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A Review of Cognitive Approaches in SLA: Identifying the Most Influential Factors from Key Studies

Erwan Rahman[1], Maida Norahmi[2], Dellis Pratika[3], Rahima Annisa Fauziyah[4], Zico Oktavino Joyanaku[5]

Universitas Palangka Raya
Email: erwan.rahman09@gmail.com

ABSTRACT

This study investigates cognitive approaches to Second Language Acquisition (SLA) by examining key components: attention, working memory, L1 transfer, and cognitive restructuring. Despite extensive research on individual cognitive factors in SLA, there remains a critical gap in understanding how these elements interact systemically in multilingual contexts, particularly in Indonesian EFL classrooms where traditional teaching methods often neglect cognitive principles. This study aims to develop an integrated cognitive model of SLA and propose practical pedagogical strategies tailored to Indonesia's unique multilingual environment. A systematic review is conducted using the SALSA framework (Search, Appraisal, Synthesis, and Analysis), incorporating NVivo 12-assisted thematic analysis of ten peer-reviewed studies published between 2018 and 2023. The methodology follows PRISMA 2020 guidelines for transparent study selection and applies qualitative analysis to identify patterns across diverse cognitive studies. The findings reveal that attention serves as a gateway for input processing and learning, while working memory determines learners' capacity to handle linguistic information. Additionally, L1 transfer either facilitates or hinders L2 learning depending on language distance and learner awareness. Cognitive restructuring enables proceduralization of explicit knowledge. In the Indonesian EFL context, these mechanisms are especially relevant. This study suggests cognitively informed instruction to enhance learning outcomes.

Keywords: *EFL learning, cognitive approach, attention, working memory, L1 transfer*

Introduction

Second Language Acquisition (SLA) has long been a subject of interest within the fields of applied linguistics, psychology, cognitive science, and language education. While behaviorist and structural linguistic theories dominated classical SLA models in the past, contemporary approaches increasingly adopt a cognitive psychology framework to explain how learners process, store, and access language (Cunnings, 2022; Li, 2022). This cognitive shift reflects a growing body of research that highlights the psychological mechanisms behind language learning, including attention, working memory, and skill development (Godfroid et al., 2024; Coumel, Ushioda, & Messenger, 2023). Foundational theories such as Schmidt's (1990) Noticing Hypothesis, Baddeley's (2000) working memory model (as adapted to SLA by Wen & Li, 2019), and DeKeyser's (2020) skill acquisition theory provide a framework for understanding how learners move from input exposure to proceduralized language use. These frameworks receive support from recent empirical studies that emphasize the roles of attention (Thi & Nhung, 2020; Bergsleithner, n.d.), memory capacity (Goo, 2012; Manchón et al., 2023), L1 interference (Li & Gollan, 2021; Westergaard, 2021), and metalinguistic awareness (Roehr-Brackin, 2024). In particular, four cognitive factors—attention, working memory, L1 transfer, and cognitive restructuring—have emerged as central to understanding how second language knowledge is acquired, processed, and internalized.

The four interconnected cognitive elements that influence second language learning outcomes are the following: (1) the process of cognitive restructuring that

underpins proceduralization (DeKeyser, 2020; Suzuki & DeKeyser, 2022); (2) the limitations of working memory capacity (Wen & Li, 2019; Cunnings, 2022); (3) the dynamics of L1 transfer (Li & Gollan, 2021; Bradlow, 2022); and (4) attention as the entry point to input processing (Schmidt, 1990; Coumel et al., 2023). In the multilingual Indonesian context, where students frequently traverse three or more linguistic systems (e.g., Bahasa Indonesia, regional languages like Dayaknese or Banjarnese, and English), these elements are crucial. There are advantages and disadvantages to this linguistic environment. Depending on how it interacts with the target structures, L1 transfer either helps or hinders L2 acquisition (Bonvin, Brugger, & Berthele, 2023). For example, positive transfer can occur when Bahasa Indonesia and English share similar syntactic structures in basic sentence patterns (e.g., Subject-Verb-Object), which facilitates understanding. However, negative transfer may arise when learners incorrectly apply L1 rules to L2, such as omitting the verb "to be" in English sentences like *"She happy"*—a common error influenced by the absence of a copula in Bahasa Indonesia. In addition, Heriyawati, Saukah, and Widiati (2018) highlight that working memory constraints affect students' ability to process reading texts, especially when instructional content is unfamiliar.

