-dispersing variables and the complexity of the output. Yet, the impact of other variables including "participant and participation factors" (Robinson, 2001a) which are known to affect the interaction among participants should be accounted for in further studies to come to conclusive remarks.

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## Appendices

### Appendix A
**Ur's (1996) scale for Oral Proficiency Interview (OPI)**

| **Accuracy** | | **Fluency** | |
|---|---|---|---|
| Little or no language produced | **2** | Little or no communication | **2** |
| Poor vocabulary, mistakes in basic grammar, a strong foreign accent | **4** | Very hesitant and brief utterances, sometimes difficult to understand | **4** |
| Adequate but not rich vocabulary, making obvious grammar slips, slight foreign accent | **6** | Good ideas across, but hesitantly and briefly | **6** |
| Good range of vocabulary, occasional grammar slips, slight foreign accent | **8** | Effective communication in short turns | **8** |
| Wide vocabulary appropriately used, virtually no grammatical mistakes, native-like or slight foreign accent | **10** | Easy and effective communication, uses long turns | **10** |

### Appendix B
1. **Task 1:** The subjects are given a map. They are required to tell how to go from point A to point B (Robinson et al., 1995).
2. **Task 2:** The subjects are given a map. They are required to go from a point to another, from "A" to "B," thinking up the route and describing it. Similar tasks have already been performed in the class by teacher (Robinson et al., 1995).
3. **Task 3:** The subjects are given a situation with which they are already familiar, but they are not given time to think of their production in advance. An instance of such a task is given here:

   *You are at school and you have an important exam in fifteen minutes. You suddenly think that you have not turned off the oven. Now explain to a friend who wants to help: how to get to your house, how to get into the kitchen and how to turn off the oven.* (Foster & Skehan, 1996)
4. **Task 4:** Suppose that you are a judge. You have four decisions to make. For

each decision, you must decide how long to send the accused to prison for. The maximum is real life sentence, the minimum is three months. You can also set her/him free.

*The accused is a doctor. He gave an overdose to an 85-year-old woman because she was dying painfully from cancer. The woman herself had asked for the overdose. The woman's family has accused the doctor of murder.* (Foster & Skehan, 1996)