

Independent Curriculum Based on the Neurolinguistic Model for Elementary School Students' Language Skills and Digital Literacy

Ari Susandi^{1*}, Oriza Zativalen², Delora Jantung Amelia³, Vanda Rezanah⁴, Rivo Yudhinata Rian⁵, Rizka Novi Irmaningrum⁶, Linaria Arofatul Ilmi Uswatun Khasanah⁷, Naureen Durrani⁸, Amy North⁹

^{1,2,6,7}Universitas Muhammadiyah Lamongan, Indonesia

³Universitas Muhammadiyah Malang, Indonesia

⁴Universitas Muhammadiyah Sidoarjo, Indonesia

⁵Universitas Brawijaya Malang, Indonesia

⁸Nazarbayev University, Kazakhstan

⁹University College London, United Kingdom

*Corresponding Author. E-mail pssandi87@gmail.com

Abstract

This study aims to determine the Independent Curriculum Based on the Neurolinguistic Model on Language Skills and Digital Literacy of Elementary School Students. The case study approach through the review of several research articles and was used because the researcher wanted to conduct in-depth data collection and include various sources of information. The data collection technique through the review of articles related to the independent curriculum, language skills, neurolinguistics, with the aim of the researcher wanting to select a number of data from existing research in accredited national scientific journals that are in accordance with the research focus and research objectives. The data collection technique through documentation studies and the researcher wanted to dig as deep as possible information about the Independent Curriculum Based on the Neurolinguistic Model on Language Skills and Digital Literacy of Elementary School Students. The Independent Curriculum is designed to provide autonomy to schools in developing a curriculum that suits the needs and characteristics of students. This is in line with the concept of information processing skills and language skills in the educational aspect that emphasizes learning based on student potential and interests. Teachers who understand brain information processing can help students who have access to language skills understand digital literacy, teachers can design inclusive, meaningful learning strategies and provide guidance and support to students in the golden generation who are capable, communicative and digitalized.

Keywords: Neurolinguistic Model, language skills, digital literacy, independent curriculum, elementary school.

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INTRODUCTION

Language plays a central role in the intellectual, social, and emotional development of learners (Dalimunthe, K. F., & Ikawati, E., 2025). Language serves as a communication tool an individual's capacity to interact with others through either spoken or written means. Indonesia is a country characterized by linguistic diversity. Language acts as a fundamental tool for communication in human life, enabling individuals to convey ideas, thoughts, and feelings to others. In Indonesia, Indonesian serves as the national and official language used across various sectors, including education (Simanullang, I., et al., 2024). From an educational perspective, Indonesian language instruction aims to enhance students' language skills, specifically listening, speaking, reading, and writing. Previous research highlights the importance of language skills in the learning process; Marbun, N. G. (2025) found that students with strong language proficiency tend to exhibit higher levels of critical and creative thinking. Similarly, Rohmatun S. et al. (2025) demonstrated that students with proficient reading and writing skills often achieve better academic results across various subjects. In the current digital era, integrating technology into language learning has become increasingly important. The use of online learning platforms, educational software, and other digital tools can enrich students' learning experiences and provide access to a wider range of language resources (Rosyidah, A. Z., et al., 2025). However, it is crucial to ensure that the use of technology is balanced with direct interaction and language practice within real-world contexts. Centuries ago, the ancient Greeks regarded language as an integral part of general knowledge and human memory; consequently, information or knowledge was viewed merely as a specific form of memory, and language and speech disorders affecting human information processing—from a neurolinguistic standpoint—were linked to the dominance of specific brain functions in communication (Eling, P., 2015).

One of our key findings is a significant increase in neurolinguistic research over the past two decades, with 3,804 out of 5,104 articles published between 2000 and 2022. We also examined metrics of knowledge production in neurolinguistics categorized by country, university, journal, publisher, research field, author, and most-cited papers thereby providing insights into the distribution of knowledge generation in this field (Roelofs, A., 2022).

