

Second Language Task Complexity

Researching the Cognition Hypothesis
of language learning and performance

Edited by
Peter Robinson

Task-Based Language Teaching

2

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Peter Robinson

Series editors' preface to Volume 2

With this, the second volume in the series *Task-Based Language Teaching: Issues, Research, and Practice*, we are happy to feature a cutting-edge collection of theoretical-empirical work on the Cognition Hypothesis of task-based language learning. Dating to the mid-1990s, though with antecedents in earlier observations of task-based interaction and second language acquisition, one of the major, and steadily increasing, areas of interest in task-based research has been the possibility that task design may interact with human cognitive response in creating distinct opportunities for language learning. It is very appealing to think that the considered adjustment of the features and conditions of tasks might lead to predictable effects on language production, participant interaction, attention and awareness, feedback, uptake, affect, and so on. With reliable frameworks for estimating task-related cognitive complexity, and the specification of likely effects on language performance and opportunities for learning, teachers, syllabus designers, and testers would be provided with a critically valuable tool for selecting, sequencing, and implementing task-based curriculum, pedagogy, and assessment. And indeed, early work at this interface showed rather clearly that adjusting aspects of tasks – planning time, presence or absence of task stimuli, number and type of elements or interlocutors – did seem to affect what learners did, said, and potentially learned, as a result of their engaging in certain kinds of pedagogic tasks.

However, the devil is in the details, and the viability of such task-complexity frameworks was quickly challenged as soon as we began to ask: which aspects of tasks are predictably related to what cognitive responses for what types of learners under what performance conditions and leading to precisely what language production and acquisition outcomes? Luckily, in the 1990s several major thinkers within the field, Peter Robinson and Peter Skehan chief among them, took it upon themselves to not only launch long-term research agendas investigating exactly these questions, but also to delve into contemporary developments in cognitive psychology and thereby found rigorous and well-informed theoretical accounts for the kinds of phenomena being observed. Over the intervening two decades, cognitive approaches to researching and explaining task-based language learning have been, without doubt, the major focus of task-based research. This work has clearly impacted the theoretical status quo, in that we have robust (if competing) hypotheses about the cognitive complexity of tasks and their relationship with language production and learning, and these hypotheses are beginning to receive systematic testing in a variety of research settings and languages. Furthermore, the work has produced enough in the way of trustworthy observations to begin to be translated into educational practice, in the form of task sequencing

decisions in language materials, pilot syllabi for diverse learning contexts, and frameworks for modeling certain kinds of language test performance. Nevertheless, considerable work remains to be done if the objective is to create a fully functional theory of cognitive task complexity, language production, and language learning, which then may be applied judiciously in educational design and practice.

Edited by Peter Robinson, the creator of the Cognition Hypothesis of task-based language learning, the current volume accomplishes important advances in several of these dimensions. Robinson's introductory chapter cogently reviews the theoretical foundations of this approach to cognitive task complexity, providing important and insightful updates on parallel developments in thinking about tasks and learning from other disciplines. In addition, Robinson provides very clear explanations and examples for the basic assumptions of his hypothesis and the triadic framework of task complexity, conditions, and difficulty, leading to specific predictions about how adjusting task complexity may influence language production and opportunities for learning. Two additional chapters in the first part of the book sketch out interesting and well-argued approaches to tasks and L2 speech production as well as the measurement of language accuracy in learner performance. The remaining nine chapters all present empirical studies of various aspects of the Cognition Hypothesis, with part two looking into the influence of mode of L2 production on apparent task complexity effects, part three addressing the effects of differentiating task complexity on learner interaction and acquisition, and part four presenting new research into learner individual differences and the relationship with task complexity and performance.

Taken together, these collected chapters present a formidable advance in our theoretical and empirical understandings of key phenomena in task-based language learning. To their credit, the contributors turn a critical eye to their own theoretical assumptions, and the findings do not all necessarily support the hypothesized predictions. However, they do all shed new light on fundamental characteristics of pedagogic tasks typical to many communicative and task-based classrooms. As such, they push even further the boundaries of what we now know about cognitive aspects of task design, and they may enable much more detailed translation of theoretical ideas into implications for practice. It is, therefore, perhaps not overly ambitious to suggest that a next phase in this particular research agenda would turn to the reality-embedded investigation of cognitive task complexity as one aspect of TBLT educational design and implementation, in intact classrooms, across diverse educational contexts, and on the kind of time scale that defines educational syllabi. Certainly, it will be only through such ecologically valid research that the ultimate contribution of these important ideas – in interaction with the variety of other factors at play in long-term and otherwise complex language teaching and learning – will be realized. We look forward to featuring such work in a future volume of this series. The development of an empirically grounded TBLT is a complex and long term project, for which this volume is a welcome and challenging contribution.