Research on attention shows that noticing is a necessary condition for form acquisition. Schmidt's (1990) Noticing Hypothesis posits that learners must consciously attend to input for acquisition to occur, a view supported by eye-tracking and syntactic priming studies (Godfroid et al., 2024; Coumel et al., 2023). In many Indonesian classrooms, where rote memorization and translation-based instruction still prevail, students often fail to notice key linguistic features due to limited salience or lack of interaction. Instructional strategies such as input enhancement and visual marking of grammatical features help learners to notice forms that would otherwise be overlooked (Lotfi, Afghah, & Ashdown, 2023).

Working memory (WM) is also a significant aspect in SLA. While learners with lower WM react better to input-rich, implicit techniques, those with higher WM capacity often benefit more from rule-based training (Sagarra & Ellis, 2021; Li, 2022). Given that traditional grammar-focused teaching approaches sometimes overburden students' cognitive capacities and result in shallow processing, this research has important implications for the Indonesian context. To properly manage cognitive load, instructors might use tactics such as chunking, visual organizers, and a combination of explicit and implicit instruction.

Another important component in SLA is L1 transfer, which describes how learners' existing linguistic knowledge influences their learning of a new language. L1 transfer happens at several linguistic levels, including phonological, syntactic, lexical, and pragmatic, and can have either positive or negative consequences (Westergaard, 2021; Bradlow, 2022). Indonesia's multilingualism complicates the transfer process. Students frequently transfer between their regional languages, Bahasa Indonesia and English, increasing both the risk of interference and the opportunity for facilitation (Gafur Marzuki et al., n.d.). Teachers can address this by combining contrastive analysis and increasing cross-linguistic awareness (Pawlak & Aronin, n.d.).

The final step in internalization is cognitive restructuring, which is the process of converting declarative knowledge into proceduralized skills. According to DeKeyser (2020), this shift demands consistent, deliberate practice and unambiguous feedback. Scaffolded tasks, structured task repetition, and gesture-based corrective feedback all help to facilitate proceduralization (Maruf et al., 2025; Roehr-Brackin, 2024). Task repetition cycles and metalinguistic reflection exercises can help improve cognitive engagement in Indonesian classrooms.

Accordingly, this study pursues three primary objectives. First, it aims to synthesize recent empirical findings (2018–2025) concerning the four core cognitive factors: attention, working memory, L1 transfer, and cognitive restructuring. Second, it analyzes how these components interact within the sociolinguistic and educational landscape of Indonesia. Third, it provides pedagogical recommendations grounded in cognitive theory for improving English instruction in teacher-centered EFL classrooms.

The decision to focus on this topic is motivated by four key considerations. First, Indonesia's extraordinary linguistic diversity over 700 local languages demands a tailored

cognitive approach to language instruction. Second, dominant classroom practices such as grammar-translation often ignore learners' cognitive limitations and undermine the development of procedural fluency (Heriyawati, Saukah, & Widiati, 2018). Third, SLA research tends to marginalize multilingual, Global South contexts like Indonesia. Fourth, most cognitive SLA literature remains theoretical, offering few practical tools for teachers working in large or resource-limited classrooms.

This study also addresses five major research gaps. Many previous studies examine cognitive components in isolation, rather than in interaction (Godfroid, 2020; Sagarra & Ellis, 2021). Multilingual EFL environments such as Indonesia remain underrepresented in the global SLA literature. Pedagogical applications of cognitive theory are still scarce, especially those suitable for public school settings. Additionally, many literature reviews lack transparent methodologies, often ignoring protocols like PRISMA or SALSA. By applying the PRISMA protocol and NVivo-assisted thematic analysis, this review ensures methodological rigor and cross-contextual relevance.