Table 1. Neurolinguistic periodic analysis

No	Year	Journal Name	Issues Examined	Research Solutions/Contributions
1	2023	Cogent Arts & Humanities	There is currently no comprehensive mapping of the global development of neurolinguistic research.	Conducting a scientometric analysis of 5,104 publications to identify trends, productive countries, institutions, authors, and research themes in neurolinguistics.
2	2022	Journal of Neurolinguistics	Research on verbal fluency tests remains scattered and has not yet been systematically mapped.	It presents a map of the development of verbal fluency research as a diagnostic tool for language and cognitive disorders.

3	2022	Frontiers in Psychology	The complexity of speech perception and language processing in the human brain.	Integrating cognitive psychology and neuroscience approaches to understand the mechanisms of language perception.
4	2021	Brain and Language	Lack of understanding regarding the brain areas involved in language processing.	Using neuroimaging technology to identify the neural networks that support language production and comprehension.
5	2021	Neuropsychologia	Post-stroke language impairment (aphasia) leads to a decline in a patient's communication abilities.	Developing a language rehabilitation model based on brain function mapping.
6	2020	Journal of Cognitive Neuroscience	The relationship between cognitive function and language ability is not yet fully understood.	Explaining the links between working memory, attention, and executive function and language ability.
7	2020	Human Brain Mapping	The lack of clarity regarding connectivity between brain regions during language processing.	The lack of clarity regarding connectivity between brain regions during language processing.
8	2019	Frontiers in Human Neuroscience	How the brain manages more than one language is still a subject of debate.	How the brain manages more than one language is still a subject of debate.
9	2019	Journal of Communication Disorders	Delayed identification of language disorders in children impacts academic performance.	Delayed identification of language disorders in children impacts academic performance.
10	2023	Humanities and Social Sciences Communications	A lack of information regarding the progress of linguistic and language research in Asia.	A lack of information regarding the progress of linguistic and language research in Asia.

Furthermore, using scientometric analysis, we identified the most significant and influential authors in this field, as well as those likely to experience citation growth. Our study also includes a visual map of the most frequently occurring keywords in neurolinguistics and clusters the entire dataset, providing a comprehensive overview of the topics and themes garnering the most attention in the field (Yang, X., et al., 2022). Overall, our findings demonstrate the utility of scientometric research in evaluating the trajectory of specific fields of study and providing valuable insights for primary school

students and decision-makers; however, there is currently limited research integrating digital literacy with the neuro-cognitive processing abilities of primary school students (Alduais, A. M. S., et al., 2023).

In 2019, the OECD announced the results of the 2018 PISA survey, which provided a snapshot of the reading proficiency issues facing Indonesians. The 2018 results revealed that Indonesia's ranking had dropped to 74th place (sixth from the bottom), down from 64th in 2015. UNESCO (2016) also reported that interest in reading in Indonesia was extremely low ranking 60th out of 61 countries at just 0.001%. Boosting reading interest and literacy among Indonesians represents a major challenge for the education sector. The Japanese storytelling method known as **kamishibai** offers a potential solution for teaching the alphabet, vocabulary, and grammar (Rahmawati, L. D., 2022). PISA is an ongoing program that provides insights to inform policies and practices regarding language skills. It also helps monitor trends in the acquisition of knowledge and language skills among students across different countries and within various demographic subgroups in each nation. PISA offers an overview of student language proficiency outcomes within existing education systems (Hanief, R., 2022). This aligns with the perspective of Julia Gillard Australia's Prime Minister at the time who sought to reform the Australian education system after major media outlets reported poor educational performance; such issues, alongside factors like information processing (neurolinguistics), were seen as having an impact on language and communication skills (Baroutsis & Lingard, 2018).

Ultimately, the development of language skills must be viewed as an ongoing process involving the entire school community. Through a holistic approach that considers the multifaceted aspects of language learning and engages a wide range of stakeholders, elementary schools can foster a secure environment for students' language skill development which, in turn, supports their future academic and social success (Ambarawati, D. A. et al., 2025). Indonesian language instruction aims to enhance students' ability to communicate effectively and correctly using the language, encompassing four key skill areas: listening, speaking, reading, and writing; these skills are, of course, interconnected (Ulkhay, M. M., 2022). Furthermore, language learning in elementary schools seeks to cultivate reasoning and communication abilities, facilitate the expression of thoughts and feelings, and foster national unity and cohesion.

