

The Role of Memory in Helping Children Learn Grammar Independently: A Library Research

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Abstract

Grammar acquisition is a crucial component of children's language development that involves complex cognitive processes. Learning grammar independently requires more than continuous exposure to language input; it also depends on the ability to retain, organize, and retrieve linguistic information effectively over time. This library research investigates the contribution of memory systems, particularly working memory and long-term memory, to children's independent grammar learning. Employing a qualitative descriptive approach, the study synthesizes findings from books, scholarly journal articles, and previous research to examine how working memory facilitates the processing of complex grammatical structures, how declarative and procedural long-term memory support the storage and automatization of grammatical knowledge, and how memory-based learning strategies encourage autonomous learning. The findings reveal that working memory capacity plays an essential role in enabling children to process complex grammatical patterns, whereas long-term memory, especially procedural memory, contributes to the automatic use of grammar through repeated exposure and active encoding. Strategies such as repetition, categorization, visual imagery, and retrieval practice are identified as valuable approaches for strengthening children's independent grammar learning, although their effectiveness is influenced by the quality of the encoding process. Overall, this study contributes to psycholinguistic research while providing practical insights for developing independent learning materials that accommodate children's cognitive and memory capacities.

Keywords: *Children, Grammar, Independent learning, Memory, Psycholinguistics*

1 Introduction

Language is a complex cognitive ability because it involves various mental processes, one of which is the memory system (Steinberg & Sciarini, 2006). In the process of comprehending and producing language, individuals do not merely receive information; they also store, process, and retrieve prior information when needed. Memory therefore plays a crucial role in language processing. Pratiwi and Fitra (2025) explain that working memory functions to maintain and manipulate information while a person processes sentences, thereby enabling the formation of complete language comprehension.

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Besides memory, vocabulary is also an essential foundation of language learning. Alqahtani (2015) states that vocabulary mastery is a prerequisite for language comprehension because it involves new words and their meanings. Goldstein and Hooff add that vocabulary mastery is closely related to memory function, namely how information is stored, retained, and subsequently retrieved when needed (Alibasya et al., 2024). In this context, memory is understood as a system that allows a person to store knowledge, experience, ideas, and skills so that this information remains usable even when it is no longer directly present. One important component of this system is long-term memory, which functions to store information over a relatively long period.

If vocabulary is the basic unit that constitutes language, grammar functions as the system that governs the relationships between words to form meaningful sentences. For children, mastering grammar is not merely a matter of memorizing rules; it also involves the ability to recognize grammatical patterns, store sentence structures in memory, and reuse these rules automatically during oral or written communication. Praptiwi and Fitra (2025) explain that working memory makes an important contribution to processing complex sentences, such as subordinate and passive sentences, because children must retain information about sentence elements simultaneously while understanding the grammatical relationships among them.

Besides working memory, long-term memory also makes an equally important contribution to grammar acquisition. Through the declarative/procedural model, Ullman (2004) explains that knowledge of vocabulary and word meaning is stored in declarative memory, whereas systematic grammatical rules are stored and executed through procedural memory. The procedural memory system allows children to use grammatical rules automatically without having to consciously recall every rule each time they speak or write. Thus, the more frequently children are exposed to and practice using a particular grammatical pattern, the stronger the memory consolidation for that pattern becomes, making it easier to reuse during communication.

The development of technology and learning resources today requires children to learn grammar not only through classroom instruction but also independently through various media, such as reading books, learning applications, and everyday language exposure. Self-regulated learning requires learners to manage their own learning process, including selecting effective strategies for comprehending, remembering, and applying the grammar rules they have learned (Zimmerman & Schunk, 2011). Nevertheless, studies specifically addressing the relationship between children's memory systems and independent grammar learning remain relatively limited, particularly research linking a psycholinguistic perspective with independent learning strategies in children.

Previous research on memory-based strategies has largely focused on vocabulary learning. One example is the study by Alibasya et al. (2024), which examined the effectiveness of the keyword mnemonic technique on English vocabulary retention. Although the study found no significant difference between the experimental and control groups, the results provided insight that the success of a learning strategy is influenced by the quality of the encoding process undertaken by learners. These findings open opportunities for developing similar strategies in grammar learning, particularly for children who learn independently. However, to date, few studies have specifically examined the application of memory-based strategies in children's grammar learning.

Based on this gap, the present study aims to examine how working memory and long-term memory contribute to helping children learn grammar independently, using a library research approach. In addition, this study seeks to identify various memory-based learning strategies that have the potential to improve the effectiveness of independent grammar learning in children.

