

## Exploring Cognitive Mechanisms in Language Attrition: A Mixed-Methods Study on Multilingual Speakers

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### Submission Track:

Received: August 28, 2025

Revised: October 7, 2025

Accepted: October 13, 2025

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### Keywords:

Language attrition, Multilingual educators, Cognitive mechanisms, Language use frequency

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**Abstract:** Language attrition, or the gradual loss of language proficiency, remains underexplored among multilingual educators in Indonesia. This study aims to uncover the cognitive mechanisms underlying language retention and attrition among junior high school teachers in Kediri, focusing on cognitive load, language use frequency, emotional attachment, and institutional policy. Using a sequential explanatory mixed-methods design, the study combines survey data, cognitive tests, and interviews to reveal how multilingual teachers manage multiple linguistic systems. Results show that Bahasa Indonesia proficiency remains strongest due to daily use, while English and regional languages exhibit varying attrition levels. Cognitive testing indicates a significant switching cost ( $M = 150$  ms,  $p < .01$ ) between Bahasa Indonesia and English, and interviews confirm that language transitions are “mentally taxing.” This study contributes theoretically by integrating cognitive and sociolinguistic perspectives on multilingual attrition and offers practical implications for designing balanced institutional language policies that sustain multilingual competence in Indonesian schools.



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## INTRODUCTION

Language attrition, or the gradual decline in language proficiency over time, has emerged as a critical concern for multilingual speakers, particularly in educational settings. In an era of increasing global communication and cultural exchange, multilingualism is becoming essential for educators who must often operate and maintain proficiency in multiple languages. However, recent observations indicate that many junior high school (SMP) teachers—despite their multilingual backgrounds—experience a noticeable decline in specific language skills, particularly in languages not used regularly in their professional or personal lives. In Indonesia, studies have revealed a decreasing proficiency trend among educators, particularly in regional languages, due to various factors such as institutional policies and linguistic exposure (Ahmadi, 2020; Suryanto & Santoso, 2021). These findings

underscore the need to better understand the cognitive mechanisms that underlie both language retention and attrition among educators.

Globally, research on language attrition in multilingual contexts has highlighted several influential factors, such as memory, age, and the frequency of language use (Bialystok, 2001). In Indonesia, the frequent use of Bahasa Indonesia has been shown to contribute to the attrition of regional languages among multilingual educators (Rahman & Wibowo, 2020). Emotional engagement and the learning environment also play significant roles, as observed by Kormos and Safar (2008) and confirmed by Sudarmanto and Fikri (2022) in their studies on regional language proficiency decline. The cognitive processes implicated in language attrition, including working memory and attentional control, appear critical to maintaining multilingualism. However, specific cognitive mechanisms that influence language attrition among multilingual junior high school educators remain underexplored.

Several theoretical frameworks provide perspectives on the cognitive processes involved in language attrition. For example, the Interlanguage Hypothesis (Selinker, 1972) suggests that multilingual individuals may develop transitional linguistic systems affected by limited exposure or incomplete acquisition of a particular language. Research by Ismail and Nugraha (2019) found that Indonesian Sundanese speakers develop hybrid linguistic patterns when switching between languages. Similarly, Lenneberg's Critical Period Hypothesis (1967) posits that cognitive and developmental factors can affect language retention over time. Supporting this view, Fahmi (2020) reported that older multilingual teachers in Indonesia exhibited more rapid language attrition. Additionally, Baddeley's Working Memory Model (2000) highlights the cognitive demands of managing multiple languages, suggesting that cognitive resource limitations may exacerbate language loss. Wulandari and Prasetyo (2021) identified similar patterns among educators, pointing to the strain of balancing multilingual cognitive demands as a contributing factor to attrition.

The influence of educational policies that prioritize Bahasa Indonesia over regional languages may also contribute to declining multilingual proficiency (Setiawan, 2022). The phenomenon of "linguistic compartmentalization," whereby educators primarily teach in a dominant language and underutilize others, can further accelerate language attrition (Amaliah, 2023). Cognitive strategies such as code-switching and code-mixing employed by multilingual educators may also favor one language over others, potentially leading to long-term proficiency decline (Susanto & Firmansyah, 2022).