The scope of Indonesian language content encompasses four aspects of speaking skills, specifically interaction with others. Speaking skills align with general competencies such as expressing ideas and feelings, engaging in dialogue, conveying messages, explaining concepts, and role-playing (Andini, N.P. et al., 2025). Speaking skills refer to the oral communication abilities possessed by anyone intending to convey a message to another person. This involves proficiency in both grasping information and effectively communicating the information received; without language, humans would be unable to sustain their lives, as the fulfillment of their desires would be obstructed. Even individuals with speech impairments communicate through gestures, expressions, and body language (Nofrianni, E. et al., 2025). Writing ability is one of the most important language skills in learning Indonesian. Writing is not just the activity of pouring out words, but a complex thinking process that includes designing, compiling, revising, and developing ideas logically and communicatively (Aljamaliah, S.N.M. et al., 2025). In the context of literacy education, writing has a strategic role as a medium to train critical thinking skills, express opinions, and explore students' personal and social experiences.

Language skills play a crucial role in supporting the learning process, serving as the primary means for conveying, receiving, and comprehending information. Writing

instruction needs to be designed so that students produce work that is not only structurally sound but also meaningful and impactful. According to Khabibah and Munir (2025), an effective writing instruction model positions students as active subjects, provides space for reflection, and encourages participation in the creative process. Writing in Indonesian is highly relevant to strengthening literacy competence, as it offers students opportunities to think critically about their content, reflect on structural and linguistic appropriateness, and improve the quality of their writing based on feedback from teachers or peers. However, despite the widespread implementation of the *Kurikulum Merdeka* (Independent Curriculum) and digital literacy initiatives in education, few studies specifically address neurolinguistics as a means to optimize students' neurolinguistic aspects particularly within the context of primary education and language skills. Existing research tends to focus on the application of the *Kurikulum Merdeka* and digital literacy in writing or reading contexts, whereas studies regarding the curriculum's impact on listening skills and its relationship with neurolinguistic processing remain very limited.

Listening plays a fundamental role in language learning (Harahap, N. H., & Kharisma, I., 2025). It is defined as the activity of comprehending and interpreting messages conveyed by a speaker through speech sounds (Rohmah, N., & Nugroho, R. Y. Y., 2024). Children possess this skill even while in the womb, and it serves as a primary foundation for language development. Listening proficiency significantly influences the mastery of speaking, reading, and writing skills; without strong listening abilities, individuals face challenges in both comprehending and clearly conveying information. A 2025 study by Asri Susetyo Rukmi et al., titled "Innovation in Listening Instruction Using Digital Storybooks to Optimize Student Neurolinguistics in Elementary Schools," found that integrating visual, audio, and interactive elements into digital storybooks plays a crucial role in boosting student engagement and deepening comprehension of the stories heard. These findings align with previous research indicating that the use of multimodal media can improve information processing and deepen student understanding. However, the study had limitations regarding sample size and intervention duration, necessitating further research with a broader scope and a longer intervention period. Overall, the study supports the use of digital storybooks as an effective instructional medium for enhancing listening skills and aligns with the principles of the *Kurikulum Merdeka* (Independent Curriculum), which emphasizes interactive and enjoyable learning. Additionally, a 2025 study by Nur Az Zahra, titled "Analysis of Learning Difficulties in Reading Comprehension with a Neurolinguistic Approach for Students with Learning Difficulties at Anubanwangmai School, Thailand," highlighted the importance of cognitive and neurological support; while environmental factors played the largest role, the study found that 28% of students had neurological disorders and 48% had cognitive limitations, underscoring the need to address these issues through targeted interventions. Students with neurological challenges may require specialized support, such as attention training or cognitive exercises, to improve their reading comprehension skills (Zahra et al., 2025).

