ENHANCING EXECUTIVE FUNCTION THROUGH A CREATIVE MUSIC MODULE FOR URBAN LEFT-BEHIND CHILDREN IN SHANDONG, CHINA

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UNIVERSITI PENDIDIKAN SULTAN IDRIS

2025

ENHANCING EXECUTIVE FUNCTION THROUGH A CREATIVE MUSIC MODULE FOR URBAN LEFT-BEHIND CHILDREN IN SHANDONG, CHINA

YE BAOLIAN

DISSERTATION PRESENTED TO QUALIFY FOR
DOCTOR OF PHILOSOPHY
RESEARCH MODE

FACULTY OF MUSIC AND PERFORMING ARTS
UNIVERSITI PENDIDIKAN SULTAN IDRIS

2025

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ACKNOWLEDGMENTS

The journey of completing my doctoral studies has been one of challenges, growth, and invaluable support. I am deeply grateful to all who have contributed to this milestone. My heartfelt thanks go to my supervisor, Dr. Christine a/p Augustine, for her expert guidance, patient mentor ship, and genuine care for both my academic and personal well-being. I also sincerely thank my evaluators, Dr. Colleen Wong and Dr. Abdul Rahman bin Safian, whose constructive feedback and insightful suggestions have significantly strengthened my research.

I owe my deepest gratitude to my family my husband, for his unwavering encouragement; my parents, for their steadfast support from afar; and my son, whose cheerful spirit gave me strength, even while he was under his grandparents' care during my time abroad. I am also thankful to my peers and friends, whose discussions, collaboration, and camaraderie enriched my academic experience and made the journey meaningful.

I would also like to express my sincere appreciation to Universiti Pendidikan Sultan Idris (UPSI) for providing a supportive academic environment and the resources necessary to carry out my research. Finally, I extend appreciation to everyone who supported me, whether through academic contributions or personal encouragement. This dissertation represents more than an academic goal; it is a testament to perseverance, shared commitment, and personal growth. The experiences and lessons I have gained will continue to inspire and guide me in my future academic and personal pursuits.

ABSTRACT

This study aimed to develop and evaluate a creative music module designed to enhance executive function in urban left-behind children aged six to seven. As urbanization accelerates and labor migration increases, the number of urban left-behind children has grown, their challenges remain under explored. A mixed method approach guided by the ADDIE model informed this study. There were 60 participants randomly assigned to experimental and control groups. The intervention lasted 12 weeks and was conducted in a natural classroom setting. Executive function, including inhibitory control, working memory, and cognitive flexibility, was assessed at three time points: before the intervention, at the midpoint, and after completion. Quantitative data were analyzed using a 2 * 3 mixed design repeated measures ANOVA to examine main and interaction effects. Although the difference in inhibitory control between the two groups did not reach statistical significance, the experimental group exhibited an upward trend in performance, indicating a possible positive effect of the intervention. However, significant improvements were observed in working memory and cognitive flexibility. For working memory, the BDST Brain Capacity test showed a significant main effect of the test period: F (1.57, 58.43) = 6.55, $p < .05$, $\eta 2p = .10$, and significant interaction effects with teaching method differences: F (1.57, 58.43) = 4.59, $p < .01$, $\eta 2p = .07$. The DCCS After Boundary test showed similar results, with significant main effects and interactions. The study found that integrating creative module can significantly enhance the executive functions of urban left-behind children. This approach shows the meaningful theoretical and practical implications, as it not only strengthens music education interventions but also directly addresses the unique developmental challenges faced by this population. Future research should explore the long term effects of the intervention and assess its transfer ability across diverse populations and educational settings.

MENINGKATKAN FUNGSI EKSEKUTIF MELALUI MODUL MUZIK KREATIF UNTUK KANAK-KANAK KETINGGALAN BANDAR DI SHANDONG, CHINA

ABSTRAK

Kajian ini bertujuan untuk membangunkan dan menilai keberkesanan modul muzik kreatif bagi meningkatkan fungsi eksekutif dalam kalangan kanak-kanak ketinggalan bandar berumur enam hingga tujuh tahun. Pendekatan kaedah campuran telah digunakan, berpandukan model reka bentuk pengajaran ADDIE. Reka bentuk kuasi-eksperimen dilaksanakan dalam fasa penilaian, melibatkan 60 orang peserta yang dibahagikan secara rawak kepada kumpulan eksperimen dan kumpulan kawalan. Intervensi berlangsung selama 12 minggu dan dijalankan dalam persekitaran bilik darjah sebenar. Fungsi eksekutif, merangkumi kawalan inhibitori, ingatan kerja, dan fleksibiliti kognitif, dinilai pada tiga titik masa: sebelum, semasa pertengahan, dan selepas intervensi. Data kuantitatif dianalisis menggunakan ANOVA ukuran berulang reka bentuk campuran 2 * 3 bagi mengenal pasti kesan utama dan kesan interaksi. Walaupun perbezaan dalam kawalan inhibitori antara kumpulan eksperimen dan kumpulan kawalan tidak mencapai tahap signifikan statistik, kumpulan eksperimen menunjukkan arah peningkatan prestasi yang mencadangkan kemungkinan kesan positif intervensi tersebut. Namun, peningkatan signifikan telah dikenal pasti dalam domain ingatan kerja dan fleksibiliti kognitif. Bagi ingatan kerja, ujian Kapasiti Otak BDST menunjukkan kesan utama yang signifikan mengikut tempoh ujian: F (1.57, 58.43) = 6.55, $p < .05$, $\eta 2p = .10$, serta kesan interaksi signifikan berdasarkan perbezaan kaedah pengajaran: F (1.57, 58.43) = 4.59, $p < .01$, $\eta 2p = .07$. Ujian DCCS Selepas Sempadan menunjukkan pola yang konsisten, dengan kesan utama dan interaksi yang signifikan. Dapatan kajian menunjukkan bahawa pengintegrasian modul kreatif dapat meningkatkan fungsi eksekutif secara signifikan dalam kalangan kanak-kanak ketinggalan bandar. Pendekatan ini mempunyai implikasi teori dan praktikal yang signifikan kerana ia bukan sahaja memperkukuh intervensi dalam pendidikan muzik, malah secara langsung menangani cabaran perkembangan yang unik dalam kalangan populasi ini. Kajian pada masa hadapan disarankan untuk meneroka kesan jangka panjang intervensi ini serta menilai keupayaan pemindahannya merentasi pelbagai populasi dan konteks pendidikan yang berbeza.

