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The Impact of Home Language and Literacy Environment on Children's Learning Outcomes

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Abstract

Background
The Home Language and Literacy Environment (HLLE) is critical for children's language development, cognitive growth, and academic success. In bilingual and multilingual households, HLLE influences linguistic proficiency, executive function, and social integration. While numerous studies emphasize HLLE's potential benefits, significant gaps remain concerning the influence of socioeconomic status, parental involvement, and access to technological tools in diverse home contexts.

Methodology
This Systematic Literature Review (SLR) synthesizes findings from 23 empirical studies (both qualitative and quantitative) published between 2019 and 2024, selected from 2,098 records across Crossref, Google Scholar, Scopus, and Web of Science. A thematic and quantitative synthesis categorizes results based on HLLE components, parental engagement, socioeconomic factors, and technology use.

Findings
HLLE supports cognitive flexibility, literacy, and executive function. Parental involvement, especially in shared reading and storytelling, strongly links to higher vocabulary scores and literacy rates. Children in HLLE-rich environments show significant gains in language and reading, with vocabulary improvements of 20–30% and more conversational turns per hour, as measured by tools like LENA.
Metrics such as adult word count and child vocalizations underscore HLLE's impact. However, limited access to books, interactions, and technology due to socioeconomic gaps continues to widen literacy disparities. While tools like LENA offer valuable insights, challenges in accessibility and equity remain.

Conclusion
HLLE is essential for bilingual and multilingual literacy development. Addressing parental literacy support, socioeconomic inequalities, and digital literacy initiatives is crucial for equitable learning outcomes. Future research should assess HLLE's long-term impact on academic success.

Originality
This study offers a comprehensive synthesis of HLLE research, integrating linguistic, sociocultural, and quantitative perspectives to inform educators, policymakers, and researchers.

Keywords	:	Home Language and Literacy Environment (HLLE); Children's Learning Outcomes; Cognitive Development; Language Development; Literacy Development; Parental Involvement; Socioeconomic Status (SES)
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1. INTRODUCTION

Language acquisition represents a cornerstone of human development, particularly during early childhood. The process is profoundly influenced by the Home Language and Literacy Environment (HLLE), which encompasses familial linguistic interactions, access to reading materials, and the overall communicative atmosphere within the home. HLLE plays a pivotal role in shaping children's cognitive abilities, language skills, and future academic achievements (Weldemariam, 2022; Vygotsky, 1978).

As emphasized by Yeomans-Maldonado (2021), children who are raised in environments rich in language exposure tend to develop foundational literacy skills at an early age. In line with this perspective, Zhang (2022) and Weldemariam (2022) further highlight that such stimulating language environments not only support early literacy but also contribute significantly to the development of cognitive flexibility and broader language competencies. These findings underscore the crucial role of early language experiences in shaping children's linguistic and cognitive growth. In the context of globalization, the prevalence of multilingual households has increased, introducing both opportunities and challenges in children's language development. Bilingualism, facilitated by a robust HLLE, enhances cognitive functions, particularly executive control, as the need to switch between languages strengthens neural pathways (Filippi et al., 2022; Chiedu, 2024). This cognitive flexibility translates into improved problem-solving skills and adaptability (Planckaert, 2023; Shaaban, 2024). However, maintaining balanced proficiency across multiple languages requires deliberate support within the HLLE to prevent language attrition and promote sustained academic success (Tran et al., 2022).

The effectiveness of the Home Language and Literacy Environment (HLLE) in supporting bilingual development is shaped by several interconnected factors, particularly those rooted in familial, institutional, and technological domains. From the familial perspective, elements such as parental education levels, the degree of media exposure, and the preservation of cultural identity play a pivotal role in enhancing HLLE and promoting bilingualism (Hammrich, 2023; Koch, 2024). These components influence not only the quantity but also the quality of language interactions within the home, which are essential for early language acquisition.

At the institutional level, bilingual education programs and structured family support services are vital in equipping children to successfully navigate multilingual environments. As

emphasized by Dang (2024) and Filippi (2024), integrating second-language learning into early childhood education frameworks enables bilingual children to demonstrate greater cognitive flexibility and perform more efficiently in executive function tasks than their monolingual counterparts.

Technological tools and resources, when equitably implemented, further amplify the impact of HLLE by providing interactive and adaptive learning experiences that reinforce language skills. Collectively, these familial, institutional, and technological influences underscore the critical role HLLE plays in shaping not only linguistic competence but also cognitive development and social integration in increasingly diverse and globalized settings.

Research highlights that multilingualism enhances children's executive functions, improving cognitive flexibility and problem-solving abilities (Romero et al., 2024), while also fostering sociopragmatic awareness, which aids in interpreting social cues and understanding diverse perspectives (Romero et al., 2024). Family support, a key component of HLLE, significantly influences children's linguistic development and cultural identity. Practices like shared reading create a rich literacy environment, encouraging active engagement and promoting language acquisition (Moody & Matthews, 2022). Educational frameworks, such as Indonesia's Merdeka curriculum, further strengthen HLLE by valuing classroom language diversity and supporting heritage language maintenance, which contributes to students' well-being and intercultural understanding (Halim et al., 2024). The COVID-19 pandemic underscored the importance of strong school-family-community partnerships in supporting HLLE, as educators adopted equity-focused care strategies to mitigate the challenges faced by culturally and linguistically diverse families (McIntosh et al., 2024). Strategies like employing professional interpreters have proven essential in bridging communication gaps between educators and multilingual families, further enhancing the HLLE and positively impacting children's academic and social outcomes (Waillet et al., 2022).

Additionally, bilingual education programs and family support resources can help children navigate multilingualism successfully in a globalized world (Xia, 2024; Hu, 2024). This study focuses on the HLLE and children's language development and its effects in multilingual settings. The findings to be generated in the study would assist in locating best practices and factors that influence language and literacy developments in the children in these contexts. The study also aims at expanding the existing knowledge by providing tools that enhance language acquisition and biliteracy. These tools would be directed to educators, policymakers, families, and relevant communities to improve learning outcomes.