Decoding studies have demonstrated that speech production can be reliably distinguished from non-speech behaviors based on ECoG data from the fronto-temporo-parietal region. Distinctions between phonetic features of speech can also be decoded. Robust phoneme classification, for instance, has been achieved based on neuronal spiking activity recorded via neurotrophic electrodes in the speech motor cortex of individuals with locked-in syndrome as well as through changes in spectral magnitude or power in the fronto-temporo-parietal cortex of epilepsy patients. Recent ECoG studies report

successful classification of phoneme categories and speech articulation features at the sub-phonemic level. Mugler et al. compared classification performance for articulatory movements (i.e., movements of various articulators) versus phonemes; the authors achieved higher decoding accuracy when decoding articulation.

As suggested by the research of Stemmer and Whitaker (1998) mentioned above, direct BCI performance could benefit from considering various levels of linguistic abstraction. However, a challenge in implementing such an integrative approach is the need to generate neurolinguistic evidence regarding the neuronal distinctions between linguistic entities at these multiple levels. Consider, for instance, the linguistic category of the 'word' such as in BCI studies on speech decoding involving the classification of ten individual words based on neuronal activity (as illustrated in Figure 1). While numerous linguistic corpora are currently available online greatly fostering quantitative linguistic research to the best of our knowledge, no published neurolinguistic corpus yet combines spontaneous spoken speech with simultaneous neuronal recordings; collaborative efforts between linguists and neuroscientists are required to create such data and make it available to interested researchers. Reading is the activity of comprehending the content and ideas whether implicit or explicit within a text; thus, the aspect of comprehension is crucial. Reading comprehension aims to seek in-depth information and grasp the meaning or significance of a written text (Murdiani, P. S. A., & Supriyadi, S., 2025). At this stage, reading skills go beyond merely recognizing the literal meanings of words; the process requires readers to interpret word meanings within a deeper context and to fully understand the text's content, intent, and purpose.

This study offers a novel approach by integrating the *Merdeka* Curriculum learning concept with a neurolinguistic model to enhance the language and digital literacy skills of elementary school students. Utilizing a neurolinguistic model as a tool to improve information-processing capabilities holds the potential to stimulate students' brains in various ways particularly regarding memory, word association, and the comprehension of complex language structures. By incorporating engaging and interactive narrative elements, students will not only learn to listen more effectively but will also be trained to connect meanings more deeply and critically (Pranckutė, 2021).

Furthermore, this study aims to explore how elements within the digital neurolinguistic model such as visualization, audio narration, and interactivity—can stimulate students' brains to optimize their language skills and digital literacy. The emphasis on neurolinguistic aspects will offer fresh insights into the implementation of learning technologies in primary schools, particularly regarding the enhancement of language skills and digital literacy through a process that is more natural, enjoyable, and effective.

RESEARCH METHODS

This study employs a conceptual, descriptive-qualitative approach aimed at examining the *Kurikulum Merdeka* (Independent Curriculum) through a neurolinguistic model lens, specifically regarding the language skills and digital literacy of elementary school students. A case study approach involving a review of various research articles was selected to facilitate in-depth data gathering and the incorporation of diverse information sources (Creswell, 2009). Descriptive-qualitative and conceptual approaches in educational research offer broad insights into specific phenomena and serve various functions: as standalone research designs, as precursors to larger qualitative studies, and as qualitative components within mixed-methods or conceptual studies (Ritchie et al., 2014).

Data collection involved reviewing articles related to the *Kurikulum Merdeka*, language skills, and neurolinguistics; the aim was to select data from existing studies published in accredited national scientific journals that aligned with the research focus and objectives. Data collection was conducted through document analysis, allowing the researcher to explore in depth the topic of the *Kurikulum Merdeka* based on a neurolinguistic model in the context of elementary students' language skills and digital literacy. Meanwhile, the documentation study phase aimed to identify the legal basis for the *Kurikulum Merdeka* (Independent Curriculum) based on the neurolinguistic model regarding elementary school students' language skills and digital literacy; thus, the data from this documentation study served to complement the data obtained from scientific articles. The research procedure involved several stages: (a) determining the research theme, (b) conducting a literature review aligned with the theme, (c) establishing the research focus, (d) collecting data through article reviews and documentation studies, (e) analyzing the data, and (f) verifying the data. The data analysis phase employed the framework proposed by Miles and Huberman (1994), comprising data collection, data reduction, data display, and verification/conclusion. The researcher prioritized research articles specifically focused on the topic of the *Kurikulum Merdeka* based on the neurolinguistic model in the context of elementary school students' language skills and digital literacy.

