

COGNITIVE LOAD THEORY AND HIERARCHICAL TASK SYSTEM IN ENGLISH LANGUAGE CLASSES

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Abstract. This article analyzes the application of Cognitive Load Theory (CLT) in English language classes and the design of a hierarchical task system. The study examines the three types of cognitive load – intrinsic, extraneous, and germane – their interrelation, their impact on working memory capacity, and the principles of sequencing tasks from simple to complex. Based on J. Sweller's Cognitive Load Theory, P. Robinson's Cognition Hypothesis and Triadic Componential Framework (TCF), and the revised version of Bloom's Taxonomy, a hierarchical task model for English language classes was developed. The research results show that correctly sequencing tasks according to their cognitive complexity enhances the quality of students' language production, reduces cognitive overload, and ensures learning effectiveness.

Keywords: cognitive load theory, hierarchical tasks, English language teaching, working memory, Bloom's taxonomy, cognition hypothesis, task sequencing, cognitive complexity.

Introduction

In the process of teaching English, students' working memory capacity is limited, and if the amount of information processed simultaneously exceeds a certain level, learning effectiveness decreases. In modern educational settings, the increasing complexity of linguistic input often leads to cognitive overload, which negatively affects students' comprehension and retention. Therefore, the issue of hierarchically sequencing tasks according to their cognitive complexity in English language classes is becoming particularly relevant.

Cognitive Load Theory (CLT) was developed by J. Sweller and is based on knowledge of human cognitive architecture and evolutionary psychology. The theory can be applied to provide practical guidelines for teaching all aspects of language learning, particularly second language acquisition. The purpose of this article is to analyze the practical application of Cognitive Load Theory in English language classes, to identify the principles of designing a hierarchical task system, and to develop an effective instructional model.

Basic Concepts of Cognitive Load Theory

Cognitive Load Theory divides knowledge into biologically primary and secondary types. Primary knowledge is knowledge that is easily acquired during human evolution, such as listening and speaking in one's native language. Secondary knowledge, on the other hand, requires special instruction and conscious effort, and most aspects of foreign language learning fall into this category.

Human cognitive architecture consists of working memory and long-term memory. Working memory is limited in capacity and duration when dealing with new information, but it operates virtually without limits when dealing with familiar information retrieved from long-term memory. It is precisely this limitation that is the key factor in designing tasks in English language classes.

Cognitive Load Theory distinguishes three types of load:

Intrinsic cognitive load – arises from the inherent complexity of the learning material and depends on the number of interacting elements. In English language classes, the interrelation of grammatical rules, syntactic structures, and lexical units determines intrinsic load.

Extraneous cognitive load – arises from the improper presentation of learning material and does not contribute to learning. For example, presenting text, audio, and visual information simultaneously in a distracting manner increases extraneous load.

Germane cognitive load – is the effective load aimed at helping students form schemas (knowledge structures) and should be encouraged during instruction.

Cognitive Load and Working Memory: Constraints in Language Learning

In English language classes, students are forced to perform several cognitive tasks simultaneously: listening, comprehending, formulating grammatically correct sentences, and pronouncing them. These parallel processes demand the limited resources of working memory. Research shows that working memory supports listening comprehension, retention of lexical units, and grammatical processing, while auditory processing contributes to speech perception and oral comprehension.

From the perspective of Cognitive Load Theory, language learning is a complex process that involves many cognitive activities because several language skills are engaged simultaneously. Therefore, when designing tasks, it is crucial to take working memory capacity into account.

Research indicates that simplifying and sequencing tasks is one of the most effective strategies for adapting to working memory capacity. For example, breaking complex writing tasks into smaller parts (brainstorming, organizing, drafting) reduces simultaneous cognitive demands. In addition, pre-task planning, especially guided planning, frees working memory and enables more fluent and structurally complex output.

Theoretical Foundations of the Hierarchical Task System

Robinson's Cognition Hypothesis and the Triadic Componential Framework

According to P. Robinson's Cognition Hypothesis, sequencing tasks by cognitive complexity progressively develops learners. Robinson proposed the Triadic Componential Framework (TCF), which classifies task design characteristics and provides a practical guide for sequencing them by complexity.

The TCF describes tasks along three dimensions: task complexity (cognitive demands), task conditions (number of participants, time limits), and task difficulty (learner's individual perception). Robinson emphasizes that sequencing tasks from cognitively simple to complex allows learners to gradually acquire linguistic units.

The SSARC Model

Robinson proposed the SSARC model: **S** – simplify, **S** – stabilize, **A** – automatize, **R** – restructure, **C** – complexify. This model aims to enhance the quality of learners' language production by gradually increasing task complexity.

Research has shown that a task sequence designed according to the SSARC principle based on the TCF has varying levels of cognitive demand and significantly affects learners' perception of task difficulty and cognitive load. Learners spend relatively more time completing tasks in this sequence, which directly influences their cognitive processes.

Integration with Bloom's Taxonomy

When designing a hierarchical task system, it is effective to use the revised version of Bloom's Taxonomy. Bloom's Taxonomy envisages a step-by-step transition from lower-order thinking skills (remembering, understanding, applying) to higher-order thinking skills (analyzing, evaluating, creating).