John M. Norris, Martin Bygate, Kris Van den Branden

Table of contents

List of contributors	VII
Acknowledgements	IX
Series editors' preface to Volume 2	XI
 PART 1. Cognition, task complexity, language learning, and performance – theoretical and methodological issues	
Chapter 1. Second language task complexity, the Cognition Hypothesis, language learning, and performance <i>Peter Robinson</i>	3
Chapter 2. Speech production and the Cognition Hypothesis <i>Judit Kormos</i>	39
Chapter 3. Corpus-driven methods for assessing accuracy in learner production <i>Stefanie Wulff and Stefan Th. Gries</i>	61
 PART 2. Researching the effects of task complexity across task types and modes of L2 performance	
Chapter 4. Task complexity and linguistic performance in L2 writing and speaking: The effect of mode <i>Folkert Kuiken and Ineke Vedder</i>	91
Chapter 5. Manipulating task complexity across task types and modes <i>Roger Gilabert, Julia Barón and Mayya Levkina</i>	105
 PART 3. Researching the effects of task complexity on L2 interaction, modified output, and uptake	
Chapter 6. Effects of task complexity and interaction on L2 performance <i>Marije C. Michel</i>	141
Chapter 7. Task complexity, modified output, and L2 development in learner-learner interaction <i>Ana-María Nuevo, Rebecca Adams and Lauren Ross-Feldman</i>	175
Chapter 8. Task complexity, uptake of recasts, and L2 development <i>Andrea Révész, Rebecca Sachs and Alison Mackey</i>	203

PART 4. Researching the influence of learner characteristics and perceptions on simple and complex L2 task performance

Chapter 9. When individual differences come into play: The effect of learner creativity on simple and complex task performance	239
<i>Ágnes Albert</i>	
Chapter 10. Working memory capacity and narrative task performance	267
<i>Judit Kormos and Anna Trebits</i>	
Chapter 11. Task complexity, language anxiety, and the development of the simple past	287
<i>YouJin Kim and Nicole Tracy-Ventura</i>	
Chapter 12. Examining the influence of intentional reasoning demands on learner perceptions of task difficulty and L2 monologic speech	307
<i>Tomohito Ishikawa</i>	
Author index	331
Subject index	337

PART 1

**Cognition, task complexity, language
learning, and performance**

Theoretical and methodological issues

CHAPTER 1

Second language task complexity, the Cognition Hypothesis, language learning, and performance

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This chapter provides an overview of pedagogic and theoretical issues that have motivated recent research into second language task complexity. The first two sections describe how procedures for task analysis, and decisions about task complexity, can be accommodated in task-based language teaching program design. The third section describes a componential framework for analysing task demands. This framework distinguishes between cognitive factors contributing to Task Complexity, interactive factors involved in performing tasks under various Task Conditions, and the learner factors affecting perceptions of Task Difficulty. The fourth section describes five ancillary predictions the Cognition Hypothesis makes about how increasing task complexity leads to measurable increases in task-based learning and performance. The final sections describe how studies of these predictions have typically been measured, to date, and a rationale for investigating the effects on task-based learning of individual differences in learners' cognitive abilities and affective dispositions. The chapter concludes by briefly summarising the organization of the chapters in this book and the empirical findings they report.