In conclusion, this study expects to provide a comprehensive and practical understanding of how attention, working memory, L1 transfer, and cognitive restructuring function together in second language learning. It seeks to offer pedagogical strategies that help teachers apply cognitive theory in classrooms, especially in Indonesia's multilingual and teacher-centered contexts. Ultimately, this review not only advances the theoretical development of cognitive SLA but also serves as a practical guide for educators aiming to enhance student learning outcomes through evidence-based, cognitively informed instruction.

Method

This review follows the SALSA framework Search, Appraisal, Synthesis, and Analysis as proposed by Grant and Booth (2009) to ensure methodological rigor and transparency throughout the research process. The study adopts a Systematic Literature Review (SLR) methodology to investigate the role of key cognitive factors in Second Language Acquisition (SLA), specifically focusing on working memory, attention, L1 transfer, and cognitive restructuring. The SALSA framework functions as the methodological compass, guiding a structured and replicable approach for identifying, evaluating, and integrating relevant empirical findings.

To preserve both academic quality and recentness, the review in the Search stage only considers peer-reviewed empirical studies that were published between 2018 and 2023. Primary data sources include academic databases like ScienceDirect, JSTOR, ERIC, and Google Scholar. To find studies that specifically address the four targeted cognitive components, boolean search strings are used: cognitive SLA AND (attention OR working memory OR L1 transfer OR cognitive restructuring) AND EFL. There are 127 studies found in the first search. There are 85 distinct studies left for additional screening after 42 duplicate records were eliminated.

In the Appraisal stage, the review applies inclusion criteria that require each selected study to (1) focus on second or foreign language learners, (2) present empirical data, and (3) explicitly investigate at least one of the four cognitive variables with measurable outcomes. During screening, 28 studies are excluded based on titles and abstracts. Further full-text evaluation leads to the exclusion of 10 studies that do not focus on cognitive SLA, 5 that are not empirical, and 3 that are not peer-reviewed. As a result, 10 studies meet all inclusion criteria and are selected for further analysis. These studies demonstrate academic credibility, methodological transparency, and are published in high-impact journals such as Language Learning, Studies in Second Language Acquisition, and Second Language Research.

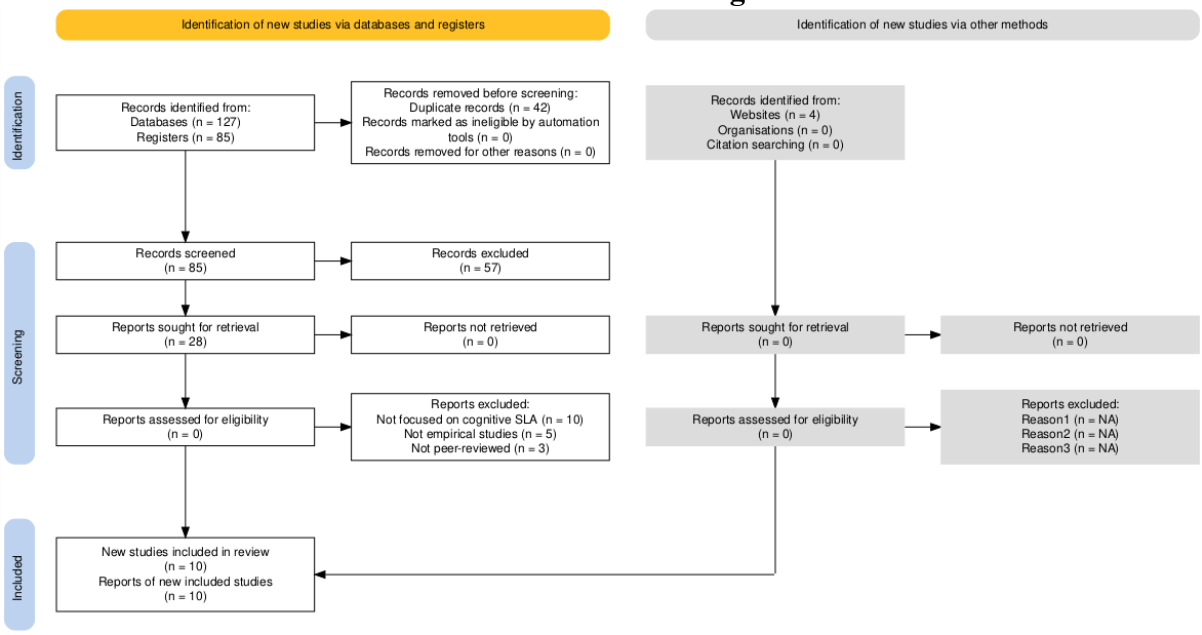
During the Synthesis stage, the selected studies are loaded into NVivo 12 software to facilitate thematic coding and qualitative analysis. Four parent nodes—attention, working memory, L1 transfer, and cognitive restructuring—are built in line with the study's conceptual framework. Each study is being coded line by line, and relevant passages are categorized based on recurring themes. For example, the Cognitive Restructuring node codes instances of practice-driven automatization, while the Attention node codes comments regarding learners' ability to notice linguistic features. This process ensures analytical consistency and enables the identification of patterns in the literature. The visualization of co-occurrence and frequency is