RESULTS AND DISCUSSION

Transformation of the Merdeka Curriculum Based on the Neurolinguistic Model for Language Skills in Elementary Schools

Educational curriculum transformation represents a fundamental shift in educational approaches, methods, and objectives designed to meet the demands of the modern era. The "Merdeka Curriculum" (Independent Curriculum) concept serves as a key pillar in this endeavor. This curriculum prioritizes active student engagement, granting learners autonomy in planning, directing, and evaluating their own learning processes. An interdisciplinary approach within this transformation integrates elements from various fields of study to foster a holistic and contextual understanding, thereby preparing students to tackle real-world challenges through diverse perspectives and innovative solutions. Furthermore, the emphasis on 21st-century skills within the Merdeka Curriculum and educational transformation helps students cultivate language and communication abilities that align with the evolving demands of the workforce. Curricula naturally evolve over time to reflect current realities a trend particularly evident in Indonesia's curriculum development. Curricula are inherently dynamic, constantly shaped by shifts in underlying factors; consequently, the government continually introduces innovations in curriculum design to enhance the quality of education.

While the transformation of education and the implementation of the *Kurikulum Merdeka* (Independent Curriculum) hold great potential for enhancing the quality of learning, they also face several challenges and issues. These include: 1. Teacher and Staff Readiness: Implementing the *Kurikulum Merdeka* requires shifts in teachers' roles and skill sets. Many teachers may need additional training to adapt to a more flexible, student-centered learning approach. 2. Quality and Consistency: The *Kurikulum Merdeka* can lead to variations in how lessons are taught and assessed across different schools. This may result in disparities in learning quality and make it difficult to ensure consistent standards throughout the education system. 3. Resources and Accessibility: Implementing the curriculum may require additional resources, such as teaching materials tailored to students' interests and needs. This can pose a challenge in resource-

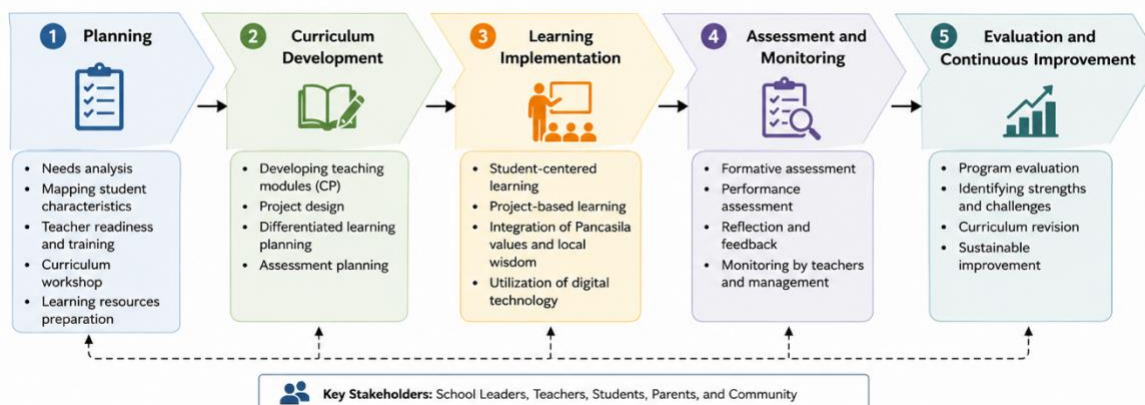
constrained environments. 4. Monitoring and Evaluation: Measuring the curriculum's effectiveness in achieving desired educational goals can be complex. A robust evaluation system is necessary to ensure students acquire the required skills and knowledge. 5. Uncertainty of Outcomes: The *Kurikulum Merdeka* can yield diverse learning outcomes depending on students' interests and learning approaches. This creates challenges when comparing student achievement across schools or regions. 6. Importance of Guidance: Students may require further direction and support when making decisions about suitable learning pathways. Guidance is essential to help them make choices that foster their personal and academic development. 7. Inequality and Inclusivity: Although the curriculum has the potential to accommodate student diversity, there is a risk that more capable and affluent students might benefit more from this approach, while vulnerable students could be left behind. 8. Technology Integration: A technology-focused *Kurikulum Merdeka* requires adequate access to infrastructure and technological devices. Unequal access to technology can lead to learning disparities.