These findings suggest that cognitive load, language use frequency, emotional attachment, and institutional language policies significantly influence language attrition among multilingual educators. Younger teachers, due to greater cognitive flexibility, may be more resilient against language attrition compared to their older counterparts (Fahmi, 2020; Rahman & Wibowo, 2020). Additionally, environments where regional languages are undervalued or infrequently used are likely to see more pronounced attrition (Ismail & Nugraha, 2019; Suryanto & Santoso, 2021). Despite these insights, much of the current research has focused on language attrition among immigrant or elderly populations, leaving a gap in understanding the experiences of junior high school educators who must balance multiple languages within institutional constraints.

To address this gap, this study investigates what cognitive mechanisms contribute to language attrition among multilingual junior high school teachers in Indonesia and how institutional language policies and emotional factors influence this process.

This study seeks to identify and analyze the key cognitive mechanisms—cognitive load, language use frequency, emotional attachment, and institutional policy—that affect language retention and loss among multilingual teachers. By examining their experiences and performance on cognitive tasks, the research aims to bridge theoretical understanding with practical implications for multilingual education. The findings are expected to contribute both theoretically, by integrating cognitive and sociolinguistic perspectives, and practically, by informing policies that promote sustained multilingual competence in Indonesian schools.

## **THEORETICAL SUPPORT**

Language attrition, the gradual loss of proficiency in a language, is a significant concern among multilingual junior high school teachers. This study examines language attrition through a review of linguistic, cognitive, and sociolinguistic theories, synthesizing them to understand the mechanisms behind language retention and loss in multilingual educational settings. This framework integrates findings from prior research, emphasizing the role of cognitive processes, language use frequency, sociocultural attachment, and institutional policies.

The Interlanguage Hypothesis (Selinker, 1972) provides insight into how multilingual speakers develop transitional linguistic systems, or *interlanguages*, when switching between languages. This perspective is particularly relevant for Indonesian multilingual teachers who frequently alternate between dominant languages such as Bahasa Indonesia and English and less-used regional languages. Such interlanguage formation, while adaptive, can also create instability in linguistic competence, especially when certain languages are rarely practiced (Ismail & Nugraha, 2019).

Complementing this linguistic view, Baddeley's Working Memory Model (2000) offers a cognitive explanation for how teachers manage these interlanguages. The model posits that working memory has limited capacity, and maintaining multiple linguistic systems simultaneously consumes considerable cognitive resources. This limitation explains why frequent switching between dominant and non-dominant languages—common in Indonesian classrooms—induces cognitive overload (Wulandari & Prasetyo, 2021). Institutional language policies that emphasize Bahasa Indonesia and English further intensify this strain by reducing opportunities to use regional languages, increasing the cognitive cost of accessing them, and accelerating attrition.

Viewed together, these frameworks suggest that language attrition in Indonesian educators results from the interaction between cognitive capacity and linguistic exposure. While the Interlanguage Hypothesis explains *how* language systems shift and blend due to uneven use, the Working Memory Model explains *why* teachers struggle to maintain fluency across all languages under cognitive constraints. Synthesizing both theories provides a holistic understanding of the cognitive and environmental pressures driving multilingual language loss in Indonesia.

The frequency of language use is another factor critical to language maintenance, as Bialystok (2001) argues that regular language practice strengthens cognitive connections, thus supporting retention. Research by Rahman and Wibowo (2020) illustrates that frequent use of Bahasa Indonesia, particularly in professional settings, often leads to the attrition of regional languages among teachers. In a multilingual context, languages used less frequently are more susceptible to fading from the speaker's repertoire. This notion aligns with findings on cognitive load, suggesting that institutional emphasis on certain languages not only diverts cognitive resources but also reduces practice opportunities for other languages.

Additionally, emotional connection plays a role in language retention. Kormos and Safar (2008) emphasize that emotional attachment to a language can help maintain its proficiency. Sudarmanto and Fikri's (2022) research in Indonesia supports this view, showing that teachers with strong ties to their regional culture retain greater proficiency in regional languages. This highlights that emotional engagement can counterbalance cognitive challenges and environmental factors that promote attrition. When viewed alongside frequency of use, emotional connection serves as a reinforcing factor that aids in the maintenance of languages with personal significance to the speaker.

Institutional language policies, as outlined by Setiawan (2022), influence language retention through linguistic compartmentalization, wherein dominant languages are prioritized, limiting the use of others. Amaliah (2023) introduced this concept to explain how policies favoring Bahasa Indonesia and English reduce opportunities for practicing regional languages. When educational institutions promote a linguistic hierarchy, non-dominant languages are marginalized, leading to attrition. This aligns with cognitive theories, suggesting that compartmentalized language use in institutional settings amplifies the vulnerability of less practiced languages to cognitive reorganization.