also made easier by NVivo's query tools, which enhance interpretability and cross-study comparisons.

In the final Analysis stage, the thematically coded data are interpreted in relation to instructional practices for Indonesian EFL learners. Results consistently show that input enhancement techniques work well for grabbing students' attention, particularly when cognitive load is properly controlled. Simultaneously, cognitive restructuring research highlights the importance of task repetition, feedback, and metalinguistic reflection in fostering procedural fluency (e.g., Suzuki & DeKeyser, 2022; Roehr-Brackin, 2024). The review also uses a modified PRISMA 2020 flowchart (Page et al., 2021) to visually represent the study selection process from the initial identification of 127 records to the final inclusion of 10 studies, thus enhancing the transparency of the review process.

By integrating the SALSA framework, PRISMA standards, and NVivo-assisted thematic analysis, this study constructs a robust and systematic platform for reviewing cognitive SLA literature. More importantly, it translates empirical findings into pedagogical strategies that are applicable to the Indonesian multilingual EFL context. This approach not only contributes to the theoretical advancement of cognitive SLA research but also provides actionable insights for teachers and curriculum designers aiming to align instruction with learners' cognitive realities.

Tabel 1
PRISMA 2020 Flow Diagram



Results and Discussion

To synthesize the findings of recent empirical research on cognitive Second Language Acquisition (SLA), this study examines ten peer-reviewed articles published between 2018 and 2023. Each study is selected based on its focus on at least one of the four cognitive variables: attention, working memory, L1 transfer, and cognitive restructuring. The

following table provides a comparative summary of these studies, outlining their cognitive focus, key findings, and implications for SLA—particularly in multilingual and instructional contexts like Indonesia