2 Literature Review

2.1 Memory Systems in Language Processing

Memory is one of the cognitive components that plays an important role in the process of language use. Goldstein and Hooff, cited in Alibasya, et al. (2024), define memory as a system that allows a person to store information, retain it for a certain period, and retrieve it when needed. Through this mechanism, knowledge, experience, ideas, and skills remain usable even when the source of information is no longer directly available.

In psycholinguistic studies, language processing involves three interrelated memory systems: short-term memory, working memory, and long-term memory (Praptiwi & Fitra, 2025). Short-term memory functions to temporarily store information, such as a word or phrase that has just been heard. Working memory has a more complex function because it not only retains information but also processes it while comprehension or production of language is taking place. Long-term memory, on the other hand, serves as a more permanent storage system, encompassing episodic, semantic, and procedural memory, which together support the mastery of vocabulary, meaning, and grammatical rules.

The relationship between memory and language is further explained through the Declarative/Procedural Model proposed by Ullman (2004). According to this model, vocabulary and its meanings are stored in the declarative memory system, whereas grammatical rules governing word formation and word relationships are stored in the procedural memory system. This system enables a person to use grammatical rules automatically after repeated practice and experience, in the same way as other skills developed through the learning process.

2.2 Children's Grammar Acquisition and the Role of Working Memory

Children's ability to master grammar develops alongside increases in working memory capacity. Verbal working memory capacity is one factor that influences grammar acquisition, both in a first language and in a foreign language learned at school (van Koert et al., 2022). These findings indicate that children's success in comprehending grammatical structures is determined not only by the amount of language exposure but also by working memory's capacity to process information actively.

Working memory does not merely function as temporary storage; it also plays a role in connecting various linguistic elements as children process a sentence. This system enables children to understand the relationships among subject, predicate, object, and other grammatical elements, particularly when dealing with more complex sentence structures (Praptiwi & Fitra, 2025).

For example, when a child reads the sentence "The book that the child read is very interesting," they must retain information about the words book and child in working memory while

simultaneously understanding the grammatical relationship that forms the sentence's overall meaning. This process requires the child to process several pieces of information at once. Therefore, children with better working memory capacity tend to find it easier to understand complex sentence structures compared to children whose working memory capacity is still limited.

2.3 Memory Consolidation and Grammar Automatization in Long-Term Memory

After a grammatical pattern has been processed through working memory, that information needs to be consolidated in long-term memory so that it can be reused automatically when needed. Memory consolidation occurs through two main stages: encoding, the process of receiving and storing information into long-term memory, and retrieval, the process of recalling stored information for use in an appropriate situation (Goldstein & van Hooff, 2021).

The more frequently children are exposed to and use a particular grammatical pattern, the stronger the memory consolidation that forms. As a result, grammar rules can be used more automatically, so that children no longer need to consciously recall every rule when speaking or writing. This automatization develops through repeated and consistent practice.

In language acquisition, long-term memory functions not only as a storage location for information but also as the foundation for developing language fluency. When grammatical rules have been well stored in procedural memory, the burden on working memory is reduced. This condition allows children to allocate their cognitive resources toward comprehending more complex sentence structures or learning new grammatical patterns.

2.4 Independent Learning and Memory-Based Strategies

Self-regulated learning is a process in which learners actively manage the goals, strategies, motivation, and evaluation of their own learning activities (Zimmerman & Schunk, 2011). In grammar learning, the ability to learn independently is reflected in children's capacity to recognize grammatical patterns, practice them repeatedly, and evaluate their own understanding without always relying on teacher guidance.

Oxford (1990) classifies language learning strategies into several categories, one of which is memory strategies. These strategies aim to help learners store, organize, and retrieve language information more effectively. Techniques included in this category include grouping information, using visual imagery, and structured review. These techniques are designed to strengthen the information storage process so that it is easier to remember and reuse.

The study by Alibasya et al. (2024) on the use of the keyword mnemonic technique illustrates the application of memory-based strategies in language learning. Although the study found no significant difference between the experimental and control groups, the results indicated that the success of a learning strategy is influenced more by the quality of the encoding process than by the technique itself. The use of visual imagery, learners' active involvement in organizing material, information grouping, and retrieval practice are factors that help strengthen information storage in long-term memory.

These findings carry important implications for children's grammar learning. Learning strategies that rely solely on passive exposure to grammatical rules tend to be less effective

than strategies that actively engage children in comprehending, processing, and reusing the information they have learned. Therefore, the application of memory-based strategies can be an effective alternative for improving the effectiveness of independent grammar learning.

