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Task complexity and SL development: Does task complexity matter?

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Abstract

Over the past two decades, studying task design and performance conditions have become a burgeoning area of research within task-based language teaching, learning, and assessment. Research on SLA concentrated on tasks and investigated task difficulty, task complexity, task design, performance condition, and the effects they have on language learning and language performance (Foster & Skehan, 1996; Samuda & Bygate, 2005; Tavakoli, 2009; Gilabert, 2009; Ahmadian & Tavakoli, 2011; Salimi et al. in press). Among the factors one of the central issues in task-based language teaching concerns the influence of cognitive load of a task on oral and written linguistic performance in three domains of accuracy, fluency, and complexity. The main purpose of the paper is to analyze the results of the studies done on the topic and present the implications of knowledge of task complexity and cognitive load of a task for syllabus and task designers as well as language teachers as one of the most important factors that should be taken into account in selection, gradation, and sequencing of the material.

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1. Introduction

When second or foreign language learners speak or write, their speed of production and complexity of their utterances will be affected in different linguistic domains by many factors such as anxiety of the L2 learners, planning time, familiarity with the topic, genre of the tasks, learners' proficiency level, task type, task structure, task condition, and the degree of cognitive complexity of the tasks that they are trying to perform (Rahimpour 1997, 1999, 2008). In recent years, there have been a number of theoretical arguments that are put forward in the favour of task-based approaches to second language pedagogy (Candlin, 1987; Long & Crooks, 1992; Long, 1985; Prabhu, 1987; Rahimpour, 2009; Robinson, 1995; Ellis, 2005).

Besides, in ELT, there exists an argument that successful learning is influenced by appropriate methods of teaching which can be considered as one of influential factors in language learning. Since 1994 on the idea of TBLT

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has become a keen contemporary interest, the emphasis on TBLT is reflected in much current research that studies the characteristics of different kinds of activities and tasks (Skehan& Foster, 1999; Long, 1985).

A growing number of studies done in the field have investigated the effects of task complexity on L2 learners’ task performance as a result of using different variables of tasks. Furthermore, the majority of these studies (Ishikawa, 2006; Kuiken & Vedder, 2007, 2008; Rahimpour, 1997) examined the effects of task complexity on oral production of L2 learners across different linguistic domains of accuracy, fluency, and complexity.

Reviewing all these studies reveals the gap of studies in relation to written task performance. Thus, this thesis is an attempt to help the current literature in the field.

2. Literature review

2.1. Task-based Language Teaching


This approach to language teaching has attracted the attention of both SLA researchers as well as teacher educators such as Prabhu (1987) and Nunan (1989, 2004). Samuda and Bygate (2008) make this connection with educational theory quite vivid by arguing that:

‘Many of the principles underlying the design and use of what we call ‘tasks’ in second language pedagogy owe their genealogy to development in general education over the last century: p 18,’

Their work and also other educationalists such as Prabhu (1987) emphasize the effectiveness of TBLT in language development. TBLT challenges the mainstream views about language teaching in that it is based on the fact that language learning will develop most successfully and effectively if teaching aims simply to create context and condition in which learners’ natural language learning ability can be nurtured. However, there are critics that try to question the validity of approach (Sheen, 1994; Swan, 2005; Seedhouse, 2005).

Ellis (2009) defines TBLT as an approach for teaching second or foreign language that seems to engage learners in interactionally authentic language use language by getting learners to perform a series of tasks. This approach aims to enable learners to acquire a new language system as well as to proceduralize their existing knowledge. In other words, this approach tries to force L2 learners to use their own linguistic resources to learn a new language.

2.2. Four major areas of task investigation can be identified according to Robinson 2007:

1. A psychological, interactional approach influenced by the work of Long (1996)
2. Sociocultural approach, represented by the work of researchers like (Swain, 1998; Lantolf, 2000).
4. Structure-focused approaches, where tasks are designed to elicit the use of a particular structure feature (Van Patten, 1990).