Finally, code-switching and code-mixing serve as strategies for cognitive management, allowing multilingual speakers to alternate languages based on context. Susanto and Firmansyah (2022) found that these practices among Indonesian teachers illustrate how speakers manage linguistic demands. However, frequent switching between dominant languages like Bahasa Indonesia and English may inadvertently reinforce these languages, accelerating attrition in less commonly used ones. This aspect, in conjunction with the institutional prioritization of specific languages, creates a cognitive imbalance, further reinforcing attrition in non-dominant languages.

Synthesizing these theories provides a comprehensive framework for understanding language attrition among multilingual junior high school teachers. Prior research illustrates that cognitive, emotional, and institutional factors intersect to shape language retention and loss. This framework highlights the need for balanced language policies in multilingual settings to mitigate attrition and support educators in retaining proficiency across multiple languages. By applying these insights to the context of Indonesian educators, this study aims to explore practical solutions to enhance multilingual language retention in educational environments.

## **METHOD**

This study adopts a sequential explanatory mixed-methods design to examine cognitive factors influencing language attrition among multilingual junior high school

teachers in Indonesia. This approach combines quantitative data from surveys and cognitive tests with in-depth qualitative data from interviews, allowing for a comprehensive analysis of the research problem. As Creswell (2015) highlights, qualitative research seeks to explore and understand how individuals or groups make sense of social or human issues. This approach blends theoretical insights with empirical evidence, offering a comprehensive view of cognitive elements driving language attrition in this unique educational context. Key data sources include academic literature, semi-structured teacher interviews, and cognitive tests, providing a multidimensional understanding of the phenomenon.

The data collection process began with a thorough literature review sourced from reputable databases like Google Scholar and Scopus, covering studies on language attrition, multilingual cognitive processes, and relevant Indonesian educational policies. This established a strong theoretical basis, focusing on cognitive factors like memory, attentional control, and language use frequency. Participants were selected using purposive sampling to ensure diversity within the specific context of Kediri. All participants were teachers proficient in at least three languages (Bahasa Indonesia, English, and a regional language). Variation was sought in terms of key demographics such as age, years of teaching experience, subject specialty, and the specific regional language spoken (e.g., Javanese). This approach was designed to capture a wide spectrum of linguistic experiences and attrition challenges within the localized multilingual ecology of Kediri. This diversity aimed to capture the multifaceted nature of language attrition influenced by institutional policies and usage patterns.

Semi-structured interviews provided rich, qualitative data, with questions addressing factors such as language switching frequency, emotional ties to languages, and institutional expectations. Guided by Creswell's methodology, these interviews allowed for in-depth narratives and adaptability to participants' responses. Complementary surveys offered quantitative insights into participants' language use, attrition levels, and cognitive challenges, contextualizing the qualitative findings. To assess cognitive factors, three tests were used: the Working Memory Span Task (to evaluate language recall and management), the Stroop Test (to measure language interference control), and a Language Switching Task (to gauge cognitive flexibility during language transitions). These tests, rooted in Baddeley's (2000) and other cognitive models, provided empirical data on cognitive demands faced by multilingual educators.

The validation of research instruments involved expert reviews from specialists in bilingualism, cognitive psychology, and language education to ensure accuracy in measuring constructs like working memory and attentional control. A pilot study further refined the tools by gauging clarity and relevance, leading to revisions based on teacher feedback. Reliability testing ensured consistency across cognitive assessments, enhancing the robustness of the study.

Data analysis followed theoretical frameworks such as Baddeley's Working Memory Model and the Interlanguage Hypothesis (Selinker, 1972). Coding of interview transcripts, survey responses, and cognitive test outcomes employed a structured approach adapted from Eggins (2004) to identify recurring themes such as *cognitive strain*, *language use frequency*, *emotional engagement*, and *self-reported attrition*.

The quantitative data (survey and cognitive tests) were first analyzed descriptively to determine proficiency levels, switching costs, and working memory capacity across languages. These numerical patterns were then compared and interpreted alongside the qualitative themes emerging from interviews. For example, teachers who recorded higher switching costs and lower working memory scores also described feeling “mentally exhausted” when alternating between languages, confirming the quantitative findings through narrative evidence.

