Bio-Lectura: Jurnal Pendidikan Biologi,
Vol. 12, No. 2, October 2025, 191-202

THE ROLE OF MEMORY AND LANGUAGE IN SCIENCE LEARNING: A NEUROPSYCHOLOGICAL PERSPECTIVE

Supriyati Fatma Rabia[1], Edi Sutomo[2], Endra Putra Raharja[3],
Yannika Nidiasari[4], Bandung Bumboro[5]

[12345]Muhammadiyah University of Education, Sorong

Email: supriyatifatmarabia@unimudasorong.ac.id

ABSTRACT

The development of elementary school children's language skills is greatly influenced by memory function, particularly working memory and phonological memory, which play a role in storing and processing verbal information. This study aims to examine the relationship between memory capacity and language skills by synthesizing empirical research results from various recent studies. The method used is a systematic literature review with descriptive qualitative analysis based on a search of relevant scientific articles published within a specified year range. The synthesis results show a consistent relationship between memory function and language performance, indicating that higher memory capacity supports children's sentence comprehension, word production, syntactic processing, and inferential abilities. Several studies in the literature review demonstrate the effectiveness of memory training interventions in improving linguistic performance, especially in children with language barriers. The implications of this research indicate the importance of integrating memory stimulation into the language learning process in elementary schools and the need for a more targeted cognitive intervention approach to support children's language development and academic readiness.

ARTICLE HISTORY

Received 5 August 2025
Revised 08 October 2025
Accepted 24 October 2025

KEYWORDS

Memory,
Language Ability,
Science Learning

INTRODUCTION

Cognitive and language development are two fundamental domains that significantly determine the success of elementary school-aged children's learning process. At this stage, a child's ability to understand information, process concepts, and express ideas depends on the quality of memory and language development as interacting neurocognitive systems (Rahmawati et al., 2018). Memory functions, which include working memory, long-term memory, and phonological memory, serve as the primary mechanisms enabling children to store, process, and reuse linguistic information in academic contexts (Faudillah et al., 2023). Working memory plays a role in retaining and manipulating information while reading or

*CORRESPONDING AUTHOR. Email: supriyatifatmarabia@unimudasorong.ac.id
ISSN 2339-241X (print/ISSN) 2598-2427 (online ISSN)

https://journal.unilak.ac.id/index.php/ BL

listening, while phonological memory forms the basis for sound processing and vocabulary formation. Long-term memory, in turn, supports the mastery of language structures and the ongoing use of linguistic knowledge. The complexity of these relationships makes neuropsychological studies crucial in understanding the cognitive processes underlying children's language development during elementary school. A neuropsychological approach explains the involvement of brain systems, such as the prefrontal cortex, temporo-parietal cortex, and hippocampus, in supporting memory and language functions.

The phenomenon of language barriers in elementary school children is increasingly found in educational settings, including slow reading ability, difficulty understanding complex sentences, and weaknesses in phonological processing (Wiarsih & Aziez, 2021). This condition directly impacts academic achievement, as almost all subjects require the ability to read and understand instructions effectively. Research by Nicole et al. (2023) indicates that one of the main causes of these barriers is related to limited working memory function and suboptimal phonological memory development. Children with low working memory capacity tend to have difficulty retaining information while reading, thus impairing text comprehension. Furthermore, weaknesses in phonological memory make it difficult for children to identify, store, and manage sound information, thus hampering the decoding process and vocabulary formation. However, despite a strong trend linking memory function to language ability, previous research results still show considerable variation.

Research by Holmes et al. (2015) demonstrated a strong correlation, while others showed moderate or inconsistent relationships, depending on the type of instrument, the age of the subjects, and the linguistic context studied. The variability of the results of this study presents challenges in drawing general conclusions regarding the role of memory in the language development of elementary school-aged children.

