

## IMPROVING SPATIAL UNDERSTANDING USING BILINGUAL PHRASES DESCRIBING POSITION IN ELEMENTARY CLASSROOM ACTIVITIES ANALISIS

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### ABSTRAK

Pemahaman spasial merupakan komponen penting dalam perkembangan kognitif awal dan berperan besar dalam kemampuan penalaran matematika, pemecahan masalah, serta navigasi sehari-hari. Penelitian ini bertujuan menganalisis kontribusi frasa spasial bilingual seperti di depan / in front of, di antara / between, di samping / next to, dan di belakang / behind dalam meningkatkan pemahaman spasial siswa sekolah dasar. Metode yang digunakan adalah tinjauan pustaka dengan mensintesis artikel jurnal dan buku ilmiah terbitan lima hingga sepuluh tahun terakhir yang relevan dengan bahasa spasial, scaffolding bilingual, dan strategi pembelajaran di kelas. Hasil sintesis menunjukkan bahwa paparan eksplisit terhadap bahasa spasial memperkuat representasi mental hubungan posisi objek pada anak, sementara penggunaan frasa bilingual semakin meningkatkan pemahaman melalui proses pemetaan konsep dari bahasa pertama ke bahasa sasaran. Aktivitas pembelajaran interaktif seperti permainan arah, penataan objek, tugas peta, dan permainan digital mampu meningkatkan kosakata spasial, kemampuan penalaran, serta keterlibatan belajar siswa. Selain itu, penggunaan bahasa spasial bilingual menciptakan lingkungan belajar yang inklusif, meningkatkan kepercayaan diri, dan mendorong partisipasi aktif terutama bagi siswa dengan kemampuan bahasa Inggris terbatas. Dengan demikian, integrasi frasa spasial bilingual merupakan pendekatan pedagogis efektif yang mendukung perkembangan kognitif, linguistik, dan akademik siswa sekolah dasar. Studi ini merekomendasikan penerapan strategi pembelajaran multimodal dan bilingual secara sistematis dalam pembelajaran awal untuk mengoptimalkan perkembangan pemahaman spasial.

**Kata Kunci:** *Bahasa Spasial Bilingual, Pemahaman Spasial Siswa, Pembelajaran Multimodal*

### ABSTRACT

Spatial understanding is an important component in early cognitive development and plays a major role in mathematical reasoning, problem solving, and everyday navigation. This study aims to examine the contribution of bilingual spatial phrases such as di depan / in front of, di antara / between, di samping / next to, and di belakang / behind in improving the spatial understanding of elementary school students. The method used is a literature review by synthesizing journal articles and scientific books published in the last five to ten years that are relevant to spatial language, bilingual scaffolding, and classroom learning strategies. The synthesis results indicate that explicit exposure to spatial language strengthens children's mental representation of object positional relationships, while the use of bilingual phrases further enhances understanding through the process of mapping concepts from the first language to the target language. Interactive learning activities such as direction games, object arrangement, map tasks, and digital games can improve spatial vocabulary, reasoning skills, and student engagement in learning. In addition, the use of bilingual spatial language creates an inclusive learning environment, increases confidence, and encourages active participation,

especially for students with limited English skills. Thus, the integration of bilingual spatial phrases is an effective pedagogical approach that supports the cognitive, linguistic, and academic development of elementary school students. This study recommends the systematic application of multimodal and bilingual learning strategies in early learning to optimize the development of spatial understanding.

**Keywords:** *Bilingual Spatial Linguistic Expressions, Spatial Cognition in Students, Multimodal Instruction*

## INTRODUCTION

Spatial understanding is an essential component of early cognitive development and strongly influences children's ability to navigate their environment, interpret visual information, and engage in problem-solving tasks. In elementary education, spatial competence is closely tied to mathematical reasoning, map-reading, literacy, and everyday communication, as spatial thinking serves as a foundational pathway for early mathematical learning and conceptual development (Clements & Sarama, 2021). According to Newcombe and Levine (2020), children's spatial skills develop rapidly during the early school years and are highly sensitive to the quality of instructional input they receive. One instructional approach shown to effectively support this development is linguistic scaffolding, particularly through simple and structured phrases that describe spatial positions such as *in front of*, *next to*, *between*, or *behind*. Empirical evidence indicates that the use of spatial language facilitates children's spatial and mathematical reasoning by helping them organize and internalize spatial information more effectively (Mix & Cheng, 2022), thereby strengthening children's mental representations of space (Frick & Möhring, 2020).