The relationship between language and thought has long been a subject of theoretical debate. Certain perspectives, such as those inspired by the Sapir-Whorf hypothesis, emphasize that language structure can influence how humans perceive the world and organize their cognitive experiences (Wang, 2020). Conversely, cognitive neuroscience research indicates that many forms of thinking can occur without the direct involvement of the language system; this is evidenced by the fact that brain regions responsible for language processing are not always active when individuals perform complex non-linguistic cognitive tasks (Aritonang, D. R., & Dewi, S. N., 2022). Nevertheless, developmental studies show that specific linguistic abilities such as the mastery of sentence structures and mental vocabulary regarding mental states are linked to advancements in social reasoning and theory of mind in children (Muslimat, N. H. et al., 2023). In the context of language education, understanding the relationship between language, thought, and the brain is crucial, as language learning is fundamentally a cognitive process rooted in mental and neurological mechanisms (Purba, 2018). Psycholinguistic models view language learners as active cognitive agents who construct language representations through the processing of comprehensible input, attention to form, and the use of various mental strategies (Dey & Sawalmeh, 2021). This aligns with the view that the quality of interaction, feedback patterns, and opportunities for deep processing of meaning are key determinants of successful language acquisition in the classroom (Aprilia, D., & Apriliyani, N. A., 2023).

Primary school language teachers who understand neurolinguistic principles will be more attuned to limitations in working memory capacity and processing speed, as well as individual differences in students' cognitive styles (Nasution et al., 2025). This knowledge can be leveraged to design learning activities aligned with brain function—for instance, by managing cognitive load through information chunking, the use of meaningful contexts, varied repetition, and multimodal material presentation (Arteaga-Quijije, 2022). Although the contribution of neurolinguistics to language education is increasingly recognized, classroom teaching practices often remain focused on the rote memorization of linguistic forms and structural drills, without considering the dynamics of the learner's mental processes (Nurhamidah et al., 2024). This gap between psycholinguistic theory and pedagogical practice creates a need for a literature review that specifically examines how concepts regarding language, the mind, and the brain can be integrated into more effective language learning designs, thereby fostering an integration of neurolinguistics and student language skills (Arteaga-Quijije, 2022). Consequently, the study titled "The Relationship Between Language, Mind, and Brain: A

Psycholinguistic Analysis in the Context of Language Education" is crucial for gathering and critically evaluating relevant, up-to-date findings, while also formulating practical implications for language instruction across various educational levels (Setyawan, 2024).

Figure 1. Stages of Merdeka Curriculum Implementation at SD Negeri 1 Bululawang



Transformation of the Merdeka Curriculum Based on a Neurolinguistic Model for Digital Literacy in Elementary Schools

Transformative education refers to an educational approach focused on fundamentally changing how teaching and learning are conducted. Its goal is to develop skills, knowledge, and understanding relevant to the demands of the modern era, while producing individuals prepared to navigate changes across various aspects of life. The *Kurikulum Merdeka* (Independent Curriculum) serves as a prime example of significant educational policy transformation. This curriculum model offers greater flexibility and autonomy to schools, teachers, and students, allowing them to determine learning paths aligned with local needs, individual interests, and personal development (Susetyo, 2020). Digital literacy and language skills are prioritized competencies. Through educational transformation and the *Kurikulum Merdeka*, students become active participants in the learning process; they play a role in identifying their interests, planning their learning, and evaluating their progress. Teachers act as guides and facilitators, helping students develop independent and critical thinking skills. This approach not only prepares students for a complex workforce but also fosters interdisciplinary thinking, innovation, collaboration, and the ability to tackle real-world challenges. Ultimately, educational transformation and the *Kurikulum Merdeka* contribute to creating a learning environment that is inclusive, relevant, and responsive to the needs of future generations.

