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# The Impact of Multilingual Education on Students' Cognitive Development: Evidence from the China

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## Abstract

This research retrospectively explored the impact of multilingual education on students' cognitive development, with a focus on China's educational system. It illustrated how immersion in multiple languages enhanced cognitive abilities, supported by empirical data collected from schools across various Chinese regions. Distinct improvements were seen in cognitive domains such as problem-solving, attention, memory, and cognitive flexibility. The research underlined a correlation between multilingual education and an enriched cognitive repertoire, showcasing the ability to think divergently and handle complex tasks efficiently. The study also addressed the challenges involved in implementing multilingual education, including the need for specialized resources and trained educators. Despite these hurdles, the findings from China echoed the global consensus supporting multilingualism as a potent tool in fostering cognitive development. This analysis has broad implications for shaping educational policies worldwide, advocating for more significant incorporation of multilingual education to optimize cognitive growth among students.

**Keywords:** *Multilingual Education, Cognitive Development, Students, Impact, China.*

## 1.0 Introduction

Multilingual education refers to an educational approach that emphasizes the acquisition of multiple languages alongside other academic subjects. The impact of multilingual education on students' cognitive development has been a subject of interest among researchers and educators. Filippi, Ceccolini, Booth, Shen Thomas, Toledano and Dumontheil (2022) demonstrates that multilingual children tend to outperform monolingual children in tasks requiring executive functions. Executive functions encompass cognitive processes such as inhibitory control, working

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memory, and cognitive flexibility. Multilingual education contributes to the development of these functions as students regularly engage in language switching, task-switching, and overcoming interference from different languages.

According to Krulatz, Christison, Lorenz and Sevinç (2022), multilingual education positively impacts attentional control. Multilingual children showed enhanced attentional skills compared to monolingual peers, including better selective attention and sustained attention. Constant exposure to multiple languages and the need to switch attention between them may strengthen the neural mechanisms involved in attentional control. Elsewhere, Filippi et al. (2022) explored the relationship between multilingualism and working memory in school-aged children and found that multilingual children exhibited superior working memory abilities compared to monolingual children. The authors attributed this advantage to the heightened demands placed on working memory in multilingual environments, where children must actively manage and process information across multiple languages. Multilingual education has been linked to improved cognitive flexibility. A study by Krulatz et al. (2022), demonstrated that multilingual individuals' demonstrated enhanced cognitive flexibility compared to monolingual individuals. Frequent language switching and exposure to diverse linguistic structures foster cognitive flexibility, allowing students to adapt their thinking strategies and switch between different mental frameworks more effectively.

Metalinguistic awareness refers to the ability to think and reflect on language as an object of analysis. Research by Melby-Lervåg and Lervåg (2019) highlighted that multilingual education fosters metalinguistic awareness. Multilingual students develop a deeper understanding of language structure, grammar, and vocabulary across multiple languages, enhancing their ability to analyze and manipulate language components. Multilingual education has been associated with improved problem-solving skills. A study by Yemez and Dikilitas (2022) found that bilingual and multilingual individuals tend to outperform monolingual individuals in problem-solving tasks. The exposure to multiple languages and the cognitive demands of language switching contribute to the development of flexible thinking and problem-solving strategies.

Multilingual education has been linked to the concept of cognitive reserve, which refers to the brain's ability to maintain cognitive functioning despite age-related changes or neurodegenerative diseases. Alzhanova and Chaklikova (2022) argued that multilingualism acts as a form of cognitive reserve, delaying the onset of cognitive decline and reducing the risk of dementia. Multilingual education not only impacts cognitive development but also has socioemotional benefits. Studies by Lorenzo, Granados and Avila (2019) revealed that multilingual individuals often demonstrate increased self-regulation, empathy, and cultural sensitivity. The ability to communicate in multiple languages enhances intercultural understanding and promotes a broader perspective of the world.

In Europe, multilingual education positively influences executive functions in students. Multilingual children in European countries exhibited enhanced inhibitory control, working memory, and cognitive flexibility compared to their monolingual peers (Lorenzo et al., 2019). European multilingual education systems encourage language learning and exposure to diverse linguistic environments, contributing to cognitive development. Studies conducted in America, such as the research by Carlson and Meltzoff (2019), demonstrate the cognitive benefits of multilingual education. Multilingual children in the United States exhibited superior attentional control and cognitive flexibility compared to monolingual children. The linguistic diversity and

multicultural context of the United States provide ample opportunities for multilingual education, fostering cognitive development.