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LIST OF ABREVIATIONS

CNKI	China National Knowledge Infrastructure
ADDIE	Analysis Design Development Implementation and Evaluation Model
NAEYC	National Association for the Education of Young Children
MTK	Models of Teachers Knowledge
PCK	Pedagogical Content Knowledge
BDST	Backward Digit Span Test
DCCS	Dimensional Change Card Sort
SPSS	Statistical Packages for the Social Science
ANOVA	Analysis of Variance
NGT	Nominal Group Technique
TOT	Training of Trainer
I-CVI	Item Content Validity Index
S-CVI	Scale Content Validity Index
IV	Independent Variable
DV	Dependent Variable
EF	Executive Function

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In recent years, the issue of urban left-behind children in China has attracted growing attention due to the rapid pace of urbanization and the significant migration of rural workers to cities. These children, often left in the care of relatives or even fending for themselves, face various socio-emotional and developmental challenges due to the absence of parental involvement. Among the many aspects of development affected by this separation, executive function a set of cognitive processes essential for self-regulation, goal-setting, and problem-solving has become a critical focus of research. Poor executive function can negatively impact a child's academic performance, social interactions, and emotional well-being.

Parallel to this, educational interventions aimed at improving cognitive functions have increasingly incorporated creative activities. Music, in particular, has shown great potential in fostering cognitive development, with studies indicating that musical training can enhance various components of executive function, including inhibitory control, working memory, and cognitive flexibility. Creativity in music not only stimulates cognitive and emotional development but also provides an engaging, culturally rich avenue for addressing the developmental gaps faced by disadvantaged

groups such as urban left-behind children.

This study aims to develop and explore the impact of a creative thinking in music module on the executive function of urban left-behind children. By focusing on how structured music interventions can enhance executive function, this research seeks to fill an important gap in the literature, contributing both to educational theory and practice. Furthermore, it responds to the growing need for tailored interventions that address the unique challenges faced by left-behind children in urban environments, where conventional forms of education may fail to meet their developmental needs.

The chapter will first provide background on the conditions and challenges of urban left-behind children in China, followed by creative thinking in music as a key educational tool. The problem statement, research objectives, and research questions will be outlined to frame the study's purpose. Additionally, the conceptual framework, hypotheses, and scope of the study will be discussed to provide a foundation for understanding the approach and significance of this research. Finally, key terms was be operationally defined to ensure clarity, and the delimitation of the study was be addressed, followed by a summary of the key elements discussed in this chapter.

1.2 Background of Study

This section addresses the variables of urban left-behind children, executive function, of urban left-behind children and creative thinking in music. It expounds on the

international background of each variable.

1.2.1 Urban Left-behind Children in China

Left-behind children are mainly in developing countries. Eastern Europe, Latin America, Africa, and Asia have all seen a rise in left-behind children. In Africa, the high migration rate of refugees, accompanied by labor force transfer, leads to the generation of left-behind children. In the Caribbean region of Latin America, scholars have examined the causes of left-behind children mainly in conjunction with the prevalence of immigrant separation (Yu, 2020). Yang (2018) pointed out that in recent years, there has been a rapid increase in economic immigration from Eastern Europe, which has also resulted in a large number of left-behind children. Therefore, researchers have pointed out that most left-behind children are distributed in economically underdeveloped areas, which objectively reflects the geographical distribution of the world economy and is mainly distributed in Asia. According to census data, three to six million Filipino children have become left-behind children because their parents work abroad. According to national statistics from 2022, there were approximately 9.02 million left-behind children under the age of 16 in China. Nearly 90％ these children were under the care of their parents, while an estimated three hundred and sixty thousand left-behind children in rural areas experienced periods without adult supervision (China Youth Net, 2022). As left-behind children seldom get the care and companionship of their parents, they also lack the necessary family education and guidance, resulting in the emotional loss of left-behind children

and a lot of adverse problems (Xing, 2019). Therefore, how to care for left-behind children's education is an important issue worthy of our social attention.

It is found that domestic researches on left-behind children mainly involve education, mental health, individual safety, type of custody, emotional life, gender structure, socialization dilemma, scale, distribution, left-behind girls, and so on. In particular, literature on the education and mental health of left-behind children accounts for 59.27% of the total (Yang & Zhu 2013). Through the search of the topic of urban left-behind children in the past five years through the database of CNKI, it is found that the proportion of literature remains at 55%, which is still a hot topic of research.

The emergence of left-behind children has its profound background and reasons. Globalization has made left-behind children a global issue, particularly in China and other developing countries. The investigation of left-behind children at home and abroad shows that they are conceptually unique to China (Cao, 2018). Left-behind children are not only a phenomenon in China but also exist in other countries, particularly in economically underdeveloped regions such as South Asia, Sub-Saharan Africa, and Eastern Europe. Studies have documented significant populations of left-behind children in these areas, largely due to internal and international labor migration (Bryant, 2005;UNICEF Georgia, 2011; Wen & Lin, 2023; Xiao, 2015; Zhao et al., 2018).

However, there are very few studies on left-behind children, and the number of children in developed areas of Europe is even less. Because of the economic system, children can move with their parents at will and receive education equally. Scholars define the concept of left-behind children as unique and with Chinese characteristics (Yu, 2017). China has a strict household registration system. Children cannot follow their parents when they go out to study or work.

In the early stage of China, the focus on left-behind children tends to be rural left-behind children. With social development and institutional influence, a new form of urban left-behind children easily ignored has emerged (Cao, 2018). However, urban left-behind children are part of particular groups that can easily be ignored. Because children live in cities and have the same material conditions as ordinary children, families, schools and society rarely focus on this topic. However, as the number of left-behind children increases and problems become more prominent domestic scholars have done some research on urban left-behind children and found that urban left-behind children have many problems, such as interpersonal communication disorders, aggressive behaviour, Internet addiction, attention deficit, and other problems (Du et al., 2012).

However, it is worth considering and studying how these problems can be solved. Zhang's practical research report on the application of group sand play training to improve the interpersonal skills of urban left-behind children points out that group sand play training significantly improves the interpersonal skills of urban

left-behind children (Zhang, 2020). Psychodrama also affects Internet addiction and social avoidance of urban left-behind children (Ge et al., 2014). Psychodrama also affects Internet addiction and social avoidance of urban left-behind children (Ge et al., 2014). Exercise habits positively impact the deviant behaviour of urban left-behind children (Xyu, 2017).

Based on previous literature, urban left-behind children's executive function is inconsistent with those of non-urban left-behind children. The executive function of urban left-behind children is lower than that of non-left-behind children regarding cognitive flexibility and inhibitory control (Wang & Zhu, 2020). Chen et al. (2016) compared the developmental characteristics of the executive function of left-behind and non-left-behind children using the psychometric method. They found that the developmental level of the left-behind children is lower than that of the non-left-behind children. Some studies have found that the various problems of urban left-behind children are closely related to the insufficient stimulation of the executive function of the brain spinous process (Mei, 2021).