Recent research indicates that the quality of language input a child receives particularly in the form of child-directed speech or "motherese" plays a significant role in accelerating language acquisition (Yuliasari et al., 2024). Similarly, the frequency and quality of dialogic interactions between children and caregivers have been shown to correlate positively with the development of vocabulary and syntactic abilities (Sapriani & Depalina, 2025). Meanwhile, neurolinguistic research utilizing brain imaging technology reveals that the critical period for language acquisition is linked to optimal brain plasticity during early childhood, highlighting the need to strengthen access to digital information (Sutrisno, 2025). Studies on language acquisition hold particular relevance within the multilingual and multicultural context of Indonesia. Indonesian children generally grow up in bilingual or even multilingual environments, where they are exposed to regional languages, Indonesian, and often foreign languages from an early age. This situation creates unique dynamics in the process of language skill development

that warrant further investigation (Yu, 2022). Research on language skills in the Indonesian context requires further development, particularly regarding the interplay between regional languages and Indonesian, as well as the specific sociocultural factors influencing this process.

Understanding the nature of language skills and their supporting factors is not merely a theoretical matter; it also carries broad practical implications. For early childhood educators and practitioners, this understanding serves as a foundation for designing curricula and instructional strategies that align with children's language development stages (Susanti et al., 2025). For parents, knowledge of the factors that support language skills can help them create an optimal linguistic environment at home. In the fields of speech-language pathology and speech therapy, an understanding of typical language skills provides a benchmark for identifying and addressing developmental language disorders in children (Yennizar et al., 2022). Despite extensive research, various aspects of language acquisition still require further investigation, particularly within the local Indonesian context. The novelty of this study addresses the lack of longitudinal data on the stages of language proficiency and neurolinguistic aspects among Indonesian children, the scarcity of studies regarding the role of regional languages in the acquisition of Indonesian as a second language, and the limited research integrating neurobiological perspectives with sociocultural factors within Indonesian society.

Figure 2. Field Evidence of Merdeka Curriculum Implementation at SD Negeri 1 Bululawang



Note. These images are documentation from the research at SD Negeri 1 Bululawang.

The Relevance of the Neurolinguistic Model-Based Merdeka Curriculum to Language Skills and Digital Literacy in Elementary Schools

A 2023 study by Nabila Mustafifi et al. regarding the Kurikulum Merdeka* (Independent Curriculum) and language skills identified several issues, particularly in storytelling during Indonesian language lessons. Students often presented narratives with a disjointed flow; their vocal projection and articulation were faint, rendering them unclear and they exhibited hesitancy, repetition of words or sentences, and the use of non-standard vocabulary. Furthermore, students felt nervous and self-conscious when telling stories in front of the class, which impacted their speaking skills. Consequently, this research aimed to describe storytelling-based speaking skills within the *Kurikulum Merdeka* framework for the Grade IV Al-Maraghy class at SD Unggulan Muslimat NU Kudus, as well as the factors influencing these skills; the study highlights that the implementation of the Kurikulum Merdeka and the associated cognitive processing involved in communication plays a significant role in enhancing speaking proficiency (Nabila et al., 2023).

Two cases from the 17th century contributed significantly to the development of neurolinguistics, primarily because they brought a level of analytical accuracy previously unattained. Johann Schmidt documented a patient who frequently substituted and jumbled words; the patient could not recognize letters or read, yet was able to write when