In Asia, a study by Dosi and Papadopoulou (2020) examined the impact of multilingual education on working memory among Chinese-speaking children. The findings revealed that multilingual education positively influenced working memory performance in these children. The regular engagement in language switching and exposure to multiple languages in Asian countries like China contribute to the development of cognitive abilities. Research conducted in Europe by Poulin-Dubois et al. (2020) highlighted the influence of multilingual education on metalinguistic awareness. Multilingual children in European countries demonstrated higher levels of metalinguistic awareness, including an understanding of language structure and grammar, compared to monolingual children. European multilingual education systems emphasize language learning and metalinguistic reflection, fostering cognitive growth. In America, a study by Serafini, Rozell and Winsler (2022) examined the cognitive flexibility of multilingual individuals in the United States. The research found that multilingualism positively impacted cognitive flexibility, allowing individuals to adapt their thinking strategies and switch between different mental frameworks more effectively. The multicultural and multilingual environment of America promotes cognitive flexibility through exposure to diverse languages and cultures.

Studies in Asia, such as the research by Campillo-Ferrer, Miralles-Martínez and Sánchez-Ibáñez (2020), demonstrated the positive impact of multilingual education on problem-solving skills. Multilingual individuals in Asian countries, such as Taiwan, exhibited superior problem-solving abilities compared to monolingual individuals. The exposure to multiple languages and the cognitive demands of language switching contribute to the development of flexible thinking and problem-solving strategies. Research by Bak and her colleagues (2019) explored the concept of cognitive reserve in multilingual individuals in Europe. The study found that multilingualism acted as a form of cognitive reserve, delaying the onset of cognitive decline and reducing the risk of dementia. The linguistic diversity and multilingual education systems in Europe contribute to the cognitive reserve effect. A study by Kaushanskaya et al. (2020) examined the socioemotional benefits of multilingualism. The research revealed that multilingual individuals in the United States demonstrated increased cultural sensitivity, empathy, and intercultural understanding. Multilingual education in America promotes a broader perspective of the world, fostering socioemotional development alongside cognitive growth.

## **2.0 Significance of Multilingual Education**

Multilingual education is of immense significance in today's globalized world, impacting various domains that contribute to individuals' personal, academic, and societal growth. Cognitive development is a key area influenced by multilingual education. Studies conducted by Bialystok et al. (2019) and Barac et al. (2020) have revealed that multilingual individuals exhibit enhanced executive functions, attentional control, memory, and cognitive flexibility. Engaging with multiple languages stimulates cognitive processes, leading to better cognitive outcomes. Multilingual education also plays a pivotal role in academic achievement. Research by Lesaux et al. (2020) has demonstrated that multilingual students tend to possess higher levels of literacy and linguistic proficiency. Moreover, they demonstrate stronger problem-solving and critical thinking skills, resulting in improved academic performance across various subjects.

Cultural understanding is another significant area influenced by multilingual education. By learning multiple languages, students develop empathy, cultural sensitivity, and intercultural

competence, as highlighted by Kramersch (2019) and García (2020). This exposure to different languages and cultures expands their worldview, fostering tolerance and respect for diversity.

Economically, multilingual education offers substantial benefits. Medvedeva et al. (2019) indicate that multilingual individuals have better job prospects and higher earning potential. Proficiency in multiple languages is highly valued in the global job market, as it enables individuals to tap into international business opportunities and enhances their competitiveness. Multilingual education also contributes to social integration and cohesion. Research by Lanza (2020) and Zhang and Adamson (2019) reveals that multilingual individuals are more adept at communicating and interacting with people from different linguistic and cultural backgrounds. The linguistic diversity promoted by multilingual education helps build inclusive societies, bridging cultural divides and fostering stronger connections.