Introduction: Task analysis, task characteristics and task complexity

The chapters in this volume are all concerned with researching the effects of the complexity of second language (L2) tasks and with drawing conclusions about the extent to which varying the complexity of tasks affects language learning and performance in measurable ways. Each of the empirical studies of the effects of task complexity operationalises one or more of the characteristics listed in a componential taxonomy, the Triadic Componential Framework (TCF, see Figure 1), which is described in detail in the following sections of this chapter. Each study also weighs evidence for and against some of the theoretical claims of the Cognition Hypothesis: for example, that complex tasks should promote more accurate and complex, though less fluent, language than

simpler counterpart tasks, and that complex tasks promote more interaction, greater attention to, uptake and learning of information provided in the input to task performance than simpler tasks (Robinson, 2001a, 2001b, 2003b, 2005a). These claims, rationales for them, and descriptions of some of the measures typically used to date in empirical research into task complexity are also described in more detail in later sections of this chapter. In light of the findings they report, implications are drawn from the various empirical studies in this book concerning the basic pedagogic claim of the Cognition Hypothesis, that tasks should be sequenced for learners from simple to complex in order to promote success in performing complex tasks in the L2, as well as opportunities for further L2 learning and interlanguage development.

Task analysis and task-based program design

Two important aims of the research described in this book are to deepen our understanding of how task characteristics can affect the second language acquisition (SLA) *processes* involved in learning while attempting to meet the challenges certain tasks set, as well as our understanding of how task demands can affect *variation* in the quality and quantity of L2 speech and writing produced during task performance. Such information will be important to accommodate in broad cognitive-interactionist theories of SLA (e.g., Ortega, 2007), and important too for test-designers concerned to elicit levels of L2 performance that most accurately characterize learners levels of proficiency (e.g., Iwashita, Elder, & McNamara, 2001). For example, researchers exploring the potential benefits for SLA processes of the opportunities for interaction that task-based language teaching provide (e.g., Mackey, 2007; Mackey & Gass, 2006), generally agree on the following:

- Tasks provide a context for *negotiating* and *comprehending* the meaning of language provided in task input, or used by a partner performing the same task.
- Tasks provide opportunities for *uptake of* (implicit or explicit) *corrective feedback* on a participant's production, by a partner, or by a teacher.
- Tasks provide opportunities for *incorporation of premodified input*, containing 'positive evidence' of forms likely to be important to communicative success, and which may previously have been unknown or poorly controlled.
- Tasks provide opportunities for *noticing the gap* between a participant's production and input provided, and for *metalinguistic reflection* on the form of output.

However, it is likely that the *cognitive demands of pedagogic tasks* that provide these opportunities for learning during interaction will also affect the extent to which learners capitalize on them. The Cognition Hypothesis makes claims about how the cognitive complexity of tasks affects the extent of interaction, and the learning that accrues from it, when performing tasks individually, or in a sequence of progressively more cognitively complex tasks.

Although they are not often performed in interaction with others, *language testing tasks* (e.g., those aimed at gauging the extent of a learner's achievement in a language program, or the level of proficiency of an L2 user) also need to accommodate differences between the complexity of parallel versions of tasks designed to meet these purposes, so as to ensure comparability of findings across a population using multiple versions of these tasks. With regard to achievement, it is important that the level of complexity of the testing task be consistent across versions of it, and with regard to proficiency, it is important that the demands of testing tasks be incrementally increased in some principled way, so as to distinguish between more and less proficient populations of L2 users.

The main pedagogic aim of the Cognition Hypothesis, however, is not to provide a metric to enable language testers to ensure the comparability of tasks used to measure achievement, or to adjust differences in task demands so as to measure different levels of proficiency more distinctly – rather it aims to provide a rationale for how to *sequence* tasks in such a way as to lead to learning, and to different levels of L2 performance in language programs.

Within the context of Task-Based Language Teaching (TBLT) program delivery (e.g., Skehan, 2003; Van den Branden, 2006; Van den Branden, Bygate, & Norris, 2009) it is essential that we understand the nature of the tasks that learners will be performing, in order to design instruction that will support learning, across sequences of tasks, and within the time programs allocate for performing them. Task analysis is probably the most important part of instructional design, for L2 learners, as it is for other learner populations with other learning targets, as has long been argued:

If I were faced with the problem of improving training, I should not look for much help from the well known learning principles like reinforcement, distribution of practice, response familiarity, and so on. I should look instead to the technique of task analysis, and the principles of component task achievement, intratask transfer, and the sequencing of subtask learning to find those ideas of greatest usefulness in the design of effective learning. (Gagne, 1962, p. 90)

Partly prompted by Gagne's thoughts on instructional design (e.g., Gagne, 1977) there are now a number of different approaches to analyzing tasks in order to identify characteristics that can be most useful in promoting learning (see Hoffman & Militello, 2009; Jonassen, Tessmer, & Hannum, 1999). These have been adopted by instructional designers in a wide variety of content domains, such as programs of instruction for trainee air traffic controllers (Wickens, Mavor & McGee, 1997) or management trainees (McGrath & Tschan, 2004), and these different approaches to task analysis are most often used at different stages of program development and delivery of task-based instruction.