Through continuous exploration and practice, it has been proved that the emphasis on music and game teaching in music teaching is of great significance to improving the sense of security of left-behind children (Tang, 2017) and music education is conducive to the mental health of left-behind children (Chen, 2021). Therefore, this chapter analyzed the different countries background of music creation teaching in primary schools.

Music creativity is widely recognized as a core component of music education globally. In many countries, fostering children's imagination and creativity through music has long been emphasized (Valasi, 2023). Among the most influential approaches are Orff Schulwerk, Kodály Method, and Dalcroze Eurhythmics. These methods have been implemented in various educational contexts across Europe, North America, and Asia, demonstrating strong applicability in both general and special education settings (Juntunen & Hyvönen, 2004; Abril, 2003; McFerran & Saarikallio, 2014).

The Orff approach, originally developed in Germany, emphasizes improvisation, rhythm, and group participation, and has been widely adopted in the United States, Australia, and parts of Asia for its child-centered, inclusive strategies (Goodkin, 2001). Kodály method, with a strong focus on vocal training and solfege, is deeply rooted in Hungarian music education but is also widely used in the United States, United Kingdom, and Canada (Choksy, 1999). Dalcroze Eurhythmics, originating in Switzerland, is noted for integrating movement and music and is applied internationally to enhance students' musical expression and bodily coordination (Juntunen, 2004).

Research from various countries confirms the benefits of these approaches. For example, Orff-based programs have been used to support the inclusion of autistic children in group music activities (Brown & Jellison, 2012). Kodály singing activities have been found to promote social and emotional development in early childhood

(Abril, 2003), while Dalcroze methods support embodied learning and musical responsiveness (McFerran & Saarikallio, 2014). These findings reflect the international visibility and practical value of these approaches in promoting musical creativity and child development.

In China, the teaching of musical creativity has evolved through three historical stages. In 2002, the Ministry of Education began formalizing goals for creative music instruction, but most practices remained teacher-centered, limiting children's creative engagement (Tong, 2014). The 2011 revision of the Compulsory Education Music Curriculum Standards (《义务教育音乐课程标, 2011 年版》) emphasizes creativity as a core educational value (Ministry of Education, 2011). However, research in China has mainly focused on lesson design rather than establishing clear links between music creativity and cognitive outcomes such as executive function.

However, due to the uneven economic and educational levels in various regions, there are still many issues in music education in most areas. The teaching model for primary school music is outdated, with a monotonous teaching approach. The majority of teachers play a dominant role and lack innovative teaching methods, leading to insufficient children engagement (Zhuo & Wang, 2022). This situation stifles children's interest. Currently, the teaching methods of most primary school music teachers do not meet the required standards, and there is a need for innovation in the teaching model and improvement in teaching methods. On the other hand, the

teaching content is excessively formalized. Despite the new curriculum reform making new demands on music education, teachers still rely excessively on textbooks and lack innovation (Han, 2019).

According to the World Health Organization (2020), nearly one billion children under 18 were subjected to physical, sexual, or emotional violence or neglect worldwide in 2019. The American Child Welfare Association (CWLA) defines kinship as the support, care, or assistance provided to a child by an adult or relative, race, or tribe related to the child (UNICEF, International Social Service, 2004). The relative support problem is usually the interaction of multiple factors such as personal, family, and work changes because the parents work, go abroad, or do not move with the family due to the need for examinations. Usemann et al (2019) found that in kinship care, dependent children are more likely to have problems with safety, mental illness, and out-of-control behaviour than ordinary children. Left-behind children are disproportionately affected by behavioural and psychological problems, such as depression, anxiety, and social withdrawal, when compared to their peers living with parents. They are also at greater risk for health-related issues, problematic behaviour, and reduced academic performance.

There are problems in the communication with teachers and some problems in the process of communication with teachers. Ye and Zeng (2006) pointed out that the main reasons for the problems of safety, psychology, health, and behaviour in the process of re-relative support are psychological injury, lack of psychological

counseling, indifference in being raised, and other invisible injuries. Judging from the existing research, in the context of globalization, the problem of left-behind children is regional and mainly concentrated in underdeveloped countries (Bankole, 2024).

In Southeast Asia, there are thousands and millions of left-behind children, based on the survey from the Journal of Marriage and Family. For instance, Graham (2014) studied that in the Philiines, a survey estimated that the workforce of Filipino immigrants was at least 3.6 million (out of a total of 8.1 million Filipino immigrants abroad). Furthermore, many of these people came overseas alone, keeping in touch with their families but not separated by foreign countries. The number of left-behind children in Chinese cities is increasing daily due to; large-scale population movement and the acceleration of urbanization. Many institutions have conducted relevant investigations and even established relevant sociological models and found that the growth conditions of these children are also very severe (Buthelezi, 2022; Yang, 2018). On April 19, 2023, the National Bureau of Statistics of China, the United Nations children's Fund (UNICEF), and the United Nations Population Fund (UNFPA) jointly released the report titled Child Population Situation in China 2020. Facts and Data. The report reveals the following:

In 2020, the number of migrant children in China reached 71.09 million, while the number of left-behind children amounted to 66.93 million. The total number of children affected by population mobility was 138 million, accounting for 46.4% of China's total child population. This implies that nearly half of China's children are

directly impacted by population mobility. In terms of scale, in line with the trend of urbanization, the total number of children affected by population mobility in 2020 increased significantly by 47.3 million compared to 2010. According to Netease News (2023), the number of migrant children in China has doubled since 2010, while the population of left-behind children in urban areas grew by 65.4 %.

Because of the lack of parental care and support, children often face dual physical and psychological difficulties (Gao et al., 2020; Zhang, 2016). Although many parents work part-time on a “short-term” basis, meetings between parents and children are still infrequent due to geographical distances and financially high costs. Many children grow up without parents, especially mothers (Tong & Peng, 2016). Some children are brought up by their grandparents; some are kept at relatives’ homes during growth (Zhao et al., 2022). In terms of physical aspects, although parents also take care of them for a short period, they are busy with work and ignore children’s mental needs, causing psychological problems. These have had a huge adverse impact on children’s growth, but there is no effective way to improve these problems (Yuan, 2018).