This study aims to identify, analyze, and synthesize the relationship between memory function and language ability in elementary school children from a neuropsychological perspective. Using a systematic literature review, this study seeks to gather scientific evidence from various empirical studies to understand the role of working memory, phonological memory, and long-term memory in language development, including comprehension, production, and vocabulary acquisition. In addition to providing a comprehensive overview of the relationships between variables, this study also aims to assess the consistency of previous research findings, examine variations in measurement methodology, and identify the neurocognitive factors underlying these relationships. By synthesizing research findings from various scientific articles, this study is expected to yield a more structured understanding of the role of memory as a foundation for children's language development. Furthermore, the results of this study aim to provide scientific recommendations for educators, psychologists, and researchers in developing learning strategies and interventions that meet the cognitive needs of elementary school children. This study also places neuropsychological aspects as the basis for analysis, so that the resulting research results are descriptive and provide an in-depth understanding of brain structure and function that contribute to memory and language development

METHOD

This research uses the method systematic literature review (SLR) to answer the research questions in a structured manner, referring to the PRISMA 2020 model (Sugiyono, 2020). This study reviews previous research on the long-term impact of shouting on children, ranging from brain cell damage to behavioral changes. The literature search was conducted on November 19, 2025, using the application Publish or Perish, which facilitates searching the Google Scholar database, as well as manual checking on indexed journal portals (Scopus and SINTA) to ensure journal accreditation status. The keywords used were arranged in a combination of Indonesian and English, including: "memory function", "memory", "language ability", "memory function", "language ability", "elementary students", and the combined phrases "memory function and language ability" and "memory and language ability". The search strategy included the use of Boolean operators (AND, OR), quotation marks for phrase searches, and filtering the publication year range 2015–2025 to maintain the literature's currency. The search process and parameters used (keywords, search dates, and databases) were recorded in detail for replication purposes. The selection of previous studies was based on the following criteria:

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Articles published between 2015 and 2025	Published before 2015
Articles have a Scopus index of Q1-Q2 or SINTA 1-3	The article does not have a Scopus Q1-Q2 or SINTA 1-3 index.
Related articles: Memory function and language skills of elementary school children	Unrelated articles: Memory function and language skills of elementary school children

Article selection is carried out in four stages according to the flow. PRISMA, namely: (1) identification of search results, (2) removal of duplication, (3) filtering based on title and abstract, and (4) assessment of the suitability of full-text articles. The criteria for its inclusion include articles that are relevant to the topic, published within the specified timeframe, and that have gone through the review process. Peer review; whereas exclusion applied to non-empirical articles, publications before 2015, and articles that do not focus on student populations.

From the selection process, it was obtained 10 articles were obtained that meet the final criteria, consisting of 5 international articles Scopus indexed Q1–Q2 and 5 national articles indexed SINTA 1–3. Data were collected through a full reading of each article and recording the results, containing the author's name, year of publication, research method, variables studied, and the main research results. Data analysis was carried out systematically and thematically. To identify patterns and relationships between memory function and the language abilities of elementary school children. The validity of the research results was maintained through the use of reputable scientific sources and a multi-layered selection procedure in accordance with PRISMA guidelines. All data and citations used were processed based on applicable scientific principles and academic ethics.

RESULT AND DISCUSSION

The following section presents the findings derived from the literature screening and analysis conducted using the Systematic Literature Review (SLR) method. The identified studies are summarized to provide a comprehensive overview of the researched topic. These results are presented in the table below.

Table 2. Research result

No	Author (Year)	Title	Method	Research Result
1	(Holmes et al., 2015)	*Improving working memory in children with low language abilities*	Training experiment (Cogmed) on 8 to 11-year-old children with low language ability.	Working memory training improves short-term verbal memory; children with low verbal IQ show the greatest improvement.
2	(Viesel-Nordmeyer A.; Starke, A.; Ritterfeld, U., 2022)	*How language skills and working memory capacities explain mathematical learning ...*	Longitudinal research, path analysis/model of the relationship between WM components (phonological loop, executive), language skills (phonology, grammar), and mathematical abilities from pre-elementary to elementary school age.	Phonological loop strongly predicts early mathematics learning; expressive grammar skills are reciprocally related to executive WM.
3	(Blything & Cain, 2019)	*The role of memory and language ability in children's production of two-clause sentences containing before and after*	Quantitatively, children aged 3–6 years were given the task of producing complex sentences (using conjunctions) and tested on working memory.	Working memory capacity (especially language) is related to the ability to produce complex sentences; children with stronger working memory produce longer and more structured clauses.
4	(Delage dkk., 2023)	*Working memory training in children with developmental language disorder*	WM training intervention in French-speaking children with DLD (Developmental Language Disorder).	WM training increases syntactic complexity in the spontaneous speech of children with DLD, indicating medium-term positive effects.
5	(Pratiwi, 2024)	*The relationship between working memory and reading and language skills in elementary school children*	Correlational quantitative (ages 6–12 years)	A positive correlation was found between working memory capacity and reading ability and language comprehension;