In behavior descriptive approaches to analyzing and classifying tasks, categories of tasks are based on observation (both participant and non-participant) and descriptions (which may be elicited by structured, or unstructured interviews from job performers, supervisors, and so on) of what people actually *do* while performing a task – including the typical patterns of interaction participants engage in, the use they make of resources such as media tools, and the time tasks typically take to complete.

Task complexity (Cognitive factors)	Task condition (Interactive factors)	Task difficulty (Learner factors)
(Classification criteria: cognitive demands)	(Classification criteria: interactional demands)	(Classification criteria: ability requirements)
(Classification procedure: information-theoretic analyses)	(Classification procedure: behavior descriptive analyses)	(Classification procedure: ability assessment analyses)
Sub categories:	Sub categories:	Sub categories:
a. resource-directing variables making cognitive/conceptual demands	a. participation variables making interactional demands	a. ability variables and task relevant resource differentials
± here and now (Gilbert, 2007)	± open solution (Lambert & Engler, 2007)	h/l working memory (Mackey et al., 2002)
± few elements (Kuiken et al., 2005)	± one way flow (Pica et al., 1993)	h/l reasoning (Stanovitch, 1999)
± spatial reasoning (Becker & Carroll, 1997)	± convergent solution (Duff, 1986)	h/l task-switching (Monsell, 2003)
± causal reasoning (Robinson, 2005a)	± few participants (Crookes, 1986)	h/l aptitude (Robinson, 2005b)
± intentional reasoning (Ishikawa, 2008)	± few contributions needed (McGrath, 1984)	h/l field independence (Skehan, 1998)
± perspective-taking (MacWhinney, 1999)	± negotiation not needed (Gass & Varonis, 1985)	h/l mind-reading (Langston et al., 2002)
b. resource-dispersing variables making performative/procedural demands	b. participant variables making interactant demands	b. affective variables and task relevant state-trait differentials
± planning time (Skehan, 1998)	± same proficiency (Yule & MacDonald, 1990)	h/l openness (Costa & Macrae, 1985)
± prior knowledge (Urwin, 1999)	± same gender (Pica et al., 1991)	h/l control of emotion (Mayer et al., 2000)
± single task (Robinson et al., 1995)	± familiar (Plough & Gass, 1993)	h/l task motivation (Dörnyei, 2002)
± task structure (Skehan & Foster, 1999)	± shared content knowledge (Pica et al., 1993)	l/h anxiety (MacIntyre & Gardner, 1994)
± few steps (Fleishman & Quaintance, 1984)	± equal status and role (Yule & MacDonald, 1990)	h/l willingness to communicate (MacIntyre, 2002)
± independency of steps (Romiszowski, 2004)	± shared cultural knowledge (Brindley, 1987)	h/l self-efficacy (Bandura, 1997)

Figure 1. The Triadic Componential Framework for pedagogic L2 Task Classification – Categories, Criteria, Analytic procedures, and Characteristics. Adapted by permission from Robinson, P. (2007). Criteria for classifying and sequencing pedagogic tasks. In M. Pilar Garcia-Mayo (Ed.), *Investigating Tasks in Formal Language Learning*, (Chapter 1, pp. 7–27). Multilingual Matters. Key: h = high, l = low. Note: References given are to empirical studies describing how task complexity, task condition, or task difficulty variables were operationalised in studies of their effects on task-based L2 learning and performance, or to helpful descriptions of these variables where empirical studies of their effects are not currently available

Examples of these approaches are behavioral typology analysis (Williams, 1977); classification of common denominators of task performances required across industrial or other workplace jobs (McCormick, 1979); descriptions of jobs on the basis of worker functions or behaviors (Fine, 1974); and activity analyses of task performance in various contextual settings (Nardi, 1996). These approaches to analyzing tasks, their interactional demands, and the subtasks and steps needed to perform them (together with a sampling of target domain discourse), are important at the Needs Analysis stage and level of Figure 2, as input to L2 course design, and also to performance-referenced testing of abilities to accomplish tasks or constituent sub-tasks to some criterion measure of success (e.g., Gagne, Waver, Golas, & Keller, 2005; Long, 2005; Long & Crookes, 1992; Munby, 1978; Norris, 2009; Norris, Brown, Hudson, & Yoshioka, 1998; Van Avermaet & Gysen, 2006).