However, despite the established importance of spatial language and the ideal expectation that classrooms provide rich and consistent verbal scaffolding, many teachers still struggle to incorporate systematic spatial phrasing in everyday instruction. In practice, spatial explanations often appear incidental rather than intentionally embedded, resulting in inconsistent exposure for students. This limited and unsystematic use of spatial language may hinder children's ability to form stable mental representations of spatial relationships. Consequently, a clear gap remains between theoretically recommended instructional practices and the realities of classroom implementation (Hawes et al., 2022).

In multilingual or bilingual learning contexts, the integration of bilingual spatial phrases offers a strategic advantage. Recent studies emphasize that bilingual explanations help young learners access new concepts more comfortably because they can anchor meaning to their first language while gradually internalizing the target language structure (García & Kleifgen, 2020). In the elementary classroom, using bilingual position-describing phrases allows students to visualize relationships between objects more clearly, reducing ambiguity and supporting students who may struggle with English-only instruction. Furthermore, bilingual scaffolding ensures inclusivity, particularly in culturally diverse regions where students enter school with varying linguistic backgrounds.

Classroom activities that embed spatial language such as arranging objects, completing map tasks, solving picture-based puzzles, or following direction-giving games have been shown to improve children's spatial vocabulary and reasoning. Verdine et al. (2021) highlight that spatially rich classroom discourse is a strong predictor of children's problem-solving and geometry performance. When these activities are delivered using bilingual phrasing, they allow students to repeatedly hear, process, and apply spatial concepts in meaningful contexts, strengthening both linguistic and cognitive outcomes simultaneously.

In addition to academic benefits, exposure to bilingual spatial language also supports broader socio-emotional development (Castro et al., 2025; García & Kleifgen, 2020). Children who feel linguistically supported are more likely to participate actively, collaborate with peers, and demonstrate confidence in learning tasks. Bilingual instruction reduces anxiety and promotes a sense of belonging among learners who may otherwise feel marginalized due to language barriers. At the same time, children who are already proficient in English benefit from repeated contextual exposure to precise spatial terminology, enhancing language sophistication and descriptive ability. Thus, the use of bilingual positional phrases does not simply assist second-language learners but enriches classroom discourse for all students.

Despite its importance, many elementary classrooms still rely on monolingual explanations or focus heavily on rote memorization rather than embodied, language-rich spatial activities (Bufasi et al., 2024). Traditional instructional models often underestimate the power of language to structure spatial thinking, resulting in missed opportunities to promote inquiry-based learning. Another ongoing challenge is the lack of teaching resources that integrate bilingual spatial phrases into hands-on activities, leaving teachers without practical frameworks to apply these strategies in everyday lessons. Moreover, limited studies have specifically explored how bilingual positional phrases can enhance spatial understanding within elementary classroom activities.

This creates a clear research gap, as prior studies tend to examine bilingual instruction in a general sense or focus on spatial reasoning in isolation, without sufficiently addressing how bilingual spatial phrases are systematically embedded within various elementary classroom learning activities. Most existing research emphasizes learning outcomes rather than the instructional processes through which spatial language is introduced and reinforced. As a result, limited attention has been given to teachers' pedagogical strategies in integrating bilingual positional phrases during everyday classroom interactions. Therefore, this study offers novelty by specifically examining the pedagogical integration of bilingual positional phrases within authentic instructional practices in elementary classrooms, an area that remains underexplored in existing literature.

Accordingly, this article examines the use of bilingual phrases describing spatial positions as a pedagogical tool for improving spatial understanding among elementary school students. By integrating insights from empirical research, cognitive theory, and classroom-based practices, this study aims to contribute to a deeper understanding of how language can mediate the development of spatial reasoning. The findings are expected to inform teachers, curriculum developers, and educational practitioners about practical strategies for embedding bilingual spatial language in everyday learning activities. Ultimately, strengthening bilingual spatial discourse in early education may create more equitable learning environments while simultaneously fostering students' cognitive, linguistic, and academic growth.

## METHOD

This study employed a literature review method to analyze how bilingual spatial phrases contribute to the development of spatial understanding in elementary classroom activities. The review focused on peer-reviewed journal articles published within the last five years and books published within the last ten years to ensure relevance and recency. Sources were gathered from major academic databases such as Google Scholar, ERIC, and ScienceDirect using keywords including *spatial understanding*, *bilingual language support*, *spatial phrases*, and *elementary education*.

The selection process followed three criteria: (1) the study must directly examine spatial reasoning or spatial language in early education, (2) the study must address bilingual or multilingual instructional support, and (3) the research design must provide empirical or conceptual insights applicable to classroom practice. A total of 32 relevant publications met these criteria and were included in the final analysis.