				children with higher WM tend to be more fluent in reading and comprehension.
6	(Putra M. & Muryanti, 2023)	*The relationship between working memory and literacy with the pragmatic abilities of preschool children in Surakarta*	Quantitative correlational design (children aged 4-6 years) in Surakarta.	Working memory is positively correlated with preschoolers' literacy and pragmatic abilities; WM aids in social language processing.
7	(Syahida et al., 2025)	*Verbal working memory, MLU, and word production in preschool children*	Correlational descriptive quantitative study in preschool children (ages 18–72 months).	MLU (mean length of utterance) is highly correlated with word production, whereas verbal WM shows a weaker correlation with word count.
8	(Currie dkk., 2015)	*Children's inference generation: The role of vocabulary and working memory*	Quantitative, children aged 5–10 years make inferences from text; vocabulary and working memory are measured.	Both factors (vocabulary and WM) contribute significantly to inference ability; verbal WM is especially important for processing information to make inferences.
9	(Shaban, 2024)	*A Systematic Review of Working Memory Applications for Language Comprehension*	A systematic (meta) literature review of language-related WM research.	Highlighting that WM is very important in language comprehension, and many WM applications (such as training) have been tested to improve language comprehension skills.
10	(Trakulphadetkrai E.; Giofrè, D., 2020)	*The contribution of general language ability, reading, and working memory*	Exploratory research, elementary school children, and regression analysis to assess the	General language skills and working memory make unique contributions to academic

		to academic achievement	contribution of WM, language skills, and reading to academic achievement.	achievement; verbal and visuospatial WM are related to aspects of reading and mathematics.

Research results show a consistent relationship between working memory capacity, phonological memory, and language skills in elementary school children. Research by Holmes et al. (2015) shows that increased verbal working memory has a direct impact on children's ability to store and process linguistic information, especially in children with low language skills. This condition aligns with research by Ibda (2015) & Babakr et al. (2029) regarding the role of the phonological loop. Working memory functions as a temporary storage system that facilitates sound processing during speaking and reading. Optimal working memory performance enables children to maintain verbal representations while reading, producing sentences, and understanding more complex syntactic structures. The consistency of research findings from several studies in this dataset strengthens the position of working memory function as a neurocognitive foundation supporting language development. Children with strong working memory capacity tend to perform better on a variety of linguistic tasks, including word production, vocabulary comprehension, and the ability to make inferences from text. Neuropsychological studies support this relationship through evidence of the involvement of the prefrontal and temporo-parietal cortex in memory and language processing. The interaction of these two areas enables children to integrate verbal information, manage cognitive load, and produce more stable language comprehension. These research findings position working memory function as a central element of elementary school children's language development and provide a strong foundation for cognitive interventions focused on improving working memory capacity.

Analysis of research by Blything & Cain (2019) and Currie et al. (2015) shows a significant contribution of verbal working memory capacity to children's syntactic and inferential abilities. Children with greater working memory capacity demonstrate the ability to construct complex sentences in a more structured manner, as the working memory system can retain and coordinate syntactic elements to produce complete language constructions. This mechanism aligns with the framework. The Working Memory Model shows that sentence processing requires coordination between short-term storage and executive control. Inferential skills are also influenced by working memory capacity because this process involves integrating new information with knowledge stored in long-term memory. Children who are better able to manage memory load tend to have higher reading comprehension because this capacity supports the storage of stable mental representations during reading activities. This relationship between memory and inference strengthens the argument that working memory functions as a primary regulator of linguistic information flow. The results of this study have important relevance in the context of elementary education, given that syntactic and inferential skills are prerequisites for academic success in various subjects that rely on reading and listening activities.