Information-theoretic approaches adopt a different level of description, analyzing and classifying task demands in terms of information processing stages, and the cognitive processes involved in mediating between input to the task performer and the output and interaction required for successful task completion. These approaches have often been used as a basis for task classification and sequencing in a number of educational domains, in line with principles described in one or another instructional design theory (see Reigeluth & Carr-Chellman, 2009). Distinctions between the cognitive demands that certain tasks make have also been variously argued to influence task-based L2 learning, and to have implications for task sequencing and syllabus design (Bygate, Skehan, & Swain, 2001; Candlin, 1987; Duran & Ramaut, 2006; Johnson, 1996; Long, 1985; Prabhu, 1987; and see Ellis, 2003, and Samuda & Bygate, 2008, for review). Perhaps the most widely-cited and influential proposal for how the cognitive demands of tasks can be classified and manipulated during L2 instruction is that of Peter Skehan (e.g., 1998, 2009).

Skehan's (1998) 'Limited Capacity Hypothesis' claims that more cognitively demanding tasks "consume more attentional resources...with the result that less attention is available for focus on form" (p. 97), and therefore that sequencing tasks from less to more demanding optimizes opportunities for attention allocation to language form (thereby promoting opportunities for task-based language learning). In the framework for task-based instruction Skehan (1996, 1998) has described, task design is also seen

as a means to promote ‘balanced language development’ in the areas of accuracy, fluency and complexity of production. This can be done because certain task characteristics “predispose learners to channel their attention in predictable ways, such as clear macrostructure towards accuracy, the need to impose order on ideas towards complexity, and so on” (Skehan, 1998, p. 112). However, due to scarcity of attentional resources, tasks can lead either to increased complexity, or accuracy of production, but not to both. Skehan (1998) therefore recommends that tasks should be sequenced by choosing those with characteristics that lead to fluency, accuracy and complexity, at an appropriate level of task difficulty, as determined by three factors: (1) *code complexity*, which is described in ‘fairly traditional ways’, as in descriptions of structural syllabuses, or developmental sequences (p. 99); (2) *cognitive complexity*, which is the result of the familiarity of the task, topic or genre, and the processing requirements; information type, clarity and organization, and amount of computation required; and (3) *communicative stress*, which involves six characteristics including time pressure, number of participants, and opportunities to control interaction. These characteristics, Skehan (2002) argues, can be manipulated during task design, and by teachers using tasks “to orient learners away from simply focusing on meaning, but also push them to extending and at the same time achieving greater control over the language” (p. 293).

As Figure 2 illustrates, one major outcome of analyses of the cognitive demands of tasks could be a decision about how to design and sequence pedagogic L2 tasks so as to gradually approximate the complexity of targeted real world task performances identified by behavior descriptions at the needs-identification stage of course design. This is not an objective of Skehan’s proposal for task-based instruction – he is concerned with how tasks should be designed and sequenced to foster increases in ‘generic’ L2 accuracy, complexity and also fluency, independently of any domain of use outside a language program that requires particular levels of these.

A third approach to task classification, the ability requirements approach, classifies tasks in terms of the human cognitive abilities required to perform them effectively (Carroll, 1993; Robinson, in press; Snow, 1994). This is important at the third stage of program delivery illustrated in Figure 2. Clearly, L2 learners differ in their strengths in abilities drawn on during information processing (such as working memory capacity), and these differences, as well as differences in the information processing demands of pedagogic tasks themselves, will affect the outcomes of pedagogic task performance for individuals. Research into interactions between L2 learner’s cognitive processing abilities, their motivational and affective dispositions, and the demands of tasks has begun to be systematically approached in recent years (e.g., Baralt, 2010; Dörnyei, 2002; Mackey, Philp, Egi, Fujii, & Tatsumi, 2002; Robinson, 2002a, 2005b), and this focus will be important to identifying aptitudes for different kinds of task performance and L2 processing, and so to matching learners to, or supporting performance on, various pedagogic task types and practice sequences.