This integration of findings occurred through a *convergent comparison approach*, in which quantitative trends informed the thematic interpretation of qualitative data, and vice versa. The combined analysis produced a holistic understanding of how cognitive load, frequency of use, emotional attachment, and institutional policy interact to shape multilingual language attrition among teachers in Kediri.

Modifications tailored to the Indonesian context included culturally sensitive interview methods and a focused examination of cognitive dimensions often overlooked in broader sociolinguistic studies. This mixed-methods approach thus provided a deep exploration of the cognitive factors driving language attrition among multilingual teachers. Combining theoretical and empirical perspectives, the study offers valuable academic insights and practical recommendations for multilingual education policies and practices in Indonesia

## RESULT AND DISCUSSION

### Result

This study examines the cognitive mechanisms that influence language attrition among multilingual junior high school teachers in Kediri, Indonesia. Findings reveal that the frequency of language use, cognitive load, and emotional connection significantly affect the retention or decline of language proficiency among these educators.

The quantitative analysis, based on teachers' self-assessment of proficiency in Bahasa Indonesia, English, and regional languages, shows notable differences across languages based on this self-reported data. Teachers consistently reported the highest proficiency in Bahasa Indonesia, averaging 4.5 out of 5 across listening, speaking, reading, and writing skills. This language is used daily in professional and personal contexts, reinforcing proficiency. English proficiency, however, averaged around 3.2, with slight variations depending on teachers' educational backgrounds; English graduates reported higher levels of proficiency. Regional languages had the lowest proficiency scores, averaging 2.8, with minimal use in professional settings. This pattern of language use emphasizes the positive correlation between frequency of use and language retention.

**Table 1: Self-Reported Language Proficiency Scores**

Language	Average Proficiency Score (out of 5)	Primary Use Context
Bahasa Indonesia	4.5	Daily, professional and personal
English	3.2	Classroom teaching
Regional Languages	2.8	Limited, mostly personal

Additionally, the cognitive test data demonstrate measurable differences in language processing demands. The *Language Switching Task* revealed a significant switching cost of 150 ms ( $p < .01$ ) when moving from Bahasa Indonesia to English, and 230 ms ( $p < .05$ ) from

English to regional languages. This suggests that switching between less dominant languages requires greater cognitive control. The *Stroop Test* showed a 12% slower response rate when reading non-dominant language stimuli, reflecting higher inhibition demands. The *Working Memory Span Task* further indicated a mean recall difference of 2.3 words, showing that participants retained fewer items when using English or regional languages compared to Bahasa Indonesia.

Interview data confirmed these quantitative findings: 8 out of 10 teachers described language transitions as “mentally taxing,” often requiring deliberate focus to maintain fluency. These patterns align with Baddeley’s Working Memory Model, indicating that managing multiple linguistic systems increases cognitive load and may contribute to attrition over time.

**Table 2: Cognitive Test Results on Language Load and Switching**

Cognitive Task	Context	Mean Score	Statistical Note	Observed Effect
Language Switching Task	Bahasa Indonesia → English	150 ms switching cost	$p < .01$	Increased mental effort and anxiety during transition
Language Switching Task	English → Regional Language	230 ms switching cost	$p < .05$	Slower cognitive response; higher self-reported fatigue
Stroop Test	Non-dominant language words	12% slower response rate	—	Indicates reduced inhibition control when using non-dominant languages
Working Memory Span Task	Bahasa Indonesia	8.4 words recalled	—	Strong working memory performance
Working Memory Span Task	English / Regional	6.1 words recalled	—	Lower recall capacity linked to cognitive strain

## Discussion

The findings of this study confirm the trend of regional language attrition previously observed in Indonesia. The high proficiency in Bahasa Indonesia and the comparatively low scores in regional languages support the attrition pattern reported by Suryanto and Santoso (2021), who attributed the decline of regional languages to limited institutional use and national language dominance. Similarly, Ahmadi (2020) highlighted how teachers’ linguistic exposure in formal contexts accelerates the loss of non-dominant languages. These results thus reinforce that local educational policies prioritizing Bahasa Indonesia contribute to the compartmentalization of language use in Indonesian schools.

