THE EFFICACY OF DETECTIVE GAME ON THE STUDENTS WORKING MEMORY CAPACITY AMONG SELECTED PRESCHOOLERS IN HEBEI PROVINCE, CHINA

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by

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I am very grateful that I am being given the privilege to study in Universiti Sains Malaysia. These three years of journey in pursuing the postgraduate is what I had dreamt of 10 years ago. I have dreamed of going abroad to study in a reckoned university since I was in high school. I opted for the research mode instead of a conventional coursework mode for my master's degree programme because I wish to overcome my weakness in research ability and face the challenges. I am very grateful to my supervisor DR. NORFARIZAH MOHD BAKHIR, she always encouraged me throughout my research process. She helped me a lot by giving plenty of advice, not only in academics, but also in English. I used to only read academic papers in Chinese. With her advice, I came into contact with English papers for the first time. At first, I didn't even know how to find English papers and which websites are available to search for the papers. She was the driving force for me to move forward on countless nights without thoughts, and she pulled me back on the right track when my thoughts were flying. She is my first teacher in my academic career. With her help, I firmly believe that I will go farther and farther on this road. She will be an important asset in my future study career. I would also like to thank teacher Qi Min, who allowed me to collect data at Shijiazhuang Shizhi Kindergarten in China. It took 5 months to collect the data. During this period of COVID pandemic, Teacher Qi Min communicated with the school many times, so I had the opportunity to enter the school and complete my data collection. In addition, I also wish to express my gratitude to the teachers who helped me in answering the defence. When my oral English speaking was not very fluent, they tolerated my pronunciation and gave me strength with a smile.

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LIST OF SYMBOLS

d	Threshold Calue of Calculated Fuzzy Value
p	Score variance of Sphericity: Mauchly's test
Q-Q	Quantile-Quantile Plot

LIST OF ABBREVIATIONS

ADHD	Attention Defects Hyperactivity Disorder
ANOVA	Analysis of Variance
AVE	Average Variance Extracted
IQ	Intelligence Query
PLS	Partial Least Squares
SPSS	Statistical Package for the Social Sciences
USM	Universiti Sains Malaysia
WM	Working Memory

KEBERKESANAN PERMAINAN BERASASKAN DETEKTIF TERHADAP KAPASITI MEMORI KERJA MURID PRASEKOLAH TERPILIH DI HEBEI, CHINA

ABSTRAK

Daya ingatan merupakan elemen yang amat penting dalam kepintaran dan ramai kajian telah menunjukkan bahawa ingatan kerja akan mendatangkan kecemerlangan dalam akademik dengan lebih berkesan jika dibandingkan dengan kepintaran.. Para ibu bapa telah dapat mengenal pasti kepentingan perkembangan daya ingatan tetapi mereka masih keliru tentang cara untuk membangunkan perkembangan daya ingatan dalam diri anak mereka. Kajian ini bertujuan untuk mengkaji keberkesanan penggunaan permainan animasi dalam meningkatkan daya ingatan anak mereka. Penyelidikan ini bertujuan untuk menentukan kesan kaedah yang berbeza terhadap minat kanak-kanak dalam meningkatkan daya ingatan kanak-kanak, mengkaji jenis permainan yang akan meningkatkan kemampuan untuk menyelesaikan masalah di kalangan kanak-kanak, dan jugak mengkaji jenis permainan baru yang akan berkesan dalam meningkatkan daya ingatan kanak-kanak. Eksperimen penyelidikan tersebut akan dijalankan dalam tadika awam bandar dan luar bandar di kawasan Bandar Shijiazhuang, Daerah Hebei, China. Kajian ini menggunakan reka bentuk kajian kaedah campuran yang melibatkan kaedah pemerhatian dan kaedah temu bual masa nyata terhadap kumpulan kajian. Seramai tiga puluh orang kanak-kanak akan dipilih untuk mengambil bahagian dalam eksperimen ini dan kesemua kanak-kanak akan dibahagikan ke dalam dua kumpulan, dengan setiap kumpulan mempunyai lima belas orang kanak-kanak. Kumpulan pertama akan diberi latihan buku bergambar, manakala kumpulan kedua pula akan bermain dengan permainan animasi bertema

detektif. Setiap eksperimen akan dijalankan sekali seminggu, dan ia akan mengambil tempoh masa empat minggu untuk diselesaikan,. Hasil kajian tersebut akan menentukan keberkesanan permainan dalam menarik perhatian kanak-kanak dan meningkatkan daya ingatan kanak-kanak. Jikalau penggunaan permainan dapat menguatkan ingatan kanak-kanak, maka ia akan menjadi satu panduan baru dalam aspek pendidikan prasekolah untuk mewujudkan cara pengajaran yang lebih baik. Ia juga dapat membantu pelajar dalam menguasai keupayaan ingatan, sejurus meningkatkan tahap ingatan, merangsangkan perkembangan ingatan selanjutnya, dan meningkatkan tahap akademik keseluruhan mereka.

THE EFFICACY