A Canadian study showed that children who took music lessons had a better memory than those of the same age who did not (Schellenberg, 2020). Children who had a year of music lessons performed were better on a memory test than children who had not attended music lessons. Professor Laurel Trina from Master University in Hamilton, Ontario, said that whether or not taking a music class affects brain

development differently, the study is the first to find, for the first time, that the brain responses of musically trained and untrained children changed over a year. There is a study that pointed out that for a year, the researchers conducted four measurements on two groups of children aged four to six, those who attended music lessons outside school hours and those who did not (Yu & Tao, 2020). The study found differences in brain development in both groups within as little as four months and found that the two groups of children developed different brains in four months. Children in the study underwent a music test and a memory test. In music tests, the researchers asked the children to identify harmony, rhythm, and melody; in memory tests, they listened to a series of numbers, memorized them, and then repeated them (Miendlarzewska & Trost, 2014). Among the older children, the average IQ scores of those who took music lessons increased faster than those who took drama classes. The study examined the impact of these courses on IQ tests in young children. The children who learn music have better audiovisual abilities than children who do not learn music (Jaschke et al., 2018; Kraus et al., 2014).

Music can improve children's dyslexia (Hugo et al., 2012; Said & Abramides, 2020) and mathematical logic operation ability (Xyu, 2021). The study found that the executive function of left-behind children is lower than that of ordinary children in tasks such as working memory and inhibitory control (Wang et al., 2022). Some studies intervene in the interpersonal communication of rural left-behind children through the Orff creative music activities. They found that creative teaching methods can improve children's social skills (Li, 2017b). Rural left-behind children's music

education problems are generally reflected in the shortage of teachers and musical instruments (Li, 2015), and studies have found that music practice courses positively impact the emotions of rural left-behind children.

The Orff methods of music creative education have positively impacted early literacy development. Music exists as a moderating factor, and music interventions must be based on these three music teaching method principles or a combination of both (Eccles et al., 2021). Studies have found that Orff music significantly affects the social skills of primary school maladaptive children and can improve their self-regulation skills (Boal-Palheiros & Ilari, 2023；Kim, 2021). Orff Music not only has an intervention effect on children with ADHD (Mastnak, 2020；Wang, 2023) but also has positive results in intervention studies of deaf children (Napitupulu et al., 2023).

The Orff, Kodaly, and Dalcroze methods each demonstrate significant impacts on children’s development in the context of music creativity teaching, as evidenced by the following studies: Tao (2021), based on the Orff classroom teaching method, found through empirical research that Orff positively influenced the mental health of left-behind children and significantly impacted autism through its emphasis on creative thinking in music (Duvall, 2020; Meng, 2020). Similarly, Kodaly has proven to be a valuable tool in children's reading and writing enlightenment (Martinez, 2014), promoting social development, and intervening in autism disorders, including improving joint attention (Chiengchana & Trakarnrung, 2014). It also significantly

enhances the musical creativity of primary school children (Houlahan & Tacka, 2015). Lastly, Dalcroze music activities contribute to improving children's motor expression and social-emotional development (Ye, 2014). Meanwhile, domestic music creativity teaching emphasizes improving curriculum design and enhancing teachers' abilities, such as strategies for cultivating children's creative abilities in music teaching (Zhang, 2021) and the application of Orff percussion instruments in primary school music creation (Wang, 2022).

However, according to China National Knowledge Infrastructure statistics (2022), 76% of the literature research focuses on the current situation and countermeasures of creative music teaching in primary schools and rarely focuses on the psychological theory of children, ignoring the psychological adjustment function of creative music teaching. In music education, this part of special children is ignored. Compared with non-left-behind children, urban left-behind children's school attendance rate is much lower than that of non-left-behind children.

Left-behind children will have different psychology and behaviour from non-left-behind children. Many scholars are devoted to studying the problems of left-behind children. In particular, many methods have also emphasized children's mental health. However, the previous research has yet to focus on the problem of left-behind children in cities, whether there is a suitable school education intervention method, and whether music creative thinking and teaching can be used as an intervention plan.

More research is needed to explore the impact of creative thinking in music on executive function, particularly in the context of left-behind children. There are few theoretical references to study the influence of musical creative thinking on children's executive function. Many studies have only been conducted in a few schools but have yet to be popularized. This study will design a creative thinking in music module and investigate its influence on the executive function of urban left-behind children.

1.2.2 Creative Thinking in Music

For the essence of music creation, the current research mainly focuses on three aspects: thinking performance, practice, and environment. Researchers have done much research on creative thinking. Research on creative thinking in experiments is mostly to extract and simplify real creative thinking activities of human beings, such as divergent thinking tasks and long-distance association tasks (Liu et al., 2022). Many studies have focused on the relationship between music and executive function elements in children. Research shows that music can promote children's executive function (Chen et al., 2017; Han & Lyu, 2013; Yue et al., 2019). Pavel Hok et al. (2021) pointed out in their research that different listening methods and creativity have been developed as an alternative approach to music education. Similar to other contemporary music styles (Hickey, 2002; Webster, 2016). Sabir et al. (2005) found that music learning can enhance individual inhibition abilities in children Frischen et al. (2019) demonstrated that a rhythm-based music training method enhanced inhibitory control in preschool children.

Some studies also suggest that systematic activities, particularly music-based training, can accelerate the development of early inhibitory control and related brain networks in children, as reported by Hennessy et al (2019). Studies have found that music can improve working memory in children, and rhythm-based musical training particularly enhances inhibition in preschoolers, affecting other executive function, such as visual spatial working memory (Assal, 2019). Music learning has significant functions in promoting cognitive development, shaping spiritual strength, and treating diseases. In terms of cognition, there is already a large body of research showing that music learning promotes language, motor, and spatial abilities (Frischen et al., 2019).

Studies have shown that music training can improve children's intelligence quotient (IQ), self control, reading ability, math ability, and memory ability (Shen, 2019). They are choosing music education as an intervention method because music learning affects factors such as emotion, sensitivity, cognition, perception, movement, social, and language. An analysis of school performance tests (SPT) evaluations showed statistically significant differences between the experimental and control groups in reading, writing, and arithmetic scores (Muthivhi & Kriger, 2019).

Related studies also show that there is a correlation between musical ability and mathematical ability (Boal-Palheiros, 2022; Francisca et al., 2023; Incognito et al., 2022). Studies proved that music could improve children's reading ability (Hugo et al.,, 2012); compared with children not receiving music education, accept children in academic ability and school skills, including reading, writing, especially arithmetic,

music has a positive impact to practice ability development (Francisca et al., 2023). Through four weeks of music training, poor speech production ability also significantly improved their performance in paragraph comprehension (Han & Lyu, 2013).