Even long-standing and substantial resources on the topic of bilingualism sit on the peripheral view and understanding of HLLE in bilingual/multilingual families. Most of the literature available is based on monolingual settings, where people have neglected the tolerance of heteroglossia in the configuration of the home. In addition, the social and economic and cultural aspects of HLLE have been under-researched particularly in the context of neglected areas such as rural areas and immigrant families. Parental views, customs, and their impact on bilingual reading habits have not been focused which needs more attention (Zhang 2022; Weldemariam 2022).

Another critical gap in HLLE research lies in the limited use of emerging technologies and updated methodologies for analyzing language environments. Advanced tools such as the Language Environment Analysis (LENA) system offer innovative perspectives on how language is used within the home setting. The LENA system records and evaluates both the amount and quality of spoken language surrounding a child, offering a more detailed and objective understanding of HLLE. For instance, studies employing LENA have quantified variables such as adult word counts, conversational turns, and child vocalizations, providing empirical evidence of the central role of parental speech in supporting language development (Zhang, 2022). Addressing this gap is vital for strengthening both the theoretical foundations and practical applications of HLLE. By incorporating such technologies, researchers and practitioners can more accurately assess the influence of home language input on bilingual development and design more effective interventions tailored to diverse linguistic environments. The primary objective of this systematic literature review is to analyze the role of HLLE in shaping language acquisition, literacy development, and cognitive growth in bilingual and multilingual children. It examines how parental involvement influences variations in HLLE and its effects on children's linguistic and academic performance. Additionally, this study explores the role of technological tools, such as Language Environment Analysis (LENA), in measuring and analyzing home language interactions. Lastly, it identifies existing research gaps and proposes future directions for enhancing HLLE-based interventions in diverse socio-economic and cultural contexts.

Therefore, this research offers a novel approach to understanding the Home Language and Literacy Environment (HLLE) in bilingual and multilingual families by integrating linguistic and cultural perspectives. It examines how language and literacy are fostered across diverse contexts, considering the interplay of language, culture, and economy. The findings inform educational practices and policies, equipping teachers with strategies to create

language-rich environments that support biliteracy and cognitive development while highlighting the need for policymakers to address resource gaps in underserved communities. Academically, the study contributes to bilingualism research by introducing tools like the LENA methodology, which records live language interactions, providing new insights into HLLE.

2. METHOD

2.1 Search Strategy

Through careful and exhaustive searching, relevant studies will be located and identified. Google Scholar, Crossref, Scopus, Web of Science, as well as home language environment, home literacy environment, children's learning outcomes, early literacy and parental involvement will be employed as keywords and phrases. Certain boundaries were defined in this regard including the last five years, peer-reviewed only in publications. The articles that fulfill the criteria for inclusion will subsequently follow a comprehensive selection process and this will be based on their abstracts in the first instance. Sourcing data from 2,098 records identified through databases such as Crossref (1,000 articles), Google Scholar (200 articles), Scopus (338 articles), and Web of Science (560 articles). These selected articles will then be scrutinised in depth and their details and methodologies critically evaluated, especially in relation to the key findings and implications of the studies done. The conclusions derived from the articles reviewed will all be presented in a structured unified synthesis where the major conclusions, the other findings, the comparisons made, and the conclusions reached will be articulated.

2.2 Study Selection

The search for databases is based off systems like Crossref, Google Scholar, Scopus, and Web of Science. Aiming for publication of academic works per the academic system's requirements. In addition to that, peer review procedures have been implemented in order to eliminate possible bias. The keywords and their synonyms are provided in Table 2.1. These specific words were chosen based on their relevance to the subject of the study as well as their correlation to the research problem.

Table 2.1. Keywords of the search process

Keywords	Synonyms
Home Language Environment	"home language context," "domestic language setting," "family language environment"
Literacy Environment	"literacy context," "reading environment," "home literacy setting".
Children's Learning Outcomes	"child learning achievements," "educational outcomes for children," "academic performance of children".
Language Development	"language acquisition," "linguistic development," "speech development".

2.2.1. Study Inclusion and Exclusion criteria

To guarantee that the articles selected were relevant to the research objectives, particular inclusion and exclusion criteria were applied, as highlighted in Table 2. These criteria were helpful in choosing the studies to be included in the systematic literature review (SLR).