words were dictated to them. This case was analyzed by Peter Rommel in the text *De aponia rara**; Rommel's observations are considered to represent a "well-described dissociation between voluntary and automatic speech" (H. Eling & W., 2010, p. 572) marking the first time such a dissociation was recognized. Swiss physician Johannes Jakob Wepfer, in his work **Observationes Medico-practicae de Affectibus Capitis Internis & Externis** (dated circa 1690 but published posthumously in 1727), described under case no. 98, titled "Loss of Memory," provides a detailed account of temporary language disorders, including anomia (inability to recall words) and syntactic agrammatism (H. Eling & W., 2010). Wepfer was one of the first physicians to link language disorders to damage in the left side of the brain (H. A. Whitaker, 2006). In the 19th century, a significant shift occurred in the study of the relationship between language and the brain. The German physician Franz Joseph Gall investigated the link between human traits and the brain, positing that mental functions are innate and localized within specific regions of the brain. Gall believed that evidence for the existence of these mental organs could be gathered by examining and measuring the indentations and protrusions on the brain's surface. This approach the study of the skull was initially termed "craniology" and later became known as "phrenology." Although the practice was abandoned by the end of the 19th century, it marked a pivotal moment in research regarding the mind, the brain, and linguistic information processing during the century's first half, and it contributed significantly to the development of neuropsychology. Phrenological theory was influenced by the Scottish physician Alexander Hood; in 1824, he published a highly detailed case description in **The Phrenological Journal and Miscellany** concerning a patient named Adam M'Conochie, who had suffered a stroke in his left frontal lobe a condition that, by the late 19th century, came to be known as Broca's aphasia (H. A. Whitaker, 2006).

Research conducted by Risma et al. (2025) on the utilization of technology through digital literacy to enhance language skills within a literary context found that digital media can improve students' language proficiency across all areas. Furthermore, regarding digital literature learning, the study explored how technology including social media platforms like Wattpad and podcasts can assist students in developing their four language skills: speaking, listening, reading, and writing. The study aimed to provide a comprehensive overview of creative and successful technology-based teaching methods capable of boosting student literacy levels in the digital era while simultaneously helping to preserve local cultural values through digital media.

This aligns with research by Dinda Kirana et al. (2023) on the impact of digital literacy-based pop-up book media on improving the speaking skills of lower-grade elementary school students. Data collected in that study were analyzed using an independent sample t-test, yielding a significance value of 0.00. This result indicates a difference in the speaking abilities of lower-grade students before and after using the digital literacy-based pop-up book media, demonstrating the media's effectiveness in enhancing these skills. The use of pop-up books in speaking instruction introduces and allows students to practice fundamental speaking skills, such as pronunciation and intonation. Pop-up books also help students visualize the sequence of content, enabling them to recount the material accurately and with a clear narrative flow. Additionally, the engaging visual appeal of pop-up books motivates students to participate actively in classroom learning. Students engage enthusiastically, as the digital literacy-based pop-up books feature audio components that allow them to not only view but also listen to the content. It can be concluded that the Kurikulum Merdeka (Independent Curriculum) based on a neurolinguistic model significantly contributes to neurolinguistic

development regarding the language skills and digital literacy of elementary school students, particularly because the cases involved elevate analytical accuracy to unprecedented levels. Johann Schmidt described a patient who frequently substituted and conflated words and could neither recognize letters nor read, yet was able to write when words were dictated to him; furthermore, this digitalization-based, meaningful learning approach encourages children to think critically, creatively, and collaboratively.

CONCLUSIONS AND RECOMMENDATIONS

A literature review indicates a significant need for a Neurolinguistic Model-based Kurikulum Merdeka (Independent Curriculum) focused on the language and digital literacy skills of elementary school students. This necessitates a profound transformation in elementary education to ensure that information processed via digital media is effectively assimilated aligning with children's language skills and their specific stages of language acquisition and requires teachers to proactively understand how children process information (involving the brain, language, and digitalization). Johann Schmidt documented a patient who frequently substituted and conflated words; while unable to recognize letters or read, the patient could write when words were dictated an example illustrating the complexity of these processes. Furthermore, this digitalization-based approach to meaningful learning encourages children to think critically, creatively, and collaboratively. Research limitations include a focus on general language skills (listening, speaking, reading, and writing) rather than an in-depth analysis of the neurolinguistic model's specific impact on each individual skill; as each skill involves distinct neurolinguistic mechanisms, more focused study is required. Additionally, since this research focused on elementary students, the findings cannot be generalized to other educational levels such as early childhood education, junior high, or senior high school—which involve different cognitive and linguistic developmental characteristics. Recommendations for future research include developing neurolinguistic-based learning models specifically designed to align with *Kurikulum Merdeka* principles, including differentiated instruction, project-based learning, and student-centered learning.

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