Drawing upon the cognition, information-theoretic models of Skehan, 1998, and Robinson, 2007, the Cognition Hypothesis, (Robinson 2005a) claims that tasks should be designed and sequenced on the basis of task characteristics. Besides, recent research into task-based language learning and teaching and assessment argue that the cognitive complexity of a task influences the learners’ tasks performance.

2.3. Justification of the use of tasks in Research, Teaching and Learning

In justifying the use of task Long & Crookes (1992, p: 43) argue that:

It is claimed that (pedagogic) tasks provide a vehicle for the presentation of appropriate target language sample to learners- input which they will inevitably reshape via application of general cognitive processing capacities- and for the delivery of comprehension and production opportunities of negotiable difficulty (Long & Crooks, 1992: 43).

Long & Crookes (1992) are advocating the use of analytic syllabuses. The analytic syllabuses are those which offer the learner the target language samples that have not been controlled for structure or lexis in the traditional manner. Ellis (2003) in support of the use of the tasks as units of teaching points out that tasks are valid devices for preparing learners for authentic communication by helping the learners to proceduralize their pre-existing knowledge. Nobuyashi & Ellis (1993) also argue that tasks will help to develop L2 learners’ communicative skills contributing linguistic development. Rahimpour (2010) also argues that task-based language teaching is very motivating for language learners and it creates more favourable conditions for second or foreign language development. The great advantage of tasks is that they allow for learner engagement in realizing the communicative potential of the encoded semantic resource (Widdowson, 2003). Nunan (2004) and Rahimpour (2010) also pointed out that task-based language teaching is an approach to the design of language courses in which the point of departure is not an ordered list of linguistic items, but a collection of tasks. It draws on and reflects the experiential and humanistic traditions as well as reflects the changing conceptions of language itself.

2.4. Models of task complexity


2.4.1. Robinson’s Triadic Framework of task complexity

Robinson’s framework distinguishes three task components: task complexity, task conditions, and task difficulty shown in table 1.

<table>
<thead>
<tr>
<th>Task Complexity (cognitive factors)</th>
<th>Task Conditions (interactional factors)</th>
<th>Task Difficulty (learners factors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) resource-directing e.g., ± few elements + Here-and-Now + no reasoning demands</td>
<td>(a) participation variables e.g., open/closed one-way/two-way convergent/divergent</td>
<td>(a) affective variables e.g., motivation anxiety confidence</td>
</tr>
<tr>
<td>(b) resource-dispersing e.g., ± planning + single task + prior knowledge</td>
<td>(b) participant variables e.g., same/different gender familiar/unfamiliar power/solidarity</td>
<td>(b) ability variables e.g., working memory intelligence aptitude</td>
</tr>
</tbody>
</table>

Table 1. A triadic of task complexity, task conditions and task difficulty factors (Robinson, 2005: 5)
In a series of arguments advanced by Robinson, he proposed "comprehensive criteria" for determining task complexity (Robinson 2001, 2003, 2005, 2007; Robinson et al. 1995, 1996). It should be mentioned that his criteria, also called Triadic Componential Framework or The cognition Hypothesis, is not free of critique; Kuiken and Vedder (2007) have questioned the validity of the framework as being not empirically researchable and operationally feasible. Unlike Kuiken and Vedder (2007), the present researcher assumes some authority to this framework and believes that further research is needed to investigate some dimensions of the Cognition Hypothesis.

Robinson (2001) pointed out that the development of theoretically motivated, empirically substantiable, and pedagogically feasible sequencing criteria has long been acknowledged as a major goal of research aimed at operationalizing task-based approaches to syllabus design. To this end, he proposed distinctions between cognitively defined task complexity, learner perceptions of task difficulty, and the interactive conditions under which tasks are performed. Robinson (2001:29) strongly argued that Task Complexity is the result of the attentional, memory, reasoning, and other information processing demands imposed by the structure of the task on the language learner. These differences in information processing demands, resulting from design characteristics, are relatively fixed and invariant. Task complexity will aid explain within learner variance when performing any two tasks. It is, also, argued that the cognitively simpler tasks will involve a lower error rate, and/or be completed faster.