Table 2.2. Inclusion and Exclusion Criteria in the Data Search Process

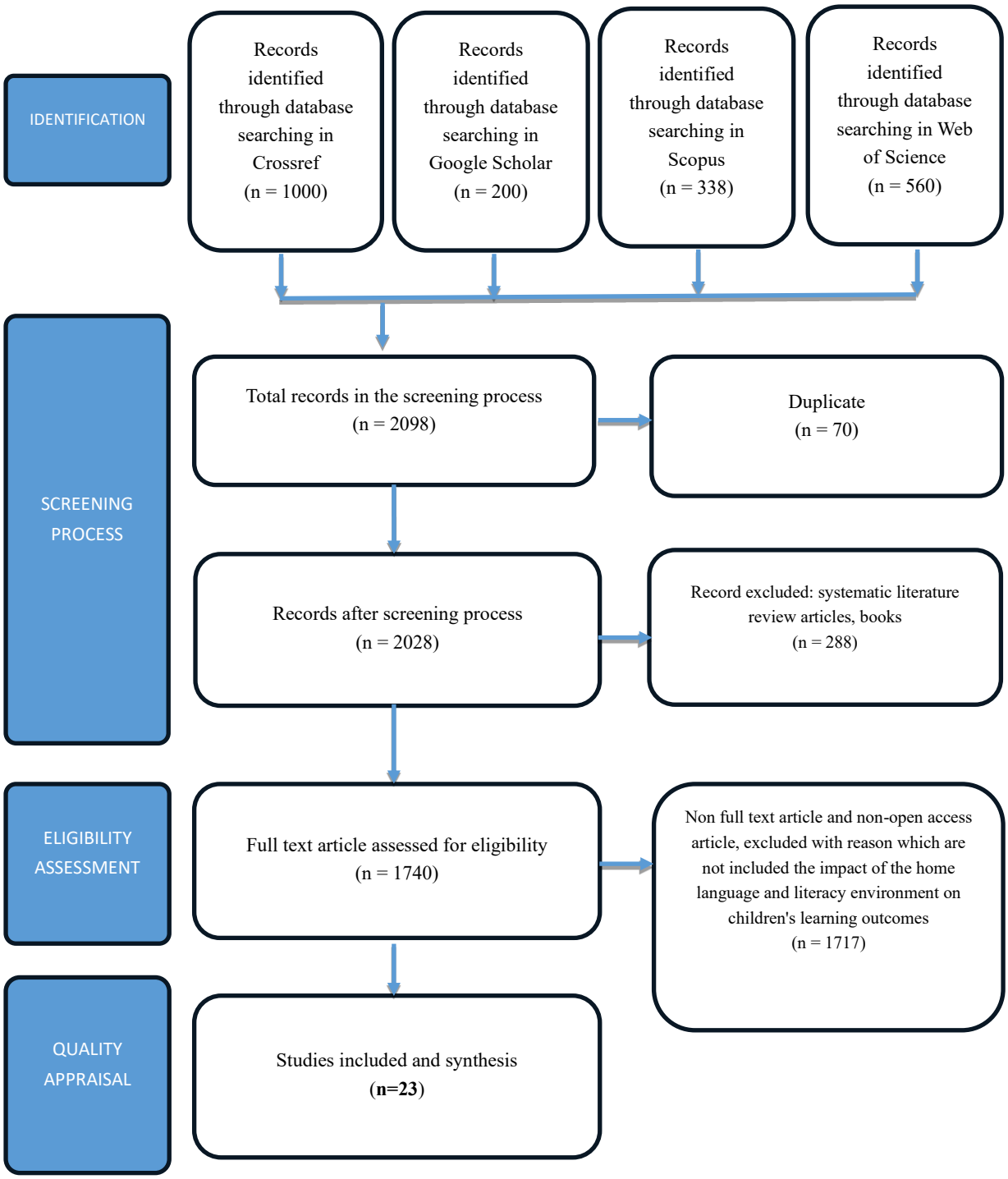
Inclusion criteria	Exclusion criteria
• Research articles published in English. • Studies focused on empirical research. • Articles published between 2019 and 2024. • Full-text availability online. • Available in the following databases: Crossref, Google Scholar, Scopus, and Web of Science.	• Articles not written in English. • Irrelevant studies or those off-topic. • Research articles published before 2019 or after 2024. • Studies without full-text access online. • Duplicate articles.

In this instance, Google Scholar and Crossref were used without restrictions as part of the retrieval process for the systematic literature review (SLR). The search phrases were: "home language environment", "home literacy environment", "children's learning outcomes", "early literacy" and "parental involvement". Several studies were selected according to the following inclusion criteria:

- Only the Research article was written in the English language.
- Articles with the research doing.
- Researches published between 2019-2024
- Full text is available online.
- Available in 4 databases Crossref, Google Scholar, Scopus, Web of Science.

A full search across Google Scholar and Crossref was performed, combining "home language environment," "home literacy environment," "children's learning outcomes," "early literacy," and "parental involvement" as keywords. Article that did not fit the inclusion criteria were eliminated, and only empirical studies on the correlation between home language and literacy environment (HLLE) and child learning outcomes were chosen.

Figure 2.1. Article's selection procedures flowchart



2.3 Data Extraction

Data will be extracted from the selected studies using a standardized form. The following information will be collected:

- Study design and methodology.
- Sample characteristics (e.g., age, socioeconomic status).
- Measures of HLLE.
- Key findings related to children's language, literacy, and academic outcomes.

2.4 Quality Assessment

To ensure the methodological rigor of the selected studies, this review employed the Critical Appraisal Skills Programme (CASP) framework, which evaluates the reliability, validity, and relevance of research. Each study was assessed using ten key CASP domains, including research clarity, appropriateness of methodology, sampling adequacy, data collection methods, analysis techniques, bias mitigation, result validity, generalizability, alignment with existing research, and overall contribution to HLLE studies. A 10-point scoring system was used, categorizing studies as high quality (8–10), moderate quality (5–7), or low quality (below 5, excluded). From the 2,098 initially identified studies, only 23 met the inclusion criteria and achieved a CASP score of 5 or higher, with a final mean CASP score of 8.2, confirming the robustness of the selected literature.

The CASP framework was chosen for its structured evaluation, minimizing bias and ensuring standardized quality appraisal across qualitative and quantitative research. Heterogeneity assessments compared methodologies, demographics, and socio-economic contexts for comprehensive representation. A narrative synthesis categorized findings by HLLE's impact on language acquisition, parental involvement, and technological tools like LENA. This rigorous assessment strengthens the review's credibility, grounding conclusions in high-quality, evidence-based research.

2.5 Data Synthesis

This study utilized a narrative synthesis approach to identify patterns, contradictions, and research gaps in Home Language and Literacy Environment (HLLE) research. The synthesis followed three stages: thematic categorization, comparative analysis, and integration of qualitative and quantitative findings.

1) Thematic Categorization: Studies were grouped into key themes, including HLLE's role in bilingual language acquisition, parental involvement, technological tools (e.g., LENA), and cognitive development impacts.

2) Comparative Analysis: Findings were compared across contexts (e.g., bilingual vs. monolingual, high-income vs. low-income households) to identify influencing factors such as parental literacy habits and socio-economic disparities. Contradictory results were examined for methodological differences.

3) Integration of Qualitative and Quantitative Findings: While most studies were qualitative, a subset included quantitative metrics (e.g., language exposure frequency, HLLE measurement tools), which were summarized and compared to strengthen conclusions.