Table 2
Comparative overview of the ten selected empirical studies

Article Names	Author(s)	Year	Cognitive Focus	Key Findings	Relevance to SLA
Skill acquisition theory and the role of practice in L2 development	DeKeyser, R.	2020	Cognitive Restructuring	Automaticity develops through structured practice and feedback.	Demonstrates how proceduralization supports restructuring.
Explaining the efficacy of practice for L2 learning	Suzuki, Y., & DeKeyser, R.	2022	Cognitive Restructuring	Practice quality and task repetition reinforce knowledge restructuring.	Emphasizes strategic task design for SLA effectiveness.
Cognitive perspectives on SLA: The CREED framework	Ellis, N. C.	2019	General Cognitive Processing	Exemplar-driven, emergent learning underlies SLA.	Provides theoretical foundation for usage-based SLA models.
Metalinguistic awareness and cognitive flexibility in L2 learning	Roehr-Brackin, K.	2021	Cognitive Restructuring	Cognitive flexibility aids language rule abstraction.	Supports metacognitive strategies in instruction.
The effects of implicit instruction on attention to L2 form	Godfroid, A.	2020	Attention	Implicit input enhances form-focused learning via attention.	Shows role of input salience and attentional engagement.
Working memory and L2 sentence processing	Wen, Z., & Li, S.	2019	Working Memory	WM predicts sentence processing ability in L2 learners.	Confirms WM as a moderating factor in L2 proficiency.
What cognates reveal about default language selection in bilingual sentence production	Li, C., & Gollan, T. H.	2021	L1 Transfer	Bilinguals default to their dominant language, and cognates trigger L1 intrusions due to entrenched structures.	Shows how L1 interference affects L2 output and stresses the need to manage cross-linguistic influence in instruction.
The role of L1 in L3 acquisition: A generative approach	Puig-Mayenco, E., et al.	2020	L1 Transfer	L1 shapes acquisition paths in multilingual learners.	Illustrates generative effects of L1 on later languages.
Noticing gaps in SLA: An eye-tracking study	Leow, R. P., & Donatelli, L.	2023	Attention	Noticing linguistic gaps predicts L2 form acquisition.	Validates noticing as a critical cognitive event in SLA.
The role of WM in implicit and explicit L2 learning	Sagarra, N., & Ellis, N. C.	2021	Working Memory	WM mediates effectiveness of explicit instruction.	Suggests WM-based differentiation in teaching.

From the ten reviewed empirical studies, four cognitive factors emerged as consistently influential in SLA: attention, working memory, L1 transfer, and cognitive restructuring. Each element plays a distinct but interrelated role in language development, and their relevance becomes even more pronounced when applied to multilingual and cognitively diverse settings such as Indonesia.

Attention as a Gateway to SLA

Among the four cognitive components discussed, attention is consistently emerging as the most influential in shaping cognitive approaches to Second Language Acquisition (SLA). Eye-tracking studies consistently show that *learners who fixate longer on target forms subsequently recall them with greater accuracy* (Godfroid, Finch, & Koh, 2024, p. 11), confirming Schmidt's (1990) Noticing Hypothesis. Likewise, Leow and Donatelli (2023) report that *the probability of form acquisition rises sharply once a gap is consciously detected* (p. 58).

In Indonesian classrooms—where English input remains limited and teacher-led instruction dominates—techniques such as input enhancement (e.g., color-coding or bolding tense markers) and problem-solving

tasks are increasingly being used to direct learners' attention to linguistically salient elements (Lotfi, Afghah, & Ashdown, 2023). Attention, therefore, is functioning as the cognitive trigger that initiates and regulates learning processes in cognitively-informed classrooms.

Working Memory and Instructional Match

Working memory (WM) is also playing a critical role in enabling learners to temporarily process and store linguistic input. Wen and Li (2019) demonstrate that *WM capacity uniquely predicts L2 syntactic processing speed after controlling for proficiency* (p. 604), while Cunnings (2022) explains that learners with limited WM are more likely to experience breakdowns in sentence parsing. Sagarra and Ellis (2021) further show that high-WM learners benefit more from explicit instruction, while low-WM learners perform better in input-based, experiential learning settings.

In Indonesian EFL classrooms, which still rely heavily on grammar-translation methods, learners are often experiencing cognitive overload, which limits comprehension and weakens retention. Teachers are increasingly responding to this by chunking instruction, reducing cognitive load, and using visual scaffolds (Manchón et al., 2023) to align instructional format with WM capacity.

L1 Transfer in Multilingual Contexts

L1 transfer is continuing to function as both a facilitator and a constraint in SLA, particularly within Indonesia's multilingual landscape. According to Li and Gollan (2021), entrenched L1 structures interfere with L2 production, especially in cases of low structural overlap., while Puig-Mayenco et al. (2020) find that transparent L1–L2 mappings accelerate acquisition in multilingual learners. Westergaard (2021) adds that multilingual learners are actively co-activating linguistic systems, leading to both positive and negative transfer.