2.5. Task Complexity and Its Justification

Rahimpour (2002) lists three theoretical frameworks for task complexity. According to him, the theoretical framework for the proposed task complexity is based on research into first language acquisition (e.g., Brown & Bellugi, 1964), research findings from second language development (Meisel, 1987), and functional linguistic theory (Givon, 1989).


Robinson (2001, p: 29) defines task complexity as:

"Task complexity is the result of the attentional, memory, reasoning, and other information processing demands imposed by the structure of the task to the language learner. These differences in information processing demands, resulting from design characteristics, are relatively fixed and invariant."

Task complexity, differences in intrinsic cognitive processing demands of tasks, will explain within-learner variation in successfully completing any two tasks (such as doing simple addition versus calculus, or doing the simple versus complex intentional reasoning task (Robinson, 2007:210). Gilabert (2009) argues that research into sequencing is of significant importance since it may contribute to L2 development by drawing attention to form. He also argues that research into sequencing is minimal. There are many suggestions with very few findings. This unresolved issue deserves further researching. Furthermore, research agenda are interested in how cognition may lead to balanced development of fluency, accuracy, complexity, and acquisition. Ellis (2003:351) believes that task complexity is the extent to which a particular task is inherently easy or difficult. Different dimensions of task complexity are code complexity, cognitive complexity, and context dependency. Like Robinson (2001), Gilabert et al (2009), Ellis (2003) explains task complexity as 'within' learner variability. In other words, the variability is evident when the same learners perform different tasks.

2.6. Task complexity studies

Robinson (1995) investigated the impact of manipulating here-and-now on three different narratives. The results obtained proved that the most complex narrative, performed in displaced past time reference (there-and-then), elicited more accurate speech with more lexical complexity and greater dysfluency than the narrative performed in
the here-and-now task. The results also revealed no significant differences for structural complexity and propositional complexity.

**Ortega (1999)** studied whether planning time results in an increased focus on form. She found that planning condition led to more syntactic complexity and fluency in participants’ performance. The results provided support for the claim that planning before doing an L2 task can promote an increased focus on form since learners allocate conscious attention during pre-task planning to formal aspects of the language needed to perform a task. Ortega believes that the Planning time before the task has two facilitative impacts. First, planning time removes some of the cognitive load and communicative pressure of a given task. The second effect of planning is that it gives the learner time to assess task demands and necessary available linguistic resources and as a result, the learners’ attention is devoted to formal properties of the language.

**Foster & Skehan (1999)** studied the impact of source of planning and focus of planning on task-based performance. Results of the study indicated that the teacher-led condition made significant effects on accuracy whereas the solitary planning condition led to more complexity, fluency and turn length. Group-based planning did not lead to performance significantly different from the control group. Finally, there was little effect on performance as a result of the language vs. content planning condition.

**Skehan & Foster (1999)** investigated the effects of task structure and processing load on L2 learners’ performance on a narrative retelling task. One of the chosen tasks represents a relatively structured narrative (restaurant) and the other one represents a relatively unstructured narrative (golf). The authors believe that the structure of the first task comes from the consensus view of the stages one follows when visiting a restaurant; the sequence of actions is predictable. They also mention that the lack of structure for the second task derives from the unpredictability of the sequence of events and the lack of their interconnectedness. Four conditions were used to influence the processing load of the task. In the first condition the participants were shown the video and asked to describe the story as they watched it. In the second condition, the participants were told the outline of the story before watching the video. Then they were asked to describe the story as they watched it. In the third condition, the participants watched the video first and then they were asked to describe the story as they watched it again. In the fourth condition, the participants watched the video and then retold it in their own time. The results of the collected data showed that the structured task generated more fluent speech in all four conditions. The complexity of language was influenced by processing load; greater complexity was attained when a non-simultaneous condition (fourth condition) was involved. For accuracy, neither task nor condition showed significant effects.