Music creative thinking plays an important role in children's education. Employing creative thinking, educators can facilitate a deeper understanding of music among children by encouraging the creation of original compositions and participation in improvisation within a children-centric learning environment (Brown, 2008). Creativity is the fundamental driving force of art and even the historical development of the whole society (Tong, 2016). Studies suggested that creative thinking is becoming a more common aspect of music education (Strand, 2006; Webster, 1990b; Whitcomb, 2005). children's cognitive development, imagination, and thinking are inseparable from the cultivation of creativity. Musical development, especially the cultivation of musical development in the early stages, is promoted mainly through the support and encouragement of spontaneous, energetic, and creative movements and postures of the human body, through the rhythmic expression of recognizing children’s emotions and motivations, and through the collaborative activities of emotions, thoughts, and concepts created by singing. The teaching method of music creative teaching can stimulate children's learning enthusiasm and interest through intrinsic motivation, form a cooperative and creative relationship in the process of sports, and learn to create new ideas and improve their creative skills (Frances & Wilfried, 2020).

From the cognitive level of neuroscience research, creative thinking design integrates fluid analogies of different concepts in working memory, which are responses to current tasks. Music creative thinking provides children with advanced task requirements. Teachers use it to maximize children's creativity by setting challenges to the generation process of high-quality creative insights. In classroom interaction, children stimulate and mobilize higher executive function, enabling children to complete advanced tasks, thus stimulating the development of the brain forehead and promoting the development of executive function (Benedek et al., 2014; Zhou, 2020), not only plays an important role in decision-making in individual development but also plays an important role in children's emotional processing and control. From the perspective of brain function, if there is no large number of neural network connections in the brain, it is even more impossible to complete creative thinking. In the course of music creation, the focus is on cultivating children's creative thinking to stimulate the network connections of neurons (Zhou, 2020).

The theory and teaching research of musical creativity began in the 1920s and gradually perfected and developed with the emergence of music teaching systems such as Kodály, and Orff (Jiyenbaevich, 2021). Foreign music education attaches great importance to cultivating children's creativity and creative thinking. Creative music teaching about sound is very common (Liu, 2013). The music class in primary schools in the United States adopts an open and multi-modal classroom teaching mode. It explores the intelligent role of music, forming a unique multi-modal music class, focusing on developing children's intelligence and creating happiness (Han,

2018). The content in the field of creation is mainly divided into improvised melody, variation, accompaniment, composing, and arranging under specific guidance (Yu, 2017).

In the practice of Japanese primary school music creation, children's autonomy and spontaneity are emphasized, and the sounds and sounds used by children are created according to their own imagination. The content of Western musical instruments as the framework is expanded to modern music and national musical instruments, emphasizing that the learning process is more important than the result (Sun, 2018). The Curriculum Plan of Northern Ireland, the National Curriculum Standards of England (Department for Education and Employment and QCA, 1999), and the music courses of Catalonia and Spain all take creative thinking training as one of the guiding principles of music education.

In 2007, England National Curriculum: Handbook for secondary teachers proposed that music courses should increase children’s musical literacy and creativity (Yu, 2017). In the “Music Curriculum Standards for Full-time Compulsory Education,” officially promulgated in 2012, China put forward the idea of encouraging children’s creative thinking.

Most of the current literature studies are based on the teaching of music creation in primary schools, such as Kodály, and Orff, and rarely implement creative thinking in music teaching from a comprehensive perspective. The idea of encouraging children's to create was put forward in the Music Curriculum Standards

for Full time Compulsory Education, officially promulgated in 2012. Through searching the database of China National Knowledge Network, it is found that there are 1091 studies of literature on music creation teaching, but only 257 studies on music creation teaching in primary schools, among which 106 kinds of articles in the last five years show a declining trend.

For the development and implementation of creative thinking in music, researchers have studied from the teacher level, such as the influence of teachers' knowledge and beliefs on primary school creative music teaching and the influence of teachers' teaching design, among others (Tong, 2016). Some are based on the cultivation of mental ability and creative and focus on the definition, measurement, and evaluation of music creativity, teaching steps, and procedures, among others (Yu, 2017). In some third and fourth-tier cities, many schools cannot purchase musical instruments due to insufficient special funds or damaged instruments; professional music teachers have limited resources and can implement creative thinking in music methods. There are few theoretical references to study the influence of musical creativity on children's executive function with musical creativity. Many studies have only been conducted in a few schools but have yet to be popularized (Deng, 2015).

1.3 Problem Statement

Current research on left-behind children primarily focuses on rural populations (Li, 2017a; Luo, 2019; Yi & Huang, 2021; Wang & Xyu, 2022), with limited attention to urban left-behind children. As urbanization accelerates and labor migration increases,

the number of urban left-behind children has grown, yet their challenges remain under explored (Guan, 2022; Song et al., 2020). Studies suggest that urban left-behind children face higher risks of mental health and substance abuse problems compared to non-left-behind children (Qiao et al., 2024), but few have examined the differences in executive function between these groups.

Secure parent-child attachments are critical for the development of executive functions (Bernier et al., 2012, 2015). The absence of parental presence often leads to emotional difficulties for left-behind children, including low self-esteem, depression, and strained relationships (Guan, 2022; Sun, 2022; Yang, 2018). Children with parental warmth develop better coping mechanisms and creativity (Wang & Dong, 2019), while those lacking such support tend to rely on emotion-focused strategies (Moran et al., 2018). These emotional challenges are often tied to brain circuit disruptions and executive dysfunction (Frances & Wilfried, 2020).

Research increasingly connects executive functions to creativity, with both associative and executive skills playing a role in creative thinking (Beaty et al., 2014; Benedek et al., 2017; Kenett et al., 2016). While studies have explored the impact of music training on executive functions, most focus on typical children, not urban left-behind children. Additionally, Schiavio & Benedek, 2020; Forgeard & Kaufman, 2016 pointed that much research examines the generation of creative ideas (>50%), with fewer studies on creative problem solving (10-20%) and music-based creativity (20-30%)Creativity can be enhanced by training in something embedded in the

creative process, such as musical creativity (Lubart & Thornhill-Miller, 2019; Webster, 2011). Music plays an important role in creativity and creative thinking. Children's cognitive development, imagination, and thinking are inseparable from the cultivation of creativity. Music creative teaching can stimulate children's learning enthusiasm and interest through intrinsic motivation, form a cooperative and creative relationship in the process of sports, and learn to create new ideas and improve their creative skills (Frances & Wilfried, 2020). Music intervention in this study involves a targeted creative music module where children engage in various musical activities such as improvisation, rhythm exercises, and melody creation, all designed to foster creative thinking and enhance executive function. The module aims to engage children in a multi-sensory experience that connects the emotional and cognitive aspects of music with the development of executive functions.

Previous studies have shown evidence that multi-modal music training taught for 45 minutes twice each week for six or ten weeks optimized young children's learning engagement and increased their executive functions (Bugos & DeMarie, 2017; Bugos et al., 2021).