Research shows that when Cognitive Load Theory and linguistic scaffolding are applied together in approaches such as CLIL (Content and Language Integrated Learning), learners achieve effective results in transitioning from lower-order to higher-order thinking. This approach provides a model that can be applied in university-level professional training programs.

Hierarchical Task Model in English Language Classes

First Stage: Reception and Retention

At this stage, tasks are based on listening and repetition. The learner acquires the basic phonetic, lexical, and grammatical elements of the language. From the perspective of cognitive load, intrinsic load is minimal at this stage, and the main focus is on reducing extraneous load. Visual aids, pictures, and contextual examples are effective tools for reducing extraneous load. Research shows that visual materials help comprehension in English language learning regardless of prior knowledge level, while advanced organizers are particularly beneficial for learners with lower prior knowledge.

Second Stage: Understanding and Application

At this stage, tasks require recognizing learned material and applying it in modified contexts. Practicing grammatical rules, using lexical units in context, and constructing simple dialogues are typical of this stage. These tasks, corresponding to the lower levels of Bloom's Taxonomy, stimulate germane cognitive load and lay the foundation for schema formation. Research indicates that when grammar and vocabulary instruction is carried out in a step-by-step, separated manner, cognitive overload is prevented.

Tasks requiring higher-order thinking skills demand that learners compare, classify, identify cause-effect relationships, and critically evaluate information. Debates, presentations, essay writing, and project work are examples of this stage. From the perspective of cognitive load, intrinsic load increases at this stage, but the learner's working memory can now operate effectively by relying on automatized knowledge.

At the highest stage, tasks require learners to generate new ideas, write original texts, and carry out independent projects. At this stage, cognitive load is minimal, and the learner can use the language freely and automatically. Research shows that sequencing tasks by cognitive complexity significantly increases syntactic complexity and lexical diversity in learners' written work.

A study on the relationship between cognitive load and motivation among vocational college students found that self-efficacy negatively affects cognitive load, which in turn determines learning motivation. This study, integrating Social Cognitive Theory (SCT) and Cognitive Load Theory (CLT), analyzed the mediating role of cognitive load. The results showed that enhancing learners' self-efficacy and managing cognitive load are important factors in strengthening motivation to learn English.

A study conducted in Thailand examined EFL learners' perception of tasks designed based on the TCF. In the study involving 30 EFL students, the task

sequence was assessed using questionnaires and stimulated recall methods. The results confirmed through two different assessment methods that the task sequence followed an increasing order of cognitive demands. Learners spent relatively equal amounts of time completing tasks, indicating the consistency of the sequence.

Discussion

The research results show that a hierarchical task system based on Cognitive Load Theory in English language classes should rely on the following principles.

First principle – gradualness. Tasks should be sequenced from simple to complex according to their cognitive complexity. This allows the learner's working memory to adapt step by step and prevents cognitive overload.

Second principle – balance of the three types of load. Intrinsic load is determined by the inherent complexity of the learning material and is difficult to reduce. Extraneous load can be reduced by presenting the material properly. Germane load is aimed at schema formation and should be encouraged.

Third principle – consideration of working memory capacity. When designing tasks, it is necessary to limit the amount of information processed simultaneously, break complex tasks into smaller parts, and encourage pre-task planning.

Fourth principle – consideration of individual characteristics. Learners' working memory capacity, prior knowledge, and self-efficacy vary. Therefore, tasks should be multi-level and offer the possibility of selection according to each learner.

Fifth principle – integration with Bloom's Taxonomy. The hierarchical task system should correspond to the lower and higher-order thinking skills of Bloom's Taxonomy. This ensures the learner's cognitive development in a systematic way.

Conclusion

A hierarchical task system based on Cognitive Load Theory in English language classes enhances the effectiveness of language acquisition by taking into account the learner's working memory capacity. The research results allow the following conclusions.

Cognitive Load Theory provides a solid theoretical foundation for designing tasks in English language teaching. The balance of intrinsic, extraneous, and germane loads ensures the effective use of the learner's cognitive resources. Sequencing tasks by cognitive complexity enhances the quality of learners' language production, reduces cognitive overload, and improves acquisition.

Robinson's Cognition Hypothesis and the SSARC model serve as a practical basis for designing task sequences. When integrated with Bloom's Taxonomy, this

model ensures the learner's step-by-step transition from lower-order to higher-order thinking.

As practical recommendations, the following can be suggested. English language teachers should take into account the three types of cognitive load when designing tasks, break complex tasks into smaller parts, and include a pre-task planning stage. Using visual aids and contextual examples in preparing learning materials reduces extraneous load. Enhancing learners' self-efficacy and managing cognitive load are important factors in strengthening motivation.

In future research, it is advisable to focus on the empirical study of hierarchical task systems based on Cognitive Load Theory in different age groups and across different language skills (listening, speaking, reading, writing), as well as on issues of integration with digital technologies and artificial intelligence tools.

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