Recent meta-analytic evidence confirms that working memory is a strong predictor of academic achievement and reading comprehension across domains (Alloway & Copello, 2023; Peng et al., 2022). Working memory supports the integration of linguistic information and maintenance of semantic representations, which are essential for processing complex academic texts, including science materials. However, although working memory training may yield improvements in near-transfer tasks, evidence for broad academic gains remains limited (Melby-Lervåg et al., 2021). This suggests that cognitive training is most effective when embedded within domain-specific instruction. Empirical findings further indicate that working memory significantly predicts science text comprehension (Follmer & Sperling, 2022), and that targeted cognitive-linguistic interventions can benefit students with language-related difficulties (Dehn, 2023). Collectively, these findings highlight the importance of integrating working memory support into language and science instruction.

The research results of Delage et al. (2023) and Shaban (2024) show that working memory training-based interventions can significantly improve language skills, especially in children with language barriers or developmental language disorder (DLD). Training programs such as Cogmed have shown positive effects on syntactic complexity and fluency of language production, thus demonstrating the success of neurocognitive approaches focused on improving memory capacity. These results align with research showing that cognitive function training can strengthen neural connectivity in areas involved in language processing, including the dorsolateral prefrontal cortex and Broca's area. Improvements in memory function following intervention reflect increased efficiency in the mechanisms for storing and manipulating verbal information. The medium-term effects of the training suggest that the increased memory capacity is temporary and generates functional changes that support ongoing language development. The implications of these results reinforce the importance of integrating cognitive interventions into children's educational programs, particularly for students with phonological and syntactic processing disorders. Implementing interventions focused on improving memory function can enrich learning approaches and provide more targeted support for the neurocognitive needs of elementary school children.

The synthesis of findings in this review has important implications for science learning at the elementary school level. Science education requires students not only to acquire factual knowledge but also to process complex causal relationships, interpret scientific explanations, and integrate information from multiple representations such as text, diagrams, and verbal instruction. These processes impose substantial cognitive demands that rely heavily on working memory and language abilities (Sana & Fenesi, 2025).

Working memory plays a central role in managing the cognitive load inherent in science learning (Forsberg et al, 2021). When students are introduced to scientific concepts such as force, energy transformation, ecosystems, or the water cycle, they must simultaneously retain definitions, understand relationships between variables, and integrate new information with prior knowledge stored in long-term memory. Limited working memory capacity may hinder students' ability to construct coherent mental models of scientific phenomena. Conversely, students with stronger working memory capacity are better able to coordinate multiple elements of information, follow multi-step experimental procedures, and comprehend explanatory texts in science subjects.

Previous research has shown that working memory capacity is linked to the comprehension of syntactically complex sentences, suggesting that effective memory processes support the understanding of structurally demanding language forms. Research by Karavasilis et al. (2023) found that distinct working memory components significantly influence children's ability to process complex syntax, particularly in groups with developmental language difficulties. Language skills are equally fundamental in science learning, as scientific knowledge is largely transmitted through specialized vocabulary, complex sentence structures, and explanatory discourse. The ability to understand conjunctions expressing causality (e.g., because, therefore, as a result) and to process syntactically complex sentences supports comprehension of scientific explanations. Furthermore, inferential skills, which are strongly associated with verbal working memory, enable students to draw conclusions from data, predict outcomes of experiments, and interpret implicit relationships in scientific texts. Thus, the interaction between memory and language systems forms a neurocognitive foundation for scientific reasoning.

From a neuropsychological perspective, the involvement of the prefrontal cortex in executive control and the temporo-parietal regions in language processing highlights the integrated brain mechanisms underlying science learning. Effective science instruction should therefore consider students' cognitive capacity, particularly their working memory limitations (Ouwehand et al., 2025). Instructional strategies such as breaking down complex information into smaller units, using visual scaffolding, providing repetition and structured explanations, and incorporating verbal rehearsal activities can reduce cognitive overload and enhance conceptual understanding.