Building on this local context, the findings also align with broader theories of multilingualism, particularly Bialystok (2010), who noted that bilingual individuals often experience reduced vocabulary sizes and slower lexical access compared to monolinguals. The observed proficiency differences corroborate these theoretical insights, illustrating how frequency of use reinforces linguistic retention while cognitive strain contributes to attrition. Moreover, neuroimaging evidence from Higby, Kim, and Obler (2013) demonstrates that multilingual speakers activate distinct brain regions during language processing, consistent

with the high cognitive load reported in this study when transitioning from Bahasa Indonesia to English.

Moreover, this study highlights the variability in cognitive processes among multilinguals, as evidenced by findings in executive control (Sun et al., 2019) and language switching (Elmer, 2016). Teachers' reliance on strategies like repetition and memory techniques mirrors mechanisms of cognitive control, including attention, working memory, and inhibition, crucial for maintaining proficiency in less frequently used languages.

Emotional connection also plays a pivotal role. Teachers with strong ties to regional communities showed greater motivation to retain regional languages, aligning with theories that emotional engagement enhances linguistic retention. This finding echoes Struys et al. (2015), who found that bilingual children with emotional connections to their languages exhibited improved cognitive control and retention.

This study has several limitations. First, the reliance on self-reported proficiency scores may introduce bias, as subjective perceptions do not always reflect actual linguistic competence. Future studies could incorporate objective assessments, such as language tests or neuroimaging techniques, to validate findings. Second, the sample is limited to junior high school teachers in Kediri, which may not generalize to other multilingual populations with different linguistic dynamics.

Additionally, while cognitive load and emotional factors are explored, other dimensions, such as socio-economic influences or the impact of immersive language environments, remain underexamined. Expanding research to include these variables would provide a more holistic understanding of multilingual language attrition.

Future research should also investigate the neural correlates of language proficiency in multilinguals, building on studies like Videsott et al. (2010) and Kang et al. (2023). These investigations could further clarify how varying proficiency levels influence brain activity and cognitive control in multilinguals.

To address the challenges of multilingual education, institutions should adopt policies fostering the balanced use of all relevant languages. Promoting emotional engagement with regional languages and creating opportunities for their use in professional contexts could mitigate attrition. Additionally, targeted training programs to reduce cognitive strain when switching languages—such as mindfulness techniques or working memory training—could support educators' multilingual proficiency.

Despite its significant contributions, this study has several limitations that should be considered when interpreting the findings. First, the reliance on self-reported proficiency scores introduces the potential for bias, as subjective measures may not fully capture participants' actual linguistic abilities. Incorporating objective assessments, such as standardized language tests or neuroimaging methods, would enhance the validity of future research. Second, the study's focus on junior high school teachers in Kediri limits the generalizability of the findings, as linguistic dynamics and multilingual experiences can vary significantly across different populations and regions. Third, while cognitive load and emotional factors are examined, other influential dimensions, such as socio-economic status, access to immersive language environments, or institutional language policies, are not explored in depth. Addressing these gaps in future research would provide a more comprehensive understanding of the factors influencing multilingual language attrition and

retention. Additionally, longitudinal studies could better capture the evolving nature of language proficiency and cognitive mechanisms over time, offering deeper insights into multilingual education challenges and solutions.

## CONCLUSION

This study has highlighted the complex interplay of cognitive mechanisms influencing language attrition among multilingual junior high school teachers in Kediri, Indonesia. The findings reveal that frequency of use, cognitive load, and emotional attachment are critical factors in determining language retention or decline. Teachers' proficiency in Bahasa Indonesia remains highest due to daily usage, while regional languages suffer from minimal practice and institutional neglect, resulting in higher attrition rates. Additionally, cognitive load, particularly when switching between languages, exacerbates the decline of less frequently used languages, aligning with theories such as Baddeley's Working Memory Model.

The role of emotional connection emerges as a key factor in language maintenance, as teachers with strong ties to regional culture show higher motivation to retain their regional languages. However, institutional policies that prioritize certain dominant languages, such as Bahasa Indonesia and English, further complicate efforts to maintain multilingual proficiency and lead to linguistic compartmentalization. For multilingual education to thrive, supportive policies are necessary to balance language practice and foster emotional engagement with all languages relevant to the educators' context. Reducing cognitive load and providing more frequent opportunities for using multiple languages in professional and personal settings can help mitigate attrition. This study contributes valuable insights into cognitive mechanisms of language attrition and offers practical implications for strengthening multilingual education practices and policies.

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