To manage heterogeneity, a structured subgroup analysis categorized studies by sample demographics, geographic regions, and data collection methods, ensuring reliable synthesis. The integration of qualitative insights, thematic synthesis, and structured comparisons provided a robust framework for understanding HLLE's impact on children's learning outcomes.

2.6 Addressing Heterogeneity

To account for study design and measure heterogeneity, subgroup analyses will be performed to examine how social economic status, parental education and cultural context can influence the association between HLLE and children's learning outcomes.

3. FINDINGS

This section presents findings from systematic literature review that are structured around major themes: home language practices impact on children's learning outcomes; literacy resources availability; family dynamics. Also, it scrutinizes peculiar challenges as well as advantages for bilingual and multilingual children while considering influent socio-cultural factors including socioeconomic factors on language acquisition and literacy development. The data was drawn from 23 selected studies that gave empirical insights into these different dimensions of early childhood learning experiences

Table 3.1 Selected Studies on Home Language and Literacy Environments

No	Author(s)	Title	Journal	Year
1	Brito, N. H., Troller-Renfree, S. V., Leon-Santos, A., Isler, J. R., Fifer, W. P., & Noble, K. G.	Associations among the home language environment and neural activity during infancy	*Developmental Cognitive Neuroscience*	2020
2	Ebert, S., Lehrl, S., & Weinert, S.	Differential Effects of the Home Language and Literacy Environment on Child Language and Theory of Mind and Their Relation to Socioeconomic Background	*Frontiers in Psychology*	2020

No	Author(s)	Title	Journal	Year
3	Florit, E., Barachetti, C., Majorano, M., & Lavelli, M.	Home Language Activities and Expressive Vocabulary of Toddlers from Low-SES Monolingual Families and Bilingual Immigrant Families	*International Journal of Environmental Research and Public Health*	2021
4	Goodrich, J. M., Lonigan, C. J., Phillips, B. M., Farver, J. M., & Wilson, K. D.	Influences of the Home Language and Literacy Environment on Spanish and English Vocabulary Growth among Dual Language Learners	*Early Childhood Research Quarterly*	2021
5	Haft, S. L., Gys, C. L., Bunge, S., Uchikoshi, Y., & Zhou, Q.	Home Language Environment and Executive Functions in Mexican American and Chinese American Preschoolers in Head Start	*Early Education and Development*	2022
6	Inoue, T., Manolitsis, G., de Jong, P. F., Landerl, K., Parrila, R., & Georgiou, G. K.	Home Literacy Environment and Early Literacy Development Across Languages Varying in Orthographic Consistency	*Frontiers in Psychology*	2020
7	Lau, C., & Richards, B.	Home Literacy Environment and Children's English Language and Literacy Skills in Hong Kong	*Frontiers in Psychology*	2021
8	Ma, Y., Jonsson, L., Yao, Z., Zhang, X., Friesen, D., Medina, A., ... & Pappas, L.	The home language environment in rural China: Variations across family characteristics	*BMC Public Health*	2023
9	Mendive, S., Aldoney, D., Lara, M. M., Pezoa, J. P., & Hoff, E.	Home language and literacy environments at the age of four: Determinants and their relation to reading	*Infancia y Aprendizaje*	2022
10	Mendive, S., Mascareño Lara, M., Aldoney, D., Pérez, J. C., & Pezoa, J. P.	Home Language and Literacy Environments and Early Literacy Trajectories of Low-Socioeconomic Status Chilean Children	*Child Development*	2020
11	Mennen, I., Kelly, N., Mayr, R., & Morris, J.	The Effects of Home Language and Bilingualism on the Realization of Lexical Stress in Welsh and Welsh English	*Frontiers in Psychology*	2020
12	Peleman, B., Van Der Wildt, A., & Vandenbroeck, M.	Home language use with children, dialogue with multilingual parents and professional development in ECEC	*Early Childhood Research Quarterly*	2022
13	Peyer, E., Barras, M., & Lüthi, G.	Including home languages in the classroom: A videographic study on challenges and possibilities of multilingual pedagogy	*International Journal of Multilingualism*	2020
14	San San Kyaw, K., Tin, S. T., Underwood, L., & Grant, C.	Effects of Home Language Environment and Household Crowding on Early Expressive Language Development	*Early Childhood Research Quarterly*	2020
15	Scarpino, S. E., Hammer, C. S., Goldstein, B., Rodriguez, B. L., & Lopez, L. M.	Effects of home language, oral language skills, and cross-linguistic phonological abilities on whole-word proximity in Spanish-English–speaking children	*American Journal of Speech-Language Pathology*	2019

No	Author(s)	Title	Journal	Year
16	Sheng, L., Wang, D., Walsh, C., Heisler, L., Li, X., & Su, P. L.	The Bilingual Home Language Boost Through the Lens of the COVID-19 Pandemic	*Frontiers in Psychology*	2021
17	Troller-Renfree, S. V., Sperber, J. F., & Noble, K. G.	Relations among Socioeconomic Status, Perceived Stress, and the Home Language Environment	*Journal of Child Language*	2023
18	Turesky, T. K., Sanfilippo, J., Zuk, J., Ahtam, B., Gagoski, B., Lee, A., ... & Gaab, N.	Home language and literacy environment and its relationship to socioeconomic status and white matter structure in infancy	*Brain Structure and Function*	2022
19	Wagley, N., Marks, R. A., Bedore, L. M., & Kovelman, I.	Contributions of bilingual home environment and language proficiency on children's Spanish–English reading outcomes	*Child Development*	2022
20	Weldemariam, K.	The home literacy environment as a venue for fostering bilingualism and biliteracy: The case of an Ethio-Norwegian bilingual family in Oslo, Norway	*Journal of Early Childhood Literacy*	2022
21	Yeomans-Maldonado, G., & Mesa, C.	The association of the home literacy environment and parental reading beliefs with oral language growth	*Reading Research Quarterly*	2021
22	Zhang, L., Tsung, L., & Qi, X.	Home language use and shift in Australia: Trends in the new millennium	*Frontiers in Psychology*	2023
23	Zhang, X., Ma, Y., Feng, T., Zhang, V., Wu, X., Li, M., ... & Rozelle, S.	The home language environment and early language ability in rural Southwestern China	*Journal of Child Language*	2022

3.1. Thematic 1: Home Language Environment and Early Learning Outcomes

The impact of the home language environment on early learning outcomes has been a subject of considerable scholarly interest. The following table summarizes key studies that explore various dimensions of home literacy practices and their influence on children's emergent literacy skills, including the rural-urban divide and the integration of technology in assessing language environments.