Recent research criticizes schools for missing opportunities to foster children's creativity in music education (Lasky & Yoon, 2020; Welch, 2012), despite evidence that understanding creativity enhances teaching effectiveness (Sawyer, 2005). Sternberg (2017) noted that a teacher-centric focus on knowledge transmission often stifles creativity. Teacher-student interaction can strengthen executive function and

self regulation in children (Sankalaite et al., 2021). Cumming et al. (2020) found that classroom emotional support and teacher-student conflict are key predictors of executive function development. These findings highlight the critical role of educators in promoting creative thinking in music. In this context, music educators will be encouraged to adopt strategies that emphasize emotional connection and creativity, allowing for greater student involvement in the learning process.

The academic field must recognize musical creativity as an intellectual pursuit that requires dedication and effort (Odena, 2012). Strong emotional bonds with teachers significantly influence children's cognitive skills, including executive function (Commodari, 2013; Verschueren & Koomen, 2012; Cadima et al., 2015; Nguyen et al., 2020). Scholars emphasize fostering musical creativity for its positive impact on human development and emotional well-being (Hallam, 2015; Welch & Ockelford, 2015). However, in many Chinese cities, music education remains conventional, focusing on music theory and song repetition, limiting opportunities for creativity (Hogenes, 2016; Li, 2015; Liu, 2020; Jing, 2020; Zhang, 2024). Constraints such as inadequate equipment and large class sizes further hinder creative practices. For urban left-behind children, this lack of creative teaching fails to stimulate the brain's mechanisms that improve executive function (Benedek et al., 2014).

Creative music strategies, including group singing, rhythmic movements, and instrument playing, can increase engagement and enhance cognitive development (Djumaboyeva, 2023; Ismail & Amuar, 2021). Rhythmic activities also significantly

improve executive function in young children (Baath et al.2016; Bashwiner et al. 2016; Diamond & Lee,2011; Kayili & Kuşcu,2021; Frischen et al., 2019; Williams er al., 2023; Wang et al., 2024). Teachers play a key role, with strong teacher student interactions predicting better executive function outcomes (Collins & Koechlin, 2012; Diamond, 2013; Spilt et al., 2022; Xu, 2024).

Wang (2022) highlights the role of Orff percussion instruments in fostering creativity and confidence, which in turn improves resilience and mental flexibility (Bungay & Vella-Burrows, 2013; Choi et al., 2022; Garcia-Ros, 2012). Creativity is also linked to greater well being (Aithal, 2021). Despite these findings, there is a need for structured creative music education to support the development of executive function in urban left-behind children.

Although numerous studies have demonstrated the influence of music creation on children's executive functions, most of these studies have explored the relationship using music intervention method (Bolduc et al., 2021; Chen et al., 2022; Degé et al., 2022; Jaschke et al., 2018). However, these studies are often overly subjective in design and lack methodological diversity, failing to adequately highlight the connection between musical elements and executive functions. Additionally, they are challenging for educators to implement in music classes, because there are no concrete modules or models that explicitly describe how these musical interventions should be structured to best enhance children's cognitive skills.

Therefore, the purpose of this study is to design a creative thinking in music module that can be easily utilized by music educators and urban left-behind children. This module will include specific activities aimed at fostering executive function through musical creativity, such as improvisational exercises, rhythm training, and collaborative musical creation, allowing students to directly engage with music in a way that promotes cognitive flexibility, emotional regulation, and problem-solving skills.

In addition, according to previous studies, existing research focuses on the status and countermeasures of creative music teaching in primary schools, seldom focuses on children's creative thinking, psychology, and ignores the psychological adjustment function of music creation teaching. Moreover, there needs to be more research on the influence of music creativity teaching on executive function for left-behind children. Few studies have examined how musical creativity affects children's executive function.

In conclusion, four research gaps have been identified. First, there is a lack of detailed empirical analysis concerning the executive function and musical creative thinking abilities of urban left-behind children. Most existing research overlooks this specific population, making it necessary to analyze their cognitive characteristics and creative capacity as a foundation for targeted pedagogical interventions. This gap was addressed in the analysis phase of this study's ADDIE model, where a comparative examination between urban left-behind and non-left-behind children was conducted.

Second, while previous studies have demonstrated that music training can positively influence children's executive function, most of this research has focused on general populations, with limited attention to the unique needs and developmental challenges of urban left-behind children. Third, conventional music teaching in many classrooms remains teacher-centered and structurally rigid. This approach often lacks opportunities for children to engage in creative expression or improvisation. Therefore, there is a clear need to design and implement creative musical thinking activities that are developmentally appropriate and cognitively stimulating. Developing such pedagogical modules is essential to cultivate the creative potential of urban left-behind children. Finally, the potential impact of creative thinking in music on the executive function development of urban left-behind children remains underexplored, especially through evidence-based experimental approaches.

1.4 Research Objectives

In order to address the research gaps mentioned above, this study focused on developing a module for teaching creative thinking in music and providing pedagogical support to primary school music teachers of left-behind children. The objectives of subsequent are as follows:

1. To identify the needs of creative thinking in music module of urban left behind children.
2. To design the creative thinking in music module elements integration of the urban left behind children.

3. To develop the creative thinking in music module for urban left-behind children by guiding the design process through expert feedback.
4. To determine the way to implement the creative thinking in music module of the urban left-behind children.
5. To examine the effect of creative thinking in music module on the executive function of urban left-behind children .

Sub- objectives:

5a.To examine the effect of creative thinking in music module on the inhibitory control of urban left-behind children .

5b. To examine the effect of creative thinking in music module on the working memory of urban left-behind children .

5c.To examine the effect of creative thinking in music module on the cognitive flexibility of urban left-behind children .

1.5 Research Questions

Research Questions In order to achieve the above research objectives, the research questions of this study were designed as follows:

1. What are the needs of the creative thinking in music module for urban left behind children in primary school?
2. What elements should be used to design the creative thinking in music module for urban left-behind children?
3. How can expert feedback guide the development of the creative thinking in music

module for urban left-behind children?

4. What approach should be used to implement the creative thinking in music module for urban left-behind children?

5. How does creative thinking in the music module enhance the executive function of urban left-behind children?

Sub-questions:

5a. How does the creative thinking in music module enhance the inhibitory control of urban left-behind children?

5b. How does the creative thinking in music module enhance the working memory of urban left-behind children?

5c. How does the creative thinking in music module enhance the cognitive flexibility of urban left-behind children?

1.6 Research Hypotheses

Based on the research questions and theoretical framework, the following hypotheses examine the impact of the creative music thinking module on executive function in urban left-behind children. As executive function comprises inhibitory control, working memory, and cognitive flexibility, one overall hypothesis and three sub-hypotheses are proposed.

Hypothesis 1:

$H0_1$: The creative thinking in music module has no significant effect on the executive function of urban left-behind children.