**Iwashita, et al. (2001)** tried to answer this question: Are different task characteristics and performance conditions (involving assumed different levels of cognitive demand) associated with different levels of fluency, complexity, or accuracy in test candidate responses? They were required to produce oral narratives from picture strips that had been designed to differ in their cognitive demands. These four dimensions of task were considered: adequacy (whether the set of pictures was complete or incomplete); immediacy (here-and-now task or there-and-then task); perspective (whether the participant was speaking as if the story had happened to him / her or not) and planning time (as either 3.5 minutes or 0.5 minute). No significant effect for any of the measures (accuracy, fluency and complexity) was found, with the single exception of an effect for accuracy in the immediacy dimension.

**Robinson (2001)** found that complex tasks elicited less fluent, but more accurate and complex production than the simple tasks. The result obtained supports Robinson’s argument that the increase in task complexity will push learners’ oral production and facilitate language development by channeling their attention towards more complex discourse to meet the linguistic and functional demands imbedded in a particular task.

**Yuan & Ellis (2003)** studied the effect of pre-task and on-line planning on learners’ monologic oral production. Planning was operationalized at three levels: no planning, pre-task planning in which the participants had 10 minutes to plan, and on-line planning in which they had unlimited time to narrate the story. The results indicated that pre-task planning enhanced grammatical complexity, lexical variation and fluency while on-line planning positively influenced accuracy and grammatical complexity. However, the pre-task planning led to more fluent and lexically varied language than the on-line planning and the language produced by the two planning group (pre-task
planning and on-line planning) was equally grammatically complex. Additionally, the on-line planning led to more accurate language than pre-task planning.

Ishikawa (2006) examined the effect of task complexity and language proficiency on task-based writing performance. Task complexity was manipulated along here-and-now / there-and-then dimension. The results showed that increasing task complexity for high-proficient learners had positive effects on accuracy, structural complexity and fluency, though; it had negative effects on lexical complexity. The results of increasing task complexity for low-proficient learners, however, showed the positive effects on accuracy, fluency, lexical and structural complexity.

Gilabert (2007) studied the effects of manipulating of the cognitive complexity of L2 oral tasks on self-repair behaviour during monologic production. He used three different types of tasks in the study. The narrative task was manipulated along here-and-now / there-and-then, an instruction-giving task was manipulated along few elements / many element and decision-making task was manipulated along with / without reasoning demands. The results demonstrated the effect of task complexity on self-repairs behaviour across task types, with different behaviours existing among the three task types. In this study similar pattern of behaviour was observed under simple and complex performance. In performing simple tasks learners made more errors and repaired more frequently. Furthermore, learners made a large proportion of errors in the narrative task than in instruction-giving task and decision-making task. Therefore, the narrative task produced the highest rate and amount of self-repairs of the three tasks.

Kuiken & Vedder (2007) investigated the effects of cognitive task complexity on written production for accuracy and lexical variation by using specific measures of writing proficiency regarding the type of errors made by the students and the frequency band of the words they used. Task complexity was manipulated along two variables of Robinson’s Triadic Componential Framework, the number of elements and reasoning demands. The results showed that both students of Italian and French produced fewer lexical errors in the complex task. However, the students of French made significantly more Appropriateness and Other errors in complex tasks than in simple tasks. In addition, the students of Italian used more high frequent words in complex task whereas the students of French used more infrequent words in complex task.

Michel, et al. (2007) were concerned with the effects of changes in task complexity, few elements / many elements, and task condition, monologic / dialogic, on L2 oral performance. The analysis of collected data showed that increased task complexity promoted accuracy but affected fluency negatively and linguistic complexity was to some extent affected. Dialogic tasks generated more accurate and fluent but less structurally complex output. Moreover, in the monologic condition task complexity promoted accuracy.

Rahimpour (2007) studied the effect of task complexity on L2 learners’ oral performance. The results showed that there-and-then task (complex task) led to more accuracy while here-and-now task (simple task) led to more complexity. In terms of fluency, here-and-now task led to more fluency than there-and-then task.