In Indonesia, learners are frequently navigating between regional languages, Bahasa Indonesia, and English. Bradlow (2022) finds that speech encoding in L2 varies depending on L1 background, while Bonvin, Brugger, and Berthele (2023) associate lexical dominance with language accuracy. Gafur Marzuki et al. (n.d.) show that Indonesian students often exhibit L1 interference in English writing tasks. Teachers are addressing this by designing contrastive analysis tasks and encouraging metalinguistic reflection to help students recognize and control cross-linguistic influence.

Cognitive Restructuring and Automatization

Cognitive restructuring is taking place as learners convert declarative knowledge into procedural use. DeKeyser (2020) emphasizes that *only sustained, meaningful rehearsal leads to true automatization* (p. 44), and Suzuki and DeKeyser (2022) observe that repeated task performance, supported by feedback, strengthens cognitive restructuring. Roehr-Brackin (2021) and Pavlekovic & Roehr-Brackin (2024) further explain that metalinguistic awareness and cognitive flexibility facilitate restructuring.

Recent studies (Maruf et al., 2025) also indicate that gesture-based feedback accelerates this transition in multilingual settings. Popovych et al. (2023) suggest that attentional regulation and task timing influence learners' ability to internalize structures effectively. This growing body of evidence supports a pedagogical shift in Indonesia: from rote grammar drills to reflective, feedback-rich learning cycles.

Together, these four cognitive components form the architecture of effective SLA. Attention serves as the entry point; working memory allows temporary manipulation; L1 transfer influences how new input is interpreted; and cognitive restructuring ensures long-term retention and fluency. The synthesis not only confirms findings from Western cognitive SLA literature but also underscores their applicability to Indonesian educational settings. The implication is clear: SLA instruction in Indonesia should be cognitively informed. Teachers must design materials that focus attention, balance cognitive load, leverage learners' L1 resources, and promote proceduralization. Failure to do so risks instructional inefficiency and learner disengagement—issues already widely observed in national EFL outcomes.

Conclusion

This study contributes to the SLA literature by synthesizing empirical findings (2018–2023) on four interrelated cognitive dimensions—attention, working memory, L1 transfer, and cognitive restructuring—specifically within the under-represented multilingual Indonesian EFL context. By adopting the SALSA framework, supported

with NVivo-assisted thematic coding and PRISMA-based study selection, this review provides a systematic yet flexible methodology that bridges Western cognitive theories with Southeast Asian educational realities.

The implication of this research is twofold: theoretically, it enriches cognitive SLA frameworks by validating their relevance in multilingual environments with diverse cognitive loads; pedagogically, it provides actionable guidance for Indonesian EFL teachers to design cognitively informed instruction. These include using input enhancement to direct attention, differentiating instructional styles based on working memory variation, designing cross-linguistic awareness tasks, and employing task repetition to support proceduralization.

However, this study also acknowledges several limitations. First, the scope is restricted to ten empirical studies published between 2018 and 2023, which, while recent, may not capture long-term trends or earlier foundational work. Second, most of the selected studies are drawn from international rather than Indonesian research, potentially overlooking localized instructional practices. Third, the thematic synthesis focuses primarily on four cognitive factors, while others—such as motivation, affect, or grit (Zhao & Wang, 2023)—are outside the review's scope but may interact with cognitive dimensions in practice.

There is still a lack of research on multilingual SLA that incorporates all four cognitive factors—attention, working memory, L1 transfer, and cognitive restructuring—especially in the Indonesian context. There are currently few studies in Indonesia that examine the interactions between these factors in multilingual real-world learning environments. In order to balance Dayaknese, Bahasa Indonesia, and English, future research is encouraged to test task-based interventions for Indonesian multilingualism, particularly in terms of how they handle competing L1s and L2s. More local empirical research is being incorporated to support the development of evidence-based, culturally relevant pedagogy in Indonesia and other multilingual contexts, strengthen policy recommendations, and contextualize global SLA theory.

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