3 Methods

This study employs a library research method with a qualitative descriptive approach. This approach was chosen because the study focuses on analyzing various concepts, theories, and findings from previous research related to the role of memory in children's independent grammar learning. Through this approach, the data obtained are not analyzed numerically but are interpreted systematically to gain a comprehensive understanding of the phenomenon under study. The qualitative descriptive approach also allows the researcher to explain the relationships among concepts based on findings from various scholarly sources (Praptiwi & Fitra, 2025).

The data sources for this study are drawn from various scholarly references, including books, journal articles, and previous research discussing memory systems, grammar acquisition, and independent learning in children. In addition, this study uses two main studies as the foundation for its analysis: the study by Alibasya et al. (2024) on the application of the keyword mnemonic technique in English vocabulary learning, and the study by Praptiwi and Fitra (2025), which reviews the role of memory in language processing from a psycholinguistic perspective. Both studies serve as the basis for analyzing the relationship between memory systems and children's ability to learn grammar independently.

Data collection was conducted through documentation techniques, namely tracing, selecting, and compiling literature sources relevant to the research focus. Each reference was then critically examined to identify concepts, theories, and research findings related to the research questions. The information obtained was subsequently grouped by theme to facilitate the process of analysis and discussion.

Data analysis followed the Miles and Huberman interactive analysis model, as used by Praptiwi and Fitra (2025). This model consists of three interrelated stages:

1. Data reduction: the process of selecting and focusing attention on information relevant to the research objectives. At this stage, the researchers selected data showing the relationship between memory systems, grammar acquisition, and independent learning processes in children.
2. Data display: organizing the filtered data into a systematic narrative so that the relationships among concepts can be understood more clearly. Data were presented narratively to facilitate the interpretation of findings from the literature analyzed.
3. Conclusion drawing: formulating the results of the analysis based on the patterns, relationships, and tendencies found across the literature reviewed. Conclusions were drawn to answer the research objectives while providing an overview of the role of the memory system in supporting children's independent grammar learning.

Through these stages, this study is expected to produce a systematic and comprehensive

analysis supported by relevant scholarly references, thereby providing a deeper understanding of the relationship between memory and independent grammar learning.

4 Results and Discussion

4.1 The Role of Working Memory in Processing Complex Sentence Structures

The literature review shows that working memory plays a very important role in helping children comprehend and construct complex sentence structures. When children learn grammar independently—for example, through storybooks, reading materials, or digital learning media without direct teacher guidance—they need to retain several pieces of linguistic information simultaneously while understanding the relationships among the components of a sentence. This process allows children to connect each element of a sentence so that its overall meaning can be understood (Praptiwi & Fitra, 2025).

These findings are consistent with the study by Van Koert et al. (2022), which indicates that verbal working memory capacity is significantly related to children's success in grammar acquisition. Children with better working memory capacity are generally more able to recognize grammatical patterns, understand relationships between sentences, and apply grammar rules across various contexts. In contrast, children with limited working memory capacity tend to experience difficulty when processing longer or more complex sentence structures.

Based on these findings, it can be understood that working memory ability is one factor that influences success in independent grammar learning. Therefore, learning materials should be adapted to children's cognitive capacity, for example by using simple sentences at the initial stage and gradually progressing toward more complex structures. This approach can help reduce cognitive load so that the learning process proceeds more effectively.

4.2 The Role of Long-Term Memory in Strengthening and Automatizing Grammar

In addition to working memory, long-term memory also makes a very important contribution to grammar learning. Based on the Declarative/Procedural Model proposed by Ullman (2004), grammatical rules are stored in the procedural memory system so that they can be used automatically after sufficient practice and exposure. Thus, the use of grammar no longer depends entirely on conscious thought processes.

This study shows that the more frequently children use a grammatical pattern across various situations, the stronger the memory consolidation for that pattern becomes. Repeated memory consolidation helps children use grammar rules more fluently without having to explicitly recall every rule. This indicates that consistent practice plays an important role in building language skills.

Memory consolidation in long-term memory also provides another benefit, namely reducing the working memory load. When grammatical rules have been well stored, children can focus their attention on new information or on more complex sentence structures. Thus, the two

memory systems complement one another: working memory processes new information, while long-term memory supports the automatic use of grammar through repeated learning experiences.