Robinson (2007) examined the effects of increasing the cognitive demands of second language tasks requiring reasoning on both speech production in terms of accuracy, fluency and complexity and the learning opportunities in terms of interaction and uptake. The results showed that task complexity led to more complex speech assessed using specific measures but it did not affect accuracy, fluency, and complexity assessed using general measures. In addition, tasks requiring complex reasoning led to significantly more interaction and uptake.

Ishikawa (2008) investigated the impacts of manipulating task demands of intentional reasoning on L2 speech performance. Three types of tasks were used: simple reasoning task, complex reasoning task, and no reasoning task. The results showed that intentional reasoning had positive effects on syntactic as well as lexical complexity and accuracy, but it had a negative effect on fluency.

Kuiken & Vedder (2008) studied the effect of cognitive task complexity on written output in Italian and French as a foreign language. The participants transacted on two writing tasks with prompts of differing cognitive
complexity. In their study cognitively more demanding task produced more accurate but it had no effect on the written output in terms of syntactic complexity and lexical variations.

Gilabert. et.al (2009) studied the effects of manipulating cognitive complexity across task types and its impact on learners’ interaction during oral performance. The result of the study concerning decision-making tasks proved no significant differences between accuracy of the learners’ performance on the two tasks. Gilabert and his colleagues attributed the result to the open nature of the decision-making task types.

Kim (2009) investigated the effects of task complexity on learner-learner interaction of students with different proficiency levels. Task complexity was manipulated along with / without reasoning demands and few elements / many elements. Tasks were two-way tasks which require interaction between participants. The findings of the study showed that task types and learner proficiency are important factors affecting the impact of task complexity on L2 learning opportunities.

Yousefi (2009) examined the effect of task complexity on L2 learners' uptake. He used two versions of simple and complex tasks of a decision-making type. The results of the study obtained showed that the rate and success of uptake in complex task were comparatively higher than its simpler version.

Mehrang & Rahimpour (2010) studied the effects of task structure and planning time on oral performance of EFL learners in terms of accuracy, fluency, and complexity of 64 upper-intermediate learners of English as a foreign language. Results indicated that planning time had no effects on the accuracy and fluency of the learner performance. However, it led to more complex performances when participants performed the unstructured, complex task. On the other hand task structure did not affect the accuracy and complexity of the learners while promoting the fluency under planned conditions.

Hosseini &Rahimpour (2010) investigated the effects of task complexity on L2 learners' written performance on narrative pictorial tasks of here-and- now and there-and- then. The results of the study demonstrated that cognitively more demanding task (there-and- then) were more fluent, but no significant effects on written narratives were observed on measures of accuracy and complexity.

Ong &Zhang (2010) based on Robinson's (2001, 2003) cognition hypothesis and Sheehan's (1998) Limited Attention Capacity Model, this study explored the effects of task complexity on fluency and lexical complexity of 108 EFL students argumentative writing. Task complexity was manipulated using three factors of planning time, provision of ideas and macro-structure, and the availability of drafts. The results of the study showed that: 1.increasing task complexity with respect to planning time continuum produced significantly greater fluency.2.increasing task complexity through the provision of ideas & macro-structure produced significantly greater lexical complexity but no effects on fluency.3.increasing task complexity through the availability of draft produced no significant differences in fluency, and lexical complexity.

Ahmadian & Tavakoli (2011) studied the effects of simultaneous use of careful online planning and task repetition on L2 learners' oral performance in terms of three linguistic domains of accuracy, fluency, and complexity. It was shown that participants in careful online planning groups spent more task completion than those in pressured online planning (control) groups did, and the differences proved to be statistically significant. The findings of this study provides further evidence in support of the limited and selective nature of attention capacity in that L2 learners who have used more time for task completion have produced more accurate language than those who have performed the task under time restriction. Furthermore, it lends support to Skehan's (1988) dual-model system proposal. Skehan argued that "rule-based system is likely to be parsimoniously and elegantly organized, with rules being compactly structured (p: 89)". The findings of the study also indicated a high level of positive impact upon complexity in EFL oral production. The finding of this study is in line with Yuan & Ellis's (2003) findings.