In addition, memory-based interventions, including working memory training and phonological exercises, may indirectly strengthen students' readiness to engage in science learning (Okur & Aksoy, 2025). By improving the efficiency of verbal information processing and retention, such interventions can support comprehension of scientific texts, participation in classroom discussions, and the construction of coherent explanations. Integrating cognitive stimulation strategies into science instruction may therefore provide a more holistic approach to improving both language development and academic achievement in science subjects.

Taken together, these findings demonstrate a coherent neurocognitive pattern across the reviewed studies. Overall, the synthesis of research findings confirms that memory function is a key neurocognitive factor underlying the development of elementary school children's language abilities. The relationship between working memory, phonological memory, and language abilities encompasses comprehension, word production, syntax, literacy, and inferential abilities (Karavasilis, 2023). The studies analyzed demonstrate that stronger working memory capacity is consistently associated with better language performance across various linguistic domains. Working memory's role in sentence processing, information integration, and phonological storage provides a stable and efficient foundation for language processing (Oberauer, 2020). These findings align with a neuropsychological perspective that emphasizes the involvement of neural systems in supporting the interaction between memory and language. Although there is variation in the strength of the relationship across studies, the overall pattern of results demonstrates a consistent positive relationship between working memory capacity and language performance. These findings provide a scientific basis for developing learning approaches that involve cognitive function stimulation and memory training interventions, thereby more comprehensively supporting children's academic achievement.

Based on the synthesis of the reviewed studies, a conceptual neurocognitive model is proposed to illustrate the relationship between working memory, language abilities, and science learning outcomes.

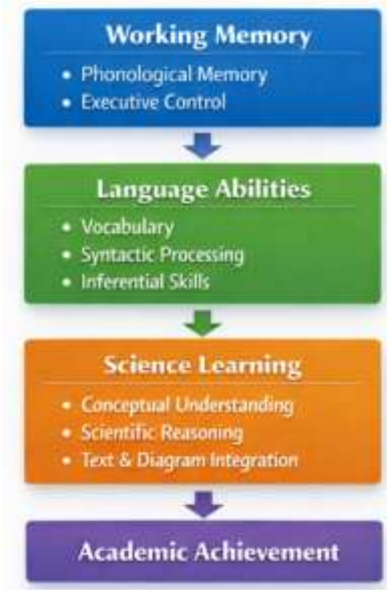

Figure 1. Conceptual Neurocognitive Model Linking Working Memory, Language Abilities, and Science Learning

Figure 1 presents this hierarchical pathway, showing how working memory components support vocabulary acquisition, syntactic processing, and inferential skills, which subsequently facilitate science learning outcomes such as conceptual understanding and scientific reasoning (Castro-Alonso, 2019). Children with stronger memory–language integration are better equipped to manage the cognitive demands of science tasks, including interpreting text and diagrams, integrating multiple representations of information, and reasoning about complex causal relationships (Sana & Fenesi, 2025). This model thus reflects an interaction between cognitive and linguistic systems that underpins success in science learning.

Figure 2. Neuropsychological Basis

Figure 2 illustrates the neuropsychological basis of this model, highlighting key brain regions involved in working memory and language processing. The prefrontal cortex supports executive control and the regulation of working memory (Hitch, 2025), the temporo-parietal cortex contributes to linguistic comprehension, and the hippocampus facilitates long-term memory consolidation (Forsberg et al., 2021). Together, these neural systems enable effective integration of memory and language processes that are necessary for science learning, including conceptual understanding and inferential reasoning. Strengthening working memory and language abilities through targeted interventions is thus supported by both cognitive theory and neuropsychological evidence as a foundation for enhancing students' capacity to engage with complex scientific concepts and reasoning tasks.

This conceptual model highlights how working memory components support language processing mechanisms, which subsequently facilitate science learning outcomes, including conceptual understanding, scientific reasoning, and the integration of textual and visual representations. The framework emphasizes that strengthening working memory and language abilities is essential for elementary students to engage successfully with complex scientific concepts and reasoning tasks.

CONCLUSION

The synthesis of the reviewed studies demonstrates that working memory, including phonological and executive components, plays a critical role in supporting language processes essential for science learning. Students with stronger memory capacity can maintain and manipulate verbal and visual information, enabling them to comprehend complex scientific concepts, follow multi-step procedures, and integrate information from texts, diagrams, and verbal instructions. Language abilities such as vocabulary knowledge, syntactic processing, and inferential skills interact closely with memory to support reasoning and understanding in science.