Table 3.2 Thematic 1

Sources	Impact of Home Literacy	Effects on Early Learning
Yeomans-Maldonado (2021)	✓	✓
Weldemariam (2022)	✓	✓
Zhang (2023)	✓	
Wang (2019)	✓	✓
Zhang (2022)	✓	✓

Filippi et al. (2022)	✓
Mendive et al. (2022)	✓

3.1.1 The Impact of Home Literacy on Bilingual Development

Research consistently highlights the crucial role of home literacy in bilingual development and emergent literacy skills. Yeomans-Maldonado (2021) demonstrates a significant effect of home literacy practices, such as library attendance, on bilingual children's vocabulary growth. Similarly, Weldemariam (2022) emphasizes that mother tongue literacy is fostered through family literacy activities like storytelling and reading. The extent of children's exposure to diverse home literacy experiences fluctuates based on their proficiency in language switching (Yeomans-Maldonado, 2021; Weldemariam, 2022).

In Australian bilingual families, home literacy supports the use of both home and English languages, improving early learning outcomes and cognitive flexibility (Zhang, 2023). Zhang (2023) notes that *"use of both home language and English among children who are growing up fosters their cognitive flexibility which in turn boosts the children's learning skills."* Children primarily use English as a target language while their home language remains prevalent. This pattern is further supported by Wang's (2019) study, which underscores the home environment's pivotal role in language development, particularly in rural areas with limited schooling. Collectively, these studies affirm that home literacy in bilingual settings enhances literacy and academic success (Zhang, 2023; Wang, 2019; Yeomans-Maldonado, 2021; Weldemariam, 2022).

Moreover, a language-rich home environment fosters bilingual children's cognitive flexibility and literacy skills (Yeomans-Maldonado, 2021; Zhang, 2023). However, the extent of these benefits varies. While Filippi et al. (2022) argue that bilingual exposure enhances executive function and problem-solving skills, Mendive et al. (2022) suggest that HLLE's advantages are mediated by socioeconomic factors rather than bilingualism alone. This discrepancy underscores the need to consider contextual influences, such as parental engagement and resource availability, in assessing HLLE's impact. As Filippi et al. (2022, p. 89) state, *"The cognitive advantages of bilingual HLLE depend not only on language exposure but also on parental strategies and socio-economic support structures."*

3.1.2 Home Language Environments Effects on Early Learning

The second pattern that is evident from the selected studies is the great diversity of language usage within a family context as well as the related implications on early experience. Zhang (2022) focuses on the analysis of rural Chinese families and reveals great disparities regarding language use within the family. It has been established that language input in the environment significantly influences children's age-appropriate language skills with those in high language input environment gaining more rapid verbal advancement than those in low

language input environment (Zhang, 2022). Weldemariam's (2022) work presents similar results whereby immigrant children are said to face difficulties in the formation of adequate bilingual homes mainly as a result of poor sociocultural and economic situation of the households (Zhang, 2022; Weldemariam's, 2022).

This theme is further developed by Wang (2019), who argues that the rural-urban divide intensifies the gap in early language learning. It is often the case in rural communities that young children are less exposed to diverse language outputs and this negatively affects the development of their language abilities in early years (Wang, 2019). Such findings strongly advocate for the need of interventions which take into account not only the amount of languages exposed in the home but the quality of the input factor in terms of language. These findings with respect to the differences in the home language environments as covered in these studies stress the fact that children in poor other environments require specific interventions in order to learn a language at an early age (Zhang, 2022; Wang, 2019; Weldemariam, 2022; Yeomans-Maldonado, 2021).

3.2 Thematic 2: Home Literacy Practices and Bilingual Children's Language Acquisition

Home literacy practices play a pivotal role in bilingual children's language acquisition. Table 3.3 presents an overview of research examining structured home literacy practices, the role of cultural and linguistic diversity, and the influence of bilingual storytelling and heritage language preservation on vocabulary growth.

Table 3.3 Home Literacy Practices and Bilingual Children's Language

Sources	Structured Home Literacy Practices	Cultural and Linguistic Diversity
Yeomans-Maldonado (2021)	✓	
Zhang (2022)	✓	✓
Weldemariam (2022)	✓	✓
Wang (2019)		✓
Zhang (2023)	✓	

3.2.1 Structured Home Literacy Practices: As a Predictor of Vocabulary Growth

A number of studies underline the critical need for consistent and organized literacy patterns within the context of the home in order to assist in the vocabulary advancement of bilingual youngsters. According to Yeomans-Maldonado (2021), telling and reading stories in both languages on a regular basis is of great importance in the level of vocabulary of a child. The article also suggests that bilingual children subjected to such practices have better vocabulary retention and usage than monolingual children. At the same time, Zhang (2022) submits that a bilingual child who is involved in reading almost every day has a greater vocabulary and that constant reading and writing are important for the child's language growth. So Weldemariam (2022) also expands on literacy environments, noting that bilingual children acquire language not only as a matter of exposure but as actions, for example, when reading

and telling stories on a daily basis comes into place. What the above imply is that home literacy practices such as the ones described are good measures for predicting early vocabulary development because they enable the child to utilize both languages in a functional approach (Yeomans-Maldonado, 2021; Zhang, 2022; Weldemariam, 2022).