2.7. Research into Task Complexity and Second Language Development

Robinson's Cognition Hypothesis (2001, 2003, 2005, 2007) claims that increasing the cognitive demands of tasks along certain dimensions will; (a) push learners to greater accuracy and complexity of L2 production in order to
meet the greater functional and conceptual communicative demands they place on the learner; (b) promote interaction, and heightened attention to and memory for input, so increasing learning from the input; as well as (c) longer term retention of input; and that (d) performing simple to complex sequences will also lead to automaticity and efficient scheduling of the components of complex L2 task performance.

More importantly, the Cognition Hypothesis predicts that along resource-directing dimensions more interactive complex tasks will result in greater amounts of interaction, and negotiation for meaning. Following Long (1996), it claims that such negotiation provides a content for attending to problematic forms in the input and output, and additionally that on complex versions of tasks, there will be greater attention to, and uptake of forms made salient during provision of reactive Focus on Form techniques such a recasts. Alternatively, where proactive Focus on Form is provided, for example in the form of pre-modified input to the task, then it similarly claims there will be greater use of this on complex, versus simpler task versions (Robinson & Gilabert, 2007).

Many TBLT research studies have investigated oral language production and, accordingly, there is a paucity of task-based research on written language production (Ong & Zhang, 2010). In reviewing task complexity studies on written language production, most of the studies have examined the effects of manipulating the resource-directing factors (Kuiken & Vedder, 2007, 2008) than resource-dispersing factors (Yuan & Ellis, 2003). For resource directing factors, studies which have provided partial empirical support to Robinson's Cognition Hypothesis, are Kuiken & Vedder (2007, 2008), and Ishikawa (2006).

The general findings of the studies done by Kuiken & Vedder (2007, 2008) supported the improvement of accuracy of SL development. Ishikawa (2006) examined the effects of manipulating task complexity with respect to here-and-now & there-and-then and he found that increasing task complexity with respect to here-and-now dimension increased the accuracy, fluency, and complexity of written language production. Kellogg (1996) investigated the effects of outlining on L2 learners' accuracy and fluency. He found that fluency greatly increased. With respect to L2 writing, Yuan & Ellis, (2003) studied the effects of pre-task planning, on-line planning, and no-planning on accuracy, fluency, and complexity of Chinese Narration writings. They found that pre-task planning led to increased fluency and syntactic variety, on-line planning led to increased accuracy. Kang (2005) reported the results of the study done on pre-task planning on L2 learners' written performance. Pre-task planning produced greater fluency and complexity of the learners.

3. Conclusion and pedagogical implications

The present paper has a number of pedagogical implications for Second Language Acquisition (SLA) researchers, teachers, syllabus and task designers, and language testing specialists. The major problem in Task-based Language Teaching and syllabus designing is to determine a valid criterion for grading and sequencing tasks. Task complexity as argued by Robinson (2007) can be considered as a valid criterion for grading pedagogical tasks in terms of their cognitive complexity. Therefore, the findings of the study can be used as empirical basis for selecting, grading, and sequencing tasks. Moreover, the findings of the current study suggest that teachers should take into account the cognitive capabilities of the learners as well as the cognitive load of the structure of the task that imposes on the learner while teaching. As Pieneman (1985), Rahimpour (2002) argued tasks should match the learners' built-in syllabus. In other words, teachability and learnability should be taken into account while designing and assigning tasks to the learners. Task complexity can be manipulated for the purpose of matching with learners' developmental sequence and their proficiency level. The testers also should consider the cognitive complexity of a task while designing a task for assessment purposes. The pedagogical implications of the present study for SLA researcher is that research on task complexity can shed light on the nature of processes involved in second language acquisition and interlanguage development while performing a task. As Ellis (2009) argued TBLT has attracted the attention of a number of SLA researchers since it is a bridge between the theory of second language acquisition and actual language teaching.

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