Interventions that enhance working memory, including training exercises and phonological activities, have been shown to improve students' ability to manage cognitive load during science tasks. Strengthened memory function supports not only sentence comprehension and word production but also the capacity to draw conclusions, predict outcomes, and construct coherent explanations based on scientific evidence. This highlights how memory and language processes form a neurocognitive foundation for scientific reasoning and conceptual understanding.

Overall, the evidence indicates that memory function is a key driver of science learning. Enhancing working memory and language abilities allows students to process, integrate, and apply scientific information more effectively. Future research should investigate how domain-specific knowledge, cognitive strategies, and memory-focused interventions can be combined to optimize science learning outcomes.

REFERENCES

Alloway, T. P., & Copello, E. (2023). Working memory and academic achievement: A meta-analytic review. *Educational Psychology Review, 35*, 45–67. https://doi.org/10.1007/s10648-022-09690-3

Babakr, Z. H., Mohamedamin, P., & Kakamad, K. (2019). Piaget's Cognitive Developmental Theory: Critical Review. *Education Quarterly Reviews*, *2*(3), 517-524. https://eric.ed.gov/?id=EJ1274368

Blything, L. P., & Cain, K. (2019). The role of memory and language ability in children's production of two-clause sentences containing before and after. Journal of Experimental Child Psychology, 182, 61–85. https://doi.org/10.1016/j.jecp.2019.01.011

Castro-Alonso, J.C., Ayres, P., Sweller, J. (2019). Instructional Visualizations, Cognitive Load Theory, and Visuospatial Processing. In: Castro-Alonso, J. (eds) Visuospatial Processing for Education in Health and Natural Sciences. Springer, Cham. https://doi.org/10.1007/978-3-030-20969-8_5

Currie, K., Seck, L., & Cain, N. K. (2015). Children's inference generation: The role of vocabulary and working memory. Journal of Experimental Child Psychology, 137, 57–75. https://doi.org/10.1016/j.jecp.2015.05.013

Dehn, M. J. (2023). Working memory and language disorders: Assessment and intervention implications. *Journal of Learning Disabilities, 56*(2), 95–108. https://doi.org/10.1177/00222194221123456

Delage, H., Stanford, E., Baratti, C., & Durrleman, S. (2023). Working memory training in children with developmental language disorder: Effects on complex syntax in narratives. *Frontiers in rehabilitation sciences*, *3*, 1068959. https://doi.org/10.3389/fresc.2022.1068959

Faudillah, A. N., Nasution, F., Munthe, A. F., & Humairah, S. (2023). Dampak Stres Terhadap Perkembangan Otak Anak. *Jurnal Riset Golden Age PAUD UHO*, *6*(2), 70-75. https://rgap.uho.ac.id/index.php/journal/article/view/45

Follmer, D. J., & Sperling, R. A. (2022). The influence of working memory on science text comprehension in elementary students. *Journal of Educational Psychology, 114*(4), 823–839. https://doi.org/10.1037/edu0000691

Forsberg, A., Adams, E. J., & Cowan, N. (2021). The role of working memory in long-term learning: Implications for childhood development. In *Psychology of learning and motivation* (Vol. 74, pp. 1-45). Academic Press. https://doi.org/10.1016/bs.plm.2021.02.001

Hitch, G. J. (2025). Developing the concept of working memory. In *Cognitive psychology* (pp. 154-196). Routledge.

Holmes, S., Cormack, F., van Loenhoud, A., Ruggero, L., Gathercole, S., J. ., & Butterfield. (2015). Improving working memory in children with low language abilities. Frontiers in Psychology, 6. https://doi.org/10.3389/fpsyg.2015.00519

Ibda, F. (2015). Perkembangan Kognitif: Teori Jean Piaget. Intelektualita, 3(1), 242904.