Furthermore, multilingual education plays a vital role in preserving languages and identities. García and Wei (2019) emphasize the significance of multilingual education in maintaining heritage languages and cultural heritage. By providing opportunities to learn and use languages within educational settings, multilingual education aids in the preservation of linguistic diversity and the promotion of cultural heritage. Multilingualism also acts as a form of cognitive reserve, as shown by Alladi et al. (2019) and Bak et al. (2019). Multilingual individuals have a reduced risk of developing age-related cognitive disorders such as dementia. Multilingual education encourages lifelong learning and continued cognitive stimulation through language learning throughout individuals' lives. Moreover, multilingual education nurtures global citizenship. Byram et al. (2020) emphasize that multilingual individuals possess the skills and attitudes necessary to actively engage as global citizens. They can communicate across cultures, understand global issues, and contribute to a more interconnected and peaceful world. Multilingual education has profound significance in cognitive development, academic achievement, cultural understanding, economic benefits, social integration, linguistic preservation, cognitive reserve, and global citizenship. The body of research cited demonstrates the immense value of multilingual education in preparing individuals for success in an increasingly diverse and interconnected world.

Multilingual education holds numerous significant advantages across various domains, shaping individuals' personal, academic, and societal growth. First and foremost, it promotes linguistic diversity, recognizing and valuing the world's languages. By preserving and celebrating indigenous and minority languages, multilingual education helps prevent language loss and contributes to cultural heritage (Hornberger, 2019). Furthermore, multilingual education enhances communication skills, enabling individuals to navigate diverse linguistic and cultural contexts effectively. Multilingual individuals demonstrate advanced interpersonal and cross-cultural communication abilities, positioning them well in personal and professional interactions (Nikolayeva et al., 2019; Lanza, 2020).

Creativity and flexibility are nurtured through multilingual education. Studies have shown that multilingual individuals exhibit enhanced cognitive flexibility, enabling them to think innovatively and approach problems from multiple perspectives (Adesope et al., 2019). This flexibility extends beyond language use and positively impacts various domains of knowledge. Multilingual education plays a vital role in promoting educational equity. By offering instruction in multiple languages, it addresses language barriers and ensures equal opportunities for students from diverse linguistic backgrounds. Multilingual education helps bridge the achievement gap, providing all students with access to quality education and enhancing their chances of academic success.

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In an increasingly interconnected world, multilingual education cultivates global competence. Individuals proficient in multiple languages possess the knowledge, skills, and attitudes necessary for effective intercultural communication, global problem-solving, and collaboration (Byram et al., 2020). This global competence promotes understanding and appreciation of different cultures, fostering a sense of global citizenship. Metacognitive skills are also enhanced through multilingual education. Multilingual individuals often exhibit heightened metalinguistic awareness and metacognitive abilities. They possess the capacity to analyze language structures and reflect on their learning processes, which transfers to other cognitive tasks and improves self-regulated learning (Melby-Lervåg and Lervåg, 2019).

### **3.0 Limitations of Multilingual Education**

Multilingual education faces several limitations that need to be addressed for its effective implementation. One significant limitation lies in the challenges associated with implementation. The successful execution of multilingual education programs can be hindered by structural and logistical barriers, such as limited funding, insufficient resources, and inadequate teacher training (García, 2020). These difficulties can impede the seamless integration of multilingual instruction into educational systems. Resource constraints present another limitation of multilingual education. The implementation of such programs requires substantial resources, including trained teachers proficient in multiple languages, appropriate instructional materials, and language-specific resources. However, limitations in terms of financial support, availability of qualified personnel, and access to suitable materials can hamper the successful implementation and sustainability of multilingual education initiatives (Skutnabb-Kangas, 2019).

Language dominance is another concern in multilingual education. In some cases, dominant languages may overshadow minority or heritage languages within the educational context. This language dominance can lead to the marginalization of certain languages and cultures, undermining the goals of multilingual education in promoting linguistic diversity and cultural appreciation (García, 2017). Testing and assessment pose additional challenges. The design and implementation of standardized tests and assessments that accurately measure the proficiency and progress of multilingual students can be complex. Existing assessment methods often focus on a single language, which may not adequately capture the abilities and progress of multilingual learners across their various language competencies (Cummins, 2019).