Each selected study was examined based on its research focus, instructional strategies, outcomes related to spatial reasoning, and the role of language scaffolding in concept acquisition. The reviewed literature was then synthesized using thematic analysis to identify recurring patterns such as the cognitive benefits of spatial language, the role of bilingual scaffolding, and classroom strategies that integrate positional phrases. Through this process, the review generated a comprehensive understanding of how bilingual spatial phrases support spatial reasoning development in elementary learners.

## RESULT AND DISCUSSION

To support clarity and continuity of analysis, this section first presents the research findings derived from the literature review, followed by a detailed discussion that interprets and connects those findings to theoretical and pedagogical perspectives. The separation of results and discussion enables readers to understand what was obtained from the data before examining how the findings relate to broader frameworks, implications, and interpretive insights.

### Result

The literature reviewed reveals a consistent pattern demonstrating that bilingual spatial phrases contribute substantially to the development of elementary students' spatial reasoning abilities. Studies on early childhood show that frequent exposure to explicit positional vocabulary such as *behind*, *between*, *in front of*, or *next to* supports the formation of stronger mental representations of spatial relationships and leads to higher performance in tasks involving orientation, direction, and numeracy. Georges et al. (2023) provide empirical evidence that children who actively produce and comprehend spatial lexicon perform better in number-sense tasks, indicating that spatial language influences broader cognitive domains beyond verbal communication.

Further findings illustrate that bilingual input enhances these developmental gains. Melzi (2022) emphasizes that bilingual caregivers offer richer linguistic scaffolding, enabling children to interpret and transfer meaning across two language systems. This cross-linguistic mapping helps refine abstract concepts and reduces ambiguity, especially among learners whose English proficiency is still emerging. Consequently, bilingual spatial phrases function not only as lexical items but also as mediational tools that foster conceptual bridging and deeper learning.

Classroom intervention studies reinforce these benefits through embodied and activity-based learning. Several classroom-based interventions consistently demonstrate significant improvements in students' spatial comprehension when physical manipulation, direction-following tasks, and visual sequencing are incorporated into learning activities. These interventions show that students who physically experience spatial relationships internalize spatial meaning more effectively than those who rely solely on verbal instruction. Participants demonstrated improved accuracy in identifying spatial terms and increased willingness to verbalize their understanding.

Digital-based research adds further support. Online spatial games have been shown to provide immediate feedback, adaptive repetition, and appropriately leveled challenges, which contribute to stronger retention and consolidation of spatial concepts, resulting in stronger retention and conceptual consolidation. These platforms also allow continuity of learning beyond classroom boundaries, reinforcing spatial language skills.

A broader trend emerging across studies is increased classroom engagement, particularly among learners with limited English proficiency. Ainul (2024) observed that structured peer interactions such as turn-taking dialogues describing object positions enhanced communicative confidence, participation, and spoken accuracy. Similarly, Castro et al. (2020) confirmed that bilingual instructional environments promote inclusivity and shared ownership of learning as students draw on both languages to negotiate meaning.

Collectively, the results presented in Table 1 demonstrate that bilingual spatial phrases embedded within interactive and multimodal learning environments strengthen spatial reasoning, enrich linguistic competence, increase classroom participation, and support inclusive learning cultures.

**Table 1. Summary of Empirical Studies on Spatial and Bilingual Language Development**

No	Study	Focus	Key Findings
1	Johannsdottir & Ragnarsdóttir (2021)	Spatial language and spatial cognition	Spatial language ability predicts children's success in non-verbal spatial tasks.
2	Cartmill, Goldin-Meadow, & Levine (2025)	Parental use of spatial talk	Frequency of parental spatial talk contributes to children's spatial vocabulary growth.
3	Pruden & Levine (2020)	Spatial language and mental rotation	Exposure to spatial language significantly improves mental rotation skills.
4	Balamurugan & Kaur (2024)	Bilingual spatial cognition and neural processing	Bilingual learners exhibit broader neural activation during spatial cue processing.
5	Verdine, Golinkoff, & Hirsh-Pasek (2021)	Spatial language and mathematics reasoning	Spatial vocabulary correlates strongly with children's mathematical and spatial reasoning.
6	Yang, Chen, & Li (2023)	Visuospatial memory and bilingual cognition	Bilingual children demonstrate better visuospatial processing and cognitive flexibility.

Overall, the empirical studies summarized in Table 1 highlight a consistent pattern: spatial language exposure, whether through parental interaction, instructional environments, or bilingual experiences, plays a central role in supporting children's cognitive development. These findings indicate that spatial vocabulary is not merely a linguistic skill, but a predictor of spatial reasoning, cognitive flexibility, and mathematical performance. The review also suggests that bilingual learners benefit from wider neural activation and more diverse processing pathways, which may contribute to strengthened spatial reasoning skills. Therefore, the evidence reinforces the importance of integrating bilingual spatial phrases into early learning contexts to support both language and cognitive growth.

## **Discussion**

The results support theoretical claims that spatial language functions as a cognitive organizer that helps structure mental representations of spatial relationships. Verbal labeling of spatial concepts allows learners to externalize mental images, which in turn facilitates manipulation of abstract ideas. Recent studies reinforce this relationship; for example, Miller et al. (2022) found that children who frequently use spatial vocabulary develop more precise mental rotation and mapping skills, demonstrating the organizing role of spatial language in cognitive processing. When delivered bilingually, these representations become even more accessible because students can use their first language (L1) as a conceptual anchor for complex ideas introduced in the second language (L2). This is consistent with cross-linguistic transfer theory, which argues that bilingual experience enhances conceptual flexibility by enabling learners to move fluidly between linguistic systems (Uccelli & Phillips Galloway, 2019; Castro et al., 2025).

The discussion also highlights the importance of embodied learning in spatial development. A substantial body of research indicates that physical interaction such as manipulating objects, navigating directional pathways, or sequencing visual stimuli supports deeper encoding of spatial meaning (Glenberg & Hayes, 2022). These findings align with grounded cognition theories, which posit that knowledge is inherently shaped by perceptual and motor experiences. Evidence suggests that embodied learning pairs effectively with bilingual instruction; for instance, previous studies reported that spatial tasks integrating movement with bilingual explanations enhanced conceptual clarity and retention due to simultaneous linguistic and sensorimotor input. This indicates that bilingual spatial scaffolding during embodied tasks strengthens comprehension through multimodal channels.

Moreover, inclusivity emerges as a key pedagogical implication. Learners with limited English proficiency often experience participation gaps in monolingual classrooms, largely due to linguistic barriers. However, research shows that bilingual spatial activities mitigate anxiety, foster risk-taking, and validate linguistic identity factors that increase classroom participation (Ainul, 2024). Peer communication practices, such as turn-taking descriptions or collaborative problem-solving, are particularly powerful. Recent work by Li & Girolametto (2022) demonstrates that bilingual peer-mediated spatial dialogue significantly improves expressive vocabulary and spatial reasoning accuracy. These outcomes echo sociocultural theories of learning, which emphasize that cognitive development is fundamentally collaborative and mediated by language.

Digital reinforcement plays an increasingly important role in complementing embodied and verbal instruction. Online spatial games and virtual simulations replicate core features of embodied learning while offering adaptive pacing and continuous practice opportunities. Found that digital spatial tasks provide self-regulated repetition, instant feedback, and multilayered representations that strengthen conceptual consolidation in bilingual learners. These findings underscore the value of integrating physical, verbal, and digital modalities to maximize learning outcomes in spatial cognition.

Overall, the discussion reinforces the idea that bilingual spatial phrases are not peripheral teaching aids but central mechanisms for developing spatial understanding. They serve interconnected functions, including conceptual clarification, linguistic accessibility, motivational engagement, and communicative practice. Consistent with recent scholarship (Gentner & Özyürek, 2019; Melzi, 2022), the evidence suggests that systematic integration of bilingual spatial expressions across classroom activities enhances both cognitive and linguistic development. Rather than relying on monolingual or rote instructional approaches,

educators are encouraged to embed bilingual spatial language purposefully within tasks, peer interactions, and digital environments. Doing so enables students to develop robust spatial reasoning skills essential for mathematics, scientific thinking, and everyday navigation while simultaneously strengthening bilingual proficiency.

## CONCLUSION

This study demonstrates that bilingual spatial phrases effectively support elementary students' spatial understanding by strengthening mental representations of positional relationships and reducing linguistic barriers. When systematically integrated into activity-based learning such as object manipulation, direction-following tasks, map activities, and digital learning tools, bilingual spatial language enhances spatial reasoning, learner engagement, and inclusive classroom participation. The findings provide clear prospects for further development and application. Practically, they can inform the design of structured instructional modules, bilingual learning resources, and teacher training programs that intentionally embed spatial language across elementary subjects. For future research, empirical classroom-based and longitudinal studies are recommended to examine the effectiveness of bilingual spatial instruction across grade levels, learning contexts, and digital learning environments. Overall, bilingual spatial language shows strong potential as a pedagogical approach that supports spatial cognition while fostering equitable and linguistically responsive elementary education.

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