3.2.2 Cultural and Linguistic Diversity's: Influence on Literacy Practices

The factors that influence the frequency and form of literacy practices in bilingual homes are shaped by the cultural and linguistic contexts of the family. This, in turn, impacts children's language development. Zhang explains that ideals believed by parents when it comes to literacy activities based on the cultural perspectives about the use of language play a crucial role. In terms of language preservation, parents in families where the heritage language has a high status are likely to engage in storytelling and reading to children in both languages further enhancing children's bilingualism. Wang corroborates this, explaining that although many rural and under-resourced communities possess a rich tradition and potential for reading skills, most of them experience problems in sourcing materials, thus leading to a difference in the community's strategies to accomplish literacy. Additionally, Weldemariam observed that among immigrant families, especially parents with such migratory backgrounds, it is difficult to promote their native language particularly if the sociable language is dominant. This study posits that these families tend to follow specific practices as regards literacy suitable for their sociocultural contexts which in turn determine the ontogeny and the overall evolution of bilingual children. This variability suggests that texts and organization of home literacy practices are affected by the wider environment that the child is brought up in (Zhang, 2023; Wang, 2019; Weldemariam, 2022).

3.3 Thematic 3: Socioeconomic Status and Home Language & Technology Resources

Socioeconomic status (SES) significantly affects access to home language and literacy resources, shaping children's language development. Table 3.4 highlights studies that investigate disparities in literacy resources, parental engagement, and the use of technology as a tool for bridging gaps in low-SES families.

Table 3.4 Socioeconomic Status and Home Language & Literacy Resources

Sources	Socioeconomic Disparities	Parental Involvement in Literacy	Technology in Literary Resources
Yeomans-Maldonado (2021)	✓	✓	✓
Zhang (2022)	✓	✓	✓
Weldemariam (2022)	✓	✓	✓
Wang (2019)	✓		✓
Zhang (2023)	✓	✓	✓

Weldemariam (2022)		✓	
Xia (2024)		✓	
Sheng et al. (2021)			✓

3.3.1 Socioeconomic Disparities: In Access to Literacy Resources

Deeply embedded within the socioeconomic strata, an impact is reflexively discerned regarding the abundance of home literacy assets. For households marked by low socioeconomic status (SES), literature scarcity prevails; there is a noticeable void in the variety of books and other educational paraphernalia. Consequently, an issue arises where children's encounters with language-nurturing settings are restricted. It was within the pages of Yeomans-Maldonado (2021) that I chanced upon this observation. This phenomenon is similarly echoed in bilingual residences, where offspring must grapple with pairs of language structures, and occasional confusion may surface. Because of this deficiency in resources, early disparities in language acquisition, you could say, take shape. In contrast, families within higher SES brackets yield diversification in their joint literacy experiences. They have at their disposal a wide range, for example, of pedagogical tools including books and other devices that facilitate language learning (Zhang, 2022). Weldemariam (2022) presents a somewhat alternate standpoint; he delves into the circumstances of immigrant families with low SES, whose financial restrictions influence their language resource accessibility. The impact of growing up under such environmental conditions is severe; they face quality degradation in home literacy environments, consequent to fewer learning chances and literacy resources.

The rural-urban split, Wang (2019) touches on it. He says the families low socioeconomic status, living in the countryside, they face extra barriers, in addition to those that come from living away from cities and lacking infrastructure; buying books, and getting educational tools is difficult. Zhang (2023) says something related: he brings up these socio-economic elements linked to home language exposure, not just in terms of amount, but also the quality of it. Mostly, families with a bit more money can afford better language education for their kids. A number of these studies put together demonstrate that - their evidence - socio-economic factors affect the reading resources for children directly. And it creates gaps, chances, and possibilities for languages acquisition. (Yeomans-Maldonado, 2021; Zhang, 2022; Weldemariam, 2022; Wang, 2019; Zhang, 2023).

3.3.2 Parental Involvement: As a Key Factor in Literacy Development

Parental involvement plays a crucial role in fostering early literacy, often outweighing economic disparities and access to physical resources. Zhang (2023) challenges the assumption that material wealth alone determines literacy outcomes, emphasizing that “reading and storytelling develop language skills more than mere provision of resources.” Yeomans-Maldonado (2021) further illustrates how parents in low-resource environments bridge gaps

through active literacy participation, strengthening their children's language skills. Similarly, Wang (2019) highlights that children in financially constrained rural areas can still develop literacy through meaningful stories and consistent conversations.

Engaging in language-rich activities benefits children across socioeconomic backgrounds. Zhang (2022) affirms that even low-SES families can support literacy when parents prioritize interactive language practices. Weldemariam (2022) expands this perspective by demonstrating how immigrant parents, despite limited resources, uphold both household and societal languages through home-based literacy efforts. This aligns with Xia's (2024) findings, which suggest that bilingual parents integrating dual-language literacy at home enhance children's proficiency in both languages. However, cultural and educational differences influence the extent of parental involvement, with immigrant families often struggling to maintain heritage language literacy (Weldemariam, 2022; Xia, 2024).

Beyond vocabulary acquisition, family literacy engagement fosters cognitive development in bilingual children. Yeomans-Maldonado (2021) underscores the impact of reading aloud and storytelling in multiple languages, emphasizing that parental involvement "adds depth to cognitive engagement in both languages." Zhang (2022) supports this by highlighting how everyday interactions, whether through storytelling, casual conversations, or play, reinforce language acquisition. Similarly, Weldemariam (2022) stresses that bilingual family gatherings strengthen language retention, with children becoming more proficient when parents and siblings actively participate. This dynamic not only reinforces home language skills but also facilitates learning the dominant social language.