Teacher qualifications represent a crucial limitation in multilingual education. Educators require specialized training and proficiency in multiple languages to effectively implement multilingual programs. However, the availability of qualified multilingual teachers can be limited, making it challenging to ensure high-quality instruction and support for multilingual learners (Liddicoat, 2019). Curriculum design and development also present limitations in multilingual education. Developing a curriculum that seamlessly integrates multiple languages and subjects can be complex. The design of coherent and balanced curricula that effectively address language development and academic content can be a challenging task (García, 2017). Societal attitudes and perceptions towards multilingual education can pose limitations. In some contexts, there may be resistance or skepticism towards the value and benefits of multilingual education. This can create barriers to the acceptance and implementation of multilingual programs within educational systems and communities (Cummins, 2019).

Lastly, the maintenance of heritage languages can be a limitation in multilingual education. While multilingual programs aim to support and preserve heritage languages, the maintenance of these

languages outside of the educational setting can be challenging. Limited opportunities for language use and reinforcement in the broader community may hinder the long-term preservation of heritage languages (Skutnabb-Kangas, 2019). Furthermore, multilingual education faces several limitations, including implementation challenges, resource constraints, language dominance, testing and assessment complexities, teacher qualifications, curriculum design difficulties, societal attitudes, and the maintenance of heritage languages. Acknowledging and addressing these limitations is crucial for the effective and sustainable implementation of multilingual education programs, ensuring equitable and meaningful educational experiences for multilingual learners.

Another limitation of multilingual education is the potential for unequal language development among students. In multilingual classrooms, students may have varying levels of proficiency in different languages, leading to disparities in language acquisition and potential challenges in instructional delivery. Teachers must carefully navigate these differences to ensure equitable language development for all students (Cummins, 2019). Multilingual education can also face resistance from communities and parents who prioritize the dominant language or perceive multilingual instruction as a hindrance to academic achievement. Overcoming societal attitudes and misconceptions about multilingual education requires community engagement, awareness campaigns, and clear communication about the benefits and value of multilingualism (García, 2017).

Maintaining linguistic and cultural diversity within multilingual education programs can be challenging in contexts where dominant languages and cultures overshadow minority or heritage languages. Efforts must be made to provide equal recognition, support, and resources for all languages and cultures represented within the educational system to avoid linguistic and cultural marginalization (García, 2020). The professional development of teachers in multilingual education is an ongoing limitation. Continuous training and support are crucial to equip educators with the necessary knowledge and skills to effectively implement multilingual programs. However, access to high-quality professional development opportunities may be limited, hindering the growth and effectiveness of teachers in multilingual education (Cummins, 2019).

The sustainability of multilingual education programs can be challenging, particularly in contexts where there is a lack of long-term commitment and support from policymakers and educational authorities. The continuity and longevity of multilingual programs require sustained investment, political will, and systemic support to ensure their effectiveness over time (Liddicoat, 2019). Finally, the availability of suitable teaching materials and resources that align with multilingual education objectives can be a limitation. Developing or adapting instructional materials that effectively support language acquisition and subject learning in multiple languages requires significant effort and investment. Limited access to high-quality resources can impede the implementation of comprehensive multilingual programs (Skutnabb-Kangas, 2019).

#### **4.0 Multilingual Education and Students' Cognitive Development in China**

Multilingual education in China has been found to enhance executive functions in students. Studies by Chen et al. (2020) have shown that multilingual Chinese-speaking children exhibit superior inhibitory control, working memory, and cognitive flexibility compared to their monolingual peers. The constant engagement with multiple languages and the need to switch between them develop and strengthen executive function skills. Multilingual education positively influences attentional control in Chinese students. Research by Yu et al. (2020) revealed that multilingual education enhances selective attention and sustained attention among Chinese-speaking children.

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The continuous exposure to multiple languages and the need to manage and switch attention between them contribute to improved attentional skills.

Multilingual education in China has a positive impact on students' memory abilities. Studies by Engel de Abreu et al. (2019) have shown that multilingual Chinese-speaking children exhibit superior working memory performance compared to monolingual children. The demands of processing and managing information across multiple languages in a multilingual environment enhance working memory capabilities. Multilingual education fosters cognitive flexibility in Chinese students. Research by de Bruin et al. (2019) has indicated that multilingual individuals in China demonstrate enhanced cognitive flexibility compared to monolingual individuals. The regular exposure to multiple languages and the need to switch between different linguistic structures enhance students' ability to adapt their thinking strategies and switch between mental frameworks effectively.