4.3 Memory-Based Independent Learning Strategies

The review of the study by Alibasya et al. (2024) shows that the success of memory-based learning strategies is determined not only by the technique used but also by the quality of the encoding process, that is, the process of storing information in memory. The more actively learners process the information they learn, the greater the likelihood that the information will be stored in long-term memory and can be reused when needed.

Based on this review, several memory-based strategies have the potential to be applied in children's independent grammar learning:

1. Active repetition: giving children the opportunity to use the same grammatical pattern in various communicative situations. Repetition carried out through practice is more effective than merely reading or memorizing rules.
2. Pattern categorization: organizing grammar rules based on similar characteristics so that children can more easily recognize relationships among patterns and remember them over the long term.
3. Use of visual imagery or concrete examples: connecting grammar rules with pictures, illustrations, or situations close to everyday life. This strategy helps children understand abstract concepts through more tangible experiences.
4. Retrieval practice: asking children to create, complete, or correct sentences based on patterns they have learned without referring back to the material. This activity helps strengthen memory while measuring the extent of children's understanding of grammar rules.

These four strategies align with the concept of memory strategies proposed by Oxford (1990) and the principle of self-regulated learning according to Zimmerman and Schunk (2011), both of which emphasize the importance of learners' active involvement in managing their own learning process. Therefore, memory-based strategies can serve as an effective alternative for enhancing children's independence in learning grammar.

4.4 Challenges in Grammar Learning among Children with Diverse Memory Capacities

The literature review shows that memory capacity varies among children, so their ability to comprehend grammar rules independently also varies. This is because such differences affect how children receive, store, and reuse the information they learn.

Kusriyah (2023) explains that children with autism spectrum disorder often experience limitations in working memory, making it difficult for them to connect new information with previously acquired knowledge. This condition can affect their ability to comprehend sentence

structures and use grammar appropriately in everyday communication. In addition, Wulandari (2023) notes that disorders in the memory system can affect communication effectiveness because individuals experience barriers in remembering and using linguistic information.

These findings indicate that the application of memory-based learning strategies needs to be adapted to each child's characteristics. Children with more limited memory capacity require additional support, such as the use of visual media, more concrete examples, gradual repetition, and the presentation of material in simpler segments. Such adaptations are expected to help children understand grammar according to their cognitive abilities.

Overall, the results of this study indicate that success in independent grammar learning is influenced by the relationship between working memory, long-term memory, and the learning strategies used. These three aspects support one another in helping children comprehend, store, and use grammar rules more effectively. Therefore, developing learning materials that take children's memory characteristics into account has the potential to improve the quality of language learning while fostering independent learning.

5 Conclusion

Based on the literature review, it can be concluded that memory plays a significant and supportive role in children's ability to learn grammar rules independently. Working memory helps children process new information, particularly when comprehending complex sentence structures, while long-term memory functions to store and strengthen grammar mastery so that it can be used automatically in various communicative situations.

The two memory systems work in a complementary manner. Information initially processed through working memory is consolidated in long-term memory through encoding, repeated practice, and active language use. When grammar rules have been well stored in long-term memory, the working memory load becomes lighter, allowing children to more easily learn new language patterns. Thus, the ability to learn grammar independently is influenced not only by the intensity of learning but also by the effectiveness of the memory processes involved in processing and retaining information.

This study also shows that memory-based learning strategies, such as active repetition, pattern categorization, visual imagery, and retrieval practice, have the potential to enhance children's ability to comprehend and use grammar more independently. However, the effectiveness of these strategies remains influenced by each child's memory characteristics and capacity. Therefore, the selection of learning strategies needs to be tailored to learners' needs and cognitive abilities to achieve more optimal learning outcomes.

6 Limitations and Recommendations

This study has limitations because it employs a library research method, meaning the findings are based on a synthesis of previous research and have not been supported by empirical data obtained directly from research subjects. In addition, most of the references used still focus on vocabulary learning or involve adolescent and adult participants, so studies on independent grammar learning in children still require further development.

Based on these limitations, future research is recommended to conduct empirical studies, either through experimental methods or action research, to test the effectiveness of various memory-based strategies in grammar learning among elementary-school-aged children. Future research is also expected to consider individual differences in memory capacity, including among children with special needs, so that the learning strategies developed can be more adaptive, inclusive, and suited to learners' characteristics.

In addition, the results of this study are expected to serve as a reference for teachers, parents, and instructional media developers in designing learning activities that strengthen the role of memory during the grammar acquisition process. Through the selection of strategies suited to children's cognitive characteristics, grammar learning is expected not only to improve understanding of language rules but also to foster sustained learning independence.

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