Taken together, these studies reinforce the view that parental engagement is a fundamental mechanism for reducing literacy gaps. As Xia (2024, p. 112) states, "Parental literacy habits significantly influence children's bilingual development, yet cultural and economic factors shape the extent of parental involvement." Family-driven literacy practices are not merely supportive elements but essential drivers of bilingual success. Ensuring children effectively grasp and maintain both languages depends largely on the degree of parental engagement in daily literacy activities (Zhang, 2022; Yeomans-Maldonado, 2021; Wang, 2019; Zhang, 2023; Weldemariam, 2022).

3.3.3 Technology in Literacy Resources

This Technology plays a crucial role in education, particularly in addressing socioeconomic disparities in literacy development. Zhang (2022) highlights the Language Environment Analysis (LENA) tool, which allows researchers and caregivers to monitor children's language exposure at home. This tool provides valuable support for families with limited access to traditional literacy resources, offering guidance on enhancing language development even within financial constraints. Similarly, Weldemariam (2022) explores whether digital learning applications can serve as literacy tools for low-SES families, questioning their accessibility and the broader digital divide. While technology has the

potential to mitigate literacy gaps, its effectiveness is dependent on equitable access. Families without digital resources may fall further behind, reinforcing the importance of bridging this gap.

Technology's role in literacy development extends beyond resource provision. Yeomans-Maldonado (2021) notes that "traditional reading materials, in a shower of digital advancement, have found their improvement," allowing children from lower socioeconomic backgrounds to engage with interactive educational content. Zhang (2023) further argues that digital e-books and storytelling platforms foster bilingual development by providing structured exposure to multiple languages. Wang (2019) shifts the focus to rural areas where access to physical books and educational materials is scarce, presenting technology as a crucial means of overcoming these barriers. However, Zhang (2022) and other scholars caution that the benefits of technology are primarily experienced by those with reliable internet access and proper training, highlighting the need for digital literacy initiatives to maximize its effectiveness.

Beyond literacy development, technology also plays an essential role in measuring home language interactions and their formative effects. Zhang (2022) introduces LENA as an advanced tool that quantifies the quantity and quality of language directed toward a child in the home environment. This method has proven effective in providing measurable insights into language exposure, enabling researchers to track essential relationships for early language acquisition. Weldemariam (2022) supports this perspective, arguing that tools like LENA complement traditional conversational analytic approaches by capturing language use in home contexts.

Zhang (2023) extends this discussion by explaining how technology makes it possible to document language patterns even in complex multilingual environments. By focusing on how children use different languages in their daily activities, technological tools allow researchers to analyze factors such as code-switching frequency and multilingual language use in context. Wang (2019) emphasizes that this advancement has significant implications for future studies, as it shows that technology could be instrumental in developing approaches to enhance language performance measures in diverse home settings.

Sheng et al. (2021) further affirm the potential of technology in literacy research, stating that "technology-assisted assessments like LENA provide empirical insights into HLLE patterns but may require refinements for more accurate multilingual analysis" (p. 74). While technology offers promising solutions, its success hinges on accessibility, infrastructure, and user training. To ensure that its benefits reach all socioeconomic groups, targeted interventions are needed to bridge the digital divide and expand the role of technology in literacy development (Zhang, 2022; Yeomans-Maldonado, 2021; Wang, 2019; Zhang, 2023; Weldemariam, 2022).

4.DISCUSSION

This systematic review highlights the critical role of the Home Language and Literacy Environment (HLLE) in shaping children's cognitive and linguistic development, particularly in bilingual and multilingual settings. Research consistently demonstrates that children raised in language-rich environments exhibit enhanced cognitive flexibility, stronger literacy skills, and improved social integration (Yeomans-Maldonado, 2021; Wang, 2019; Zhang, 2023; Weldemariam, 2022). These advantages stem from increased exposure to diverse linguistic inputs, which strengthen executive functioning and problem-solving abilities (Filippi et al., 2022; Planckaert, 2023). Furthermore, early exposure to multiple languages fosters neural plasticity, supporting bilingual children's ability to switch between linguistic systems with greater efficiency (Bialystok, 2009; Filippi, 2024).

Parental involvement emerges as a pivotal factor in optimizing HLLE. Parents who actively engage in reading, storytelling, and interactive conversations contribute significantly to children's vocabulary acquisition and comprehension (Weldemariam, 2022; Yeomans-Maldonado, 2021). This aligns with findings that bilingual children benefit from home literacy practices that reinforce both heritage and societal languages, thereby preventing language attrition and supporting biliteracy (Zhang, 2023; Wang, 2019). However, disparities in HLLE quality persist, often linked to socioeconomic status (SES), with higher SES families providing richer literacy environments, while lower SES households face barriers such as limited access to books, parental time constraints, and financial difficulties (Wang, 2019; Zhang, 2022).

Additionally, cultural factors play a crucial role in shaping HLLE, particularly among immigrant families navigating sociocultural dissonance. Families often struggle between maintaining heritage languages and adapting to dominant societal languages (Weldemariam, 2022). Some research indicates that culturally mixed families tend to promote biliteracy more effectively than those from monolingual backgrounds, suggesting that cultural identity reinforcement can positively influence bilingual language acquisition (Xia, 2024; McIntosh et al., 2024).

Despite the strong empirical evidence supporting HLLE, several research gaps remain. First, the majority of studies focus on short-term linguistic benefits rather than long-term cognitive and educational outcomes. There is limited longitudinal research tracking how HLLE influences academic performance, career readiness, and socio-emotional development beyond

early childhood (Bialystok, 2009; Zhang, 2023). Future studies should incorporate longitudinal methodologies to assess the sustained impact of HLLE across different life stages.

Second, existing literature tends to concentrate on high-resource bilingual families, neglecting the unique challenges faced by low-income and immigrant households (Zhang, 2023; Weldemariam, 2022). These groups encounter difficulties such as inadequate literacy materials, restricted access to educational technology, and cultural stigma associated with maintaining heritage languages. Addressing these disparities requires further research into HLLE interventions tailored for underprivileged and linguistically diverse communities (Zhang, 2022; Wang, 2019).