H1: The creative thinking in music module has a significant effect on the executive function of urban left-behind children.

Sub-hypothesis :

$H0_{1a}$: The creative thinking in music module has no significant effect on the inhibitory control of urban left-behind children.

H1a: The creative thinking in music module has a significant effect on the inhibitory control of urban left-behind children.

$H0_{1b}$: The creative thinking in music module has no significant effect on the working memory of urban left-behind children.

H1b: The creative thinking in music module has a significant effect on the working memory of urban left-behind children.

$H0_{1c}$: The creative thinking in music module has no significant effect on the cognitive flexibility of urban left-behind children.

H1c: The creative thinking in music module has a significant effect on the cognitive flexibility of urban left-behind children.

1.7 Conceptual Framework of This Study

This study aims to develop a module based on creative thinking in music, specifically to enhance the executive functions of urban left-behind children. The research framework integrates elements from creative thinking to executive function, and based on Grossman's 1990 model of teacher knowledge framework, systematically developing a module tailored to this specific demographic then using the ADDIE

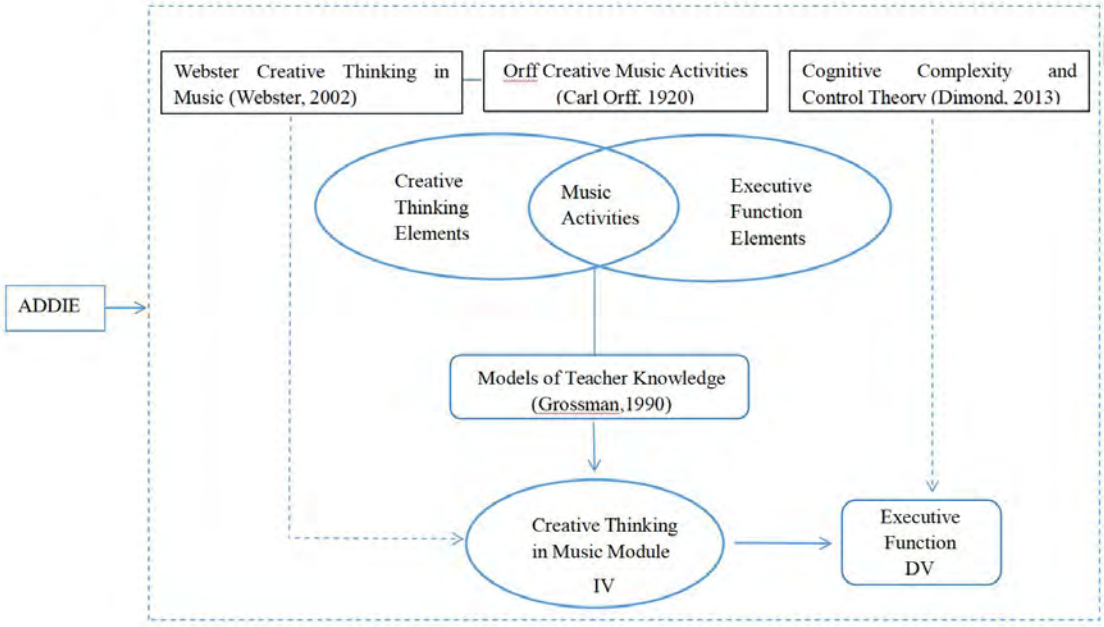
instructional design model.

Elements of creative thinking refer to activities that promote cognitive innovation and individual creativity, The elements are designed to stimulate children's creative thinking, thereby enhancing their problem-solving and decision-making capabilities. Music activities represent teaching strategies that concrete creative thinking, ensuring that children can experience and apply these creative thinking skills through music practice activities, thereby deepening their understanding and mastery of music and other disciplines. Elements of executive function include working memory, cognitive flexibility, and inhibitory control, which are key indicators for assessing improvements in students' executive functions following creative thinking education.

The ADDIE model is central to instructional design, encompassing five stages: Analysis (determining educational needs and objectives), Design (formulating teaching plans and strategies), Development (creating teaching content and materials), Implementation (executing the teaching plan), and Evaluation (assessing the effectiveness of teaching). In this study, the application of the ADDIE model ensures effective integration between theory and practice:

The framework not only provides a theoretical basis for research, but also delineates a practical approach aimed at enhancing the educational practice of music through the development of a music creation thinking module through systematic instructional design. The conceptual framework of this study is shown in Figure 1.1.

Figure 1.1
Conceptual Framework of this Research



1.8 Scope of the Study

Creative thinking plays a vital role for children in early years, in preschool, middle, and high school, but the scope of this study is children aged from six to seven years old who is studying primary school. Moreover, this study focuses on the urban left-behind children rather than the regular children's in school. Urban left-behind children can be classified as explicit and implicit left-behind children. Explicit left-behind refers to children who have not lived with their parents for at least six months and whose parents, either one or both, are not present to accompany them. Implicit left-behind children can be defined on three levels: first, inadequate time spent together, where a parent (the one who spends more time with the child, as defined in this study) spends less than 4 hours per day with the child in the last month.

Second, even with sufficient time, the parent is not fully engaged, showing limited attention and care. Third, although the parent is fully engaged, their interaction style is not suitable, lacking physical affection and meaningful conversation with the child, resulting in implicit left-behind status (Song et al., 2020). In the present study, all grade one students are boarders and can only go home once in two weeks. Among these children, many experience situations where both parents work away from home, inter-generational care arrangements, or instances where one parent works long-term outside the home while the mother assumes sole care giving responsibilities.

In all these scenarios, it can be objectively observed that these children have effectively become left-behind, given the circumstances they are subjected to. The effect of a music creative teaching module on children's executive function will be investigated. The researcher will use a quantitative research method experimental design to conduct the study in Liaocheng city, Shandong province. Only two groups will be involved in this study .

1.9 Operational Definition

Four terms in the study need to be defined in operating the study. The operational terms will be defined in this section.

1.9.1 Creative Thinking in Music

The original concept of creative thinking was that the process of using both convergent and divergent cognitive skills, for the purposes of evaluating an existing,

or creating a new, idea or product (Guilford, 1950). Webster's 1990 advocacy for the term "creative thinking" in music education reflects a shift towards process-oriented learning. This reorientation from "creativity" to "creative thinking" emphasizes the significance of the generative process in music education, aligning more closely with the cognitive development and creative engagement of children's. Webster places Guilford creative thinking at the core of creative music teaching, which requires children's to use divergent thinking in the process of music creation. Creative music teaching is a process of teaching activities that cultivate and develop children's creative consciousness and music creation ability (Ma, 2015; Ramón & Chacón-López, 2021).