Karavasilis, G., Diakogiorgi, K., & Papadopoulou, D. (2023). The role of working memory in the comprehension of syntactically complex sentences in children with and without developmental language disorder: A literature review. *Psychology: the Journal of the Hellenic Psychological Society*, *28*(2), 205-222. https://doi.org/10.12681/psy_hps.32457

Melby-Lervåg, M., Redick, T. S., & Hulme, C. (2021). Working memory training does not improve performance beyond near transfer: Evidence from a comprehensive meta-analysis. *Perspectives on Psychological Science, 16*(3), 512–534. https://doi.org/10.1177/1745691620967089

Nicole, D. E., Baratti, C., Durrleman, S., & Stanford, H. (2023). Working memory training in children with developmental language disorder: Effects on complex syntax in narratives. Frontiers in Rehabilitation Sciences, 3. https://doi.org/10.3389/fresc.2022.1068959

Oberauer, K. (2020). Towards a theory of working memory: From metaphors to mechanisms. In R. H. Logie, V. Camos, & N. Cowan (Eds.), *Working memory: State of the science* (pp. 116–149). Oxford University Press. https://doi.org/10.1093/oso/9780198842286.003.0005

Okur, M., & Aksoy, V. (2025). The Effect of a Working Memory Intervention Package on the Working Memory Performance of Primary School Students with Specific Learning Disabilities. *Journal of Intelligence*, *13*(2), 16. https://doi.org/10.3390/jintelligence13020016

Ouwehand, K., Lespiau, F., Tricot, A., & Paas, F. (2025). Cognitive Load Theory: Emerging Trends and Innovations. *Education Sciences*, *15*(4), 458. https://doi.org/10.3390/educsci15040458

Peng, P., Barnes, M., Wang, C., Wang, W., Li, S., Swanson, H. L., & Tao, S. (2022). A meta-analysis on the relation between reading comprehension and working memory. *Psychological Bulletin, 148*(5–6), 343–371. https://doi.org/10.1037/bul0000350

Pratiwi, D. (2024). Hubungan antara working memory dengan reading dan kemampuan bahasa pada anak SD. Jurnal Teaching & …, 3(1), 23–36. https://doi.org/10.59686/jtwb.v3i1.136

Putra M., S. P., & Muryanti. (2023). Hubungan working memory dan literacy dengan kemampuan pragmatik anak usia prasekolah di Surakarta. Nusra : Jurnal Penelitian Dan Ilmu Pendidikan, 4(4), 1035–1043. https://doi.org/10.55681/nusra.v4i4.1737

Rahmawati, A., Tairas, M. M. W., & Nawangsari, N. A. F. (2018). Profil Kesiapan Sekolah Anak Memasuki Sekolah Dasar. JPUD - Jurnal Pendidikan Usia Dini, 12(2), 201–210. https://doi.org/10.21009/jpud.122.01

Sana, F., & Fenesi, B. (2025). Working Memory and Instructional Fit: Reintroducing Aptitude–Treatment Interaction in Education Research. *Behavioral Sciences*, *15*(6), 765. https://doi.org/10.3390/bs15060765

Shaban, A. (2024). A Systematic Review of Working Memory Applications for Language Comprehension. Education Sciences, 14(1), 1–20. https://doi.org/10.3390/educsci140101260

Sugiyono. (2020). Metode Penelitian Kualitatif. Alfabeta, CV.

Syahida, A. S., Pratomo, H. T. A., & Nugroho, S. (2025). Verbal working memory, MLU, dan produksi kata pada anak prasekolah. Jurnal Kesehatan Tambusai. https://doi.org/10.31004/jkt.v6i1.42538

Trakulphadetkrai E.; Giofrè, D., N. V. . D. (2020). The contribution of general language ability, reading, and working memory to academic achievement. Learning and Individual Differences, 23(4), 473–487. https://doi.org/10.1080/13670050.2017.1373742

Viesel-Nordmeyer A.; Starke, A.; Ritterfeld, U., N. . R. (2022). How language skills and working memory capacities explain mathematical learning ... (longitudinal). PLOS ONE. https://doi.org/10.1371/journal.pone.0270427

Wiarsih, C., & Aziez, F. (2021). Mengeksplorasi Strategi Manajemen Kelas Bahasa Inggris Di Sekolah Dasar Inklusi. Khazanah Pendidikan, 15(1), 74. https://doi.org/10.30595/jkp.v15i1.10359