A significant contribution to this study is its discussion on the rural-urban divide in HLLE. Children in rural communities frequently experience reduced access to literacy resources and bilingual education programs, limiting their exposure to diverse language inputs (Wang, 2019). In contrast, urban settings provide greater opportunities for multilingual learning through public libraries, language support services, and structured bilingual education (Zhang, 2023). Furthermore, rural bilingual families are more prone to language dominance issues, where one language is prioritized over the other, potentially leading to heritage language loss (Grosjean, 2010). Addressing these disparities requires targeted interventions such as community-based literacy initiatives and mobile libraries (Yeomans-Maldonado, 2021; Wang, 2019).

Selection bias is a notable limitation in HLLE research, as many studies rely on self-reported parental assessments, which may be subject to social desirability bias (Yeomans-Maldonado, 2021; Weldemariam, 2022). Additionally, most HLLE studies are conducted in high-income countries, limiting the generalizability of findings to lower-resource environments (Zhang, 2023). Future research should include cross-cultural comparisons to capture the diverse ways in which HLLE functions across different socioeconomic and linguistic contexts (McIntosh et al., 2024).

Measurement bias is another challenge. While tools like the Language Environment Analysis (LENA) system offer quantitative insights into linguistic exposure, they fail to assess the qualitative aspects of language interactions, such as narrative complexity and pragmatic language use (Sheng et al., 2021; Zhang, 2022). Future studies should incorporate qualitative methodologies to provide a more nuanced understanding of HLLE and its role in cognitive and linguistic development.

This study contributes to the HLLE literature by integrating sociocultural and technological perspectives. The use of LENA technology represents a paradigm shift in assessing home language interactions, offering precise, real-time data on linguistic exposure (Zhang, 2022; Xia, 2024). However, while LENA provides valuable insights, it remains inaccessible to many low-income households, raising concerns about equity in HLLE research (Zhang, 2023). Policymakers should consider subsidizing digital literacy tools to ensure broader accessibility across diverse socioeconomic backgrounds.

The findings have significant implications for education policy and practice. Schools should implement bilingual education programs that align with home literacy practices, particularly in linguistically diverse communities (Garcia & Wei, 2014; Wang, 2019). Strategies such as mobile libraries, culturally responsive teaching, and digital literacy initiatives can help bridge literacy gaps and foster equitable learning environments (Weldemariam, 2022; McIntosh et al., 2024). Additionally, teacher training programs should emphasize the importance of integrating students' home languages into curricula, reinforcing bilingual children's linguistic identities while promoting academic success (Filippi et al., 2022).

This systematic literature review (SLR) offers valuable insights into the role of the Home Language and Literacy Environment (HLLE) but has certain methodological and database-related limitations. A key limitation is the reliance on secondary data, where variations in methodologies, sample sizes, and analytical frameworks create inconsistencies, further compounded by the lack of standardized HLLE assessment tools, making cross-study comparisons difficult; thus, future research should establish uniform methodologies for better consistency. Another constraint stems from the database selection criteria, as the review primarily sourced data from Scopus, Web of Science, Google Scholar, and CrossRef, potentially excluding gray literature, unpublished studies, and non-English sources, which limits the comprehensiveness of findings, highlighting the need to expand inclusion to regional and multilingual databases.

Additionally, many reviewed studies rely on self-reported parental data, which introduces social desirability bias and lacks direct observational measures, reducing the objectivity of HLLE assessments; incorporating empirical methods such as longitudinal observations or digital language tracking tools would enhance measurement accuracy. Furthermore, the cross-sectional nature of most reviewed studies prevents an exploration of HLLE's long-term impact beyond early childhood, necessitating more longitudinal research to assess its influence on cognitive development, academic success, and career outcomes.

Addressing these limitations will improve HLLE evaluation methods, broaden literature inclusion, and strengthen the applicability of findings across diverse sociolinguistic contexts.

Future research should explore the long-term impact of HLLE on educational attainment, socio-emotional development, and career trajectories. There is also a need to examine how HLLE evolves within multilingual households over time, considering factors such as generational language shifts, parental language proficiency, and the role of national language policies (Zhang, 2023; Xia, 2024).

Comparative studies are crucial to identifying scalable interventions that enhance HLLE equity across different socioeconomic settings. For instance, research should assess the efficacy of community literacy programs and digital storytelling platforms in promoting biliteracy among disadvantaged populations (Yeomans-Maldonado, 2021; Wang, 2019). Additionally, future investigations should explore the intersection of HLLE with digital learning tools to determine how technology can facilitate language acquisition for children in remote or underserved communities (Sheng et al., 2021).

By addressing these gaps, future research can refine HLLE models to ensure that all children, regardless of linguistic or socioeconomic background, have equitable opportunities for literacy development and academic success.

4. CONCLUSION

The findings of this systematic literature review highlight the critical role of the Home Language and Literacy Environment (HLLE) in shaping children's language acquisition, cognitive flexibility, and literacy development, particularly in bilingual and multilingual settings. Evidence suggests that a rich HLLE fosters vocabulary growth, reading comprehension, and executive functioning, with parental involvement emerging as a key determinant of positive learning outcomes. However, disparities in HLLE due to socioeconomic status and resource availability continue to widen literacy gaps, particularly in underserved communities. This study contributes novel insights by integrating linguistic, sociocultural, and technological perspectives, particularly the role of digital tools such as Language Environment Analysis (LENA) in quantifying home language interactions. The implications extend to educators, policymakers, and parents, emphasizing the need for targeted interventions to enhance literacy-rich environments, promote bilingual education, and support equitable access to educational resources. Future research should explore the long-term impact of HLLE on academic achievement and socio-emotional development, assess the effectiveness

of digital literacy interventions in underprivileged communities, and examine the evolving role of HLLE in multilingual households over time. Additionally, comparative studies across diverse cultural and economic contexts would provide deeper insights into scalable strategies for enhancing HLLE equity worldwide.

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