According to Schiavio and Benedek (2020), musical creative thinking is an embodied and adaptive cognitive process in which individuals generate novel and functional musical ideas through dynamic interaction with their environment. This process involves the flexible organization, evaluation, and expression of musical material, supported by divergent and convergent thinking as well as core cognitive resources such as attention, memory, and control mechanisms. In this study, the design of the creative thinking in music module based on convergent and divergent thinking. The teaching module utilized a series of interactive teaching plans and methods in music activities, focusing on the development of creative knowledge, creative thinking and creative abilities.

1.9.2 Urban Left-behind Children

Urban left-behind children can be categorized as explicit and implicit. Explicit left-behind children are those who have been physically separated from their parents for at least six months, often due to one or both parents being absent and unable to accompany them (Cao, 2018; Yang & Zhu, 2013). Implicit left-behind children, on the other hand, are those who, despite living with their parents, experience insufficient parental engagement, leading to psychological abandonment. This implicit status can manifest in three ways: inadequate time spent together, where a parent, defined as the one spending more time with the child, spends less than four hours per day with them in the last month (Song et al., 2020); lack of engagement, where the parent is present but fails to provide sufficient attention and care; and ineffective interaction, where the parent's engagement lacks physical affection or meaningful conversation (Song et al., 2020). In this study, which focuses on grade one China students who board at school and return home only once every two weeks, many children experience situations such as parents working away from home, inter-generational care giving, or one parent working long-term outside the home while the other assumes sole care giving responsibilities.

1.9.3 Executive Function

Executive function, also known as cognitive or executive control, refers to a set of cognitive processes mediated by the prefrontal cortex that enable goal-directed behavior (Harlow, 1993, as cited in Jones & Graff-Radford, 2021). In this study,

executive function is defined as a higher-order cognitive system that regulates thoughts and behaviors to achieve specific goals. It comprises three core components: inhibitory control, working memory, and cognitive flexibility (Diamond, 2013; Friedman & Miyake, 2017).

Inhibitory control is the ability to suppress automatic responses, regulate attention and emotions, and filter out distractions to support task completion (Diamond, 2013; Zelazo & Müller, 2002). Working memory refers to the capacity to temporarily store and manipulate information during cognitive tasks, essential for reasoning and learning (Yurgil et al., 2020). Cognitive flexibility involves adapting behavior and thinking in response to changing rules or contexts, allowing individuals to shift perspectives and strategies as needed (Diamond, 2005; Bowmer et al., 2018). Together, these elements enable individuals to plan, monitor, and execute complex cognitive tasks efficiently.

1.10 Delimitation of Study

This study is subject to several delimitation, which must be acknowledged to fully understand the scope and limitations of the research findings. Firstly, the study will be conducted in Liaocheng city, located in Shandong province, China. The geographic focus of this research means that the findings may not be universally applicable across all cities in the country. The results are most relevant to schools in Liaocheng city that have similar demographics, particularly those with populations of left-behind children. Due to the varying cultural, economic, and educational contexts across different

regions, the generalizability of the study's conclusions may be limited when applied to other areas. This geographic delimitation inherently constrains the external validity of the research outcomes.

Secondly, the research specifically targets urban left-behind children as the experimental subjects, which introduces a limitation in terms of the research population. While the study aims to provide insights that could benefit this particular group, its findings may not necessarily extend to other groups, such as non-left-behind children or left-behind children from rural areas. Children from different backgrounds and living environments may exhibit varying responses to the creative music module, thereby affecting the applicability of the results to a broader population. This delimitation highlights the need for future research to explore the effectiveness of creative thinking in music education for ordinary children as well as other subgroups within the left-behind children population.

Thirdly, the duration of the experimental intervention is limited to one academic semester, equivalent to four months. This relatively short intervention period may not be sufficient to capture the long-term effects of the creative music teaching method. The impact of such educational interventions often requires a more extended period to be fully realized, and conclusions drawn from this study may only reflect the immediate effects of the intervention. The brevity of the study period raises questions about the need for longitudinal follow-up studies to assess the sustained impact of the creative music module. Future research should consider extending the

intervention period to better understand the long-term outcomes and the durability of the educational benefits observed.

Finally, this research is confined to the application of creative thinking in music education within the formal school setting. The focus on the school environment means that the findings are primarily applicable to classroom contexts and do not fully address the potential integration of creative music education into the home environment. The education and development of left-behind children are influenced by both school and family environments, making it essential to consider how music education can be effectively incorporated into family life. Future research efforts could be directed towards designing more specific and practical music training module that are tailored to be implemented within the family setting. Such module could potentially offer more comprehensive support to left-behind children, enhancing their development and well-being beyond the school environment. This expansion of scope would contribute to the practical applicability and relevance of the research in addressing the needs of this vulnerable population.

1.11 Significance of the Study

The integration of a creative thinking in music module into school music education holds both theoretical and practical significance, particularly for urban left-behind children, the focus of this study. While the concept of creative thinking in music has gained attention in international music education, its structured implementation within formal school curricula in China remains limited. This study emphasizes the need to

incorporate such a module into music teaching practices to support children's creative thinking development and cognitive growth.

Firstly, the use of a creative thinking in music module to enhance the executive functions of urban left-behind children has rarely been studied. Most existing research focuses on teaching design or instructional reflections, without systematically examining its cognitive outcomes. This study, grounded in Webster theory of creative thinking in music, integrates Orff creative pedagogical principles and cognitive complexity theory. It enriches the theoretical foundation for creative music education and provides a framework for its application in school settings.

Secondly, this research promotes the adoption of creative thinking in music among teachers, enabling them to support the musical and cognitive development of urban left-behind children. It challenges the limitations of conventional, teacher-centered methods and encourages the use of student centered, creative approaches in music instruction.

Finally, the study brings greater awareness to the challenges faced by urban left-behind children, prompting schools, families, and society to pay closer attention to their developmental needs. By highlighting the educational and social relevance of creative music teaching, this research contributes to more inclusive and supportive learning environments.

1.12 Summary

Urban left-behind children face challenges that impede their cognitive and emotional development, affecting their executive functions key processes like problem-solving and impulse control. Interventions that foster creative thinking through music show potential to enhance their self-assurance, social interactions, and relationships with teachers. Despite promising indicators, research on the impact of creative music thinking on these children's executive functions is limited. This study aims to explore the influence of creative music teaching on urban left-behind children's executive functions. It seeks to assess the effectiveness of structured music activities that incorporate creative thinking in supporting their development. Chapter two will provide a comprehensive literature review, outlining existing theories and previous studies related to music education and creative thinking. It will critically examine the gaps in current research and establish a theoretical framework for the study, laying the groundwork for further investigations into the benefits and challenges of creative music teaching methodologies.

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