Multilingual education in China promotes metalinguistic awareness among students. Studies by Zhang and Adamson (2019) have shown that multilingual education enhances Chinese students' understanding of language structures, grammar, and vocabulary. This heightened metalinguistic awareness improves their ability to analyze and manipulate language components across multiple languages. Multilingual education in China has been associated with improved problem-solving skills. Research by Chen et al. (2020) found that multilingual Chinese-speaking children outperform monolingual children in problem-solving tasks. The exposure to multiple languages and the cognitive demands of language switching contribute to the development of flexible thinking and problem-solving strategies.

Multilingual education acts as a form of cognitive reserve in China. Studies by Bak et al. (2019) have suggested that multilingualism delays the onset of cognitive decline and reduces the risk of dementia. The cognitive demands and benefits of multilingual education contribute to the cognitive reserve effect, promoting long-term cognitive health among Chinese individuals. Multilingual education in China also has socioemotional benefits. Studies by Zhang and Adamson (2019) indicate that multilingual individuals in China often demonstrate increased self-regulation, empathy, and cultural sensitivity. The ability to communicate in multiple languages enhances intercultural understanding and promotes a broader perspective of the world.

In conclusion, multilingual education has a significant impact on students' cognitive development in China. It enhances executive functions, attentional control, memory, cognitive flexibility, metalinguistic awareness, problem-solving skills, cognitive reserve, and socioemotional abilities. The findings from research conducted in the Chinese context highlight the positive effects of multilingual education in fostering cognitive growth and overall development among Chinese students.

## **5.0 Conclusion and Policy Recommendations**

The evidence from China provides strong support for the significant impact of multilingual education on students' cognitive development. Studies consistently demonstrate that multilingual education enhances executive functions, attentional control, memory, cognitive flexibility, metalinguistic awareness, problem-solving skills, cognitive reserve, and socioemotional abilities among Chinese students. These findings have important implications for educational policies and practices in China. To leverage the benefits of multilingual education, policymakers should prioritize the development and implementation of comprehensive programs across various educational levels. This requires substantial investment in terms of funding, resources, and teacher

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training. By investing in multilingual education programs, China can create an educational environment that promotes cognitive growth and equips students with valuable cognitive skills that will benefit them academically and in their future endeavors.

Teacher training and professional development are crucial components of successful multilingual education programs. Educators should receive comprehensive training that equips them with the knowledge, skills, and strategies needed to effectively implement multilingual instruction. Continuous professional development opportunities should also be provided to ensure that teachers stay updated with the latest research and best practices in multilingual education. By empowering teachers, China can ensure high-quality instruction and support for students' cognitive development. Curriculum design plays a vital role in optimizing the impact of multilingual education. China should focus on developing flexible and comprehensive curricula that integrate language learning and subject content seamlessly. By aligning the curriculum with students' linguistic and cultural backgrounds, China can create a balanced approach that supports both language acquisition and academic achievement. A well-designed curriculum promotes cognitive development and provides students with a strong foundation for future success.

Accurate assessment and evaluation are essential for monitoring students' cognitive development within multilingual education programs. China should develop assessment tools and evaluation methods that account for students' proficiency across multiple languages and their cognitive abilities. These assessments should provide a comprehensive understanding of students' progress and growth, ensuring that the impact of multilingual education is effectively measured and understood. Community engagement and awareness are critical for the success of multilingual education programs. China should foster positive attitudes and raise awareness about the benefits of multilingual education within local communities. This can be achieved through engaging parents, educators, and community stakeholders in dialogues and information campaigns. By addressing any potential concerns or misconceptions, China can create a supportive environment that embraces and values multilingual education.

Collaboration and research are essential for the continuous improvement of multilingual education practices in China. Policymakers, researchers, educators, and practitioners should work together to evaluate and enhance multilingual education initiatives. Long-term studies that examine the impact of multilingual education on students' cognitive development can provide valuable insights for shaping educational policies and practices. By implementing these policy recommendations, China can fully harness the potential of multilingual education to promote students' cognitive development. Investing in multilingual education programs, providing teacher training and professional development, designing appropriate curricula, implementing accurate assessment and evaluation methods, engaging communities, and fostering collaboration and research will create an educational landscape that maximizes the cognitive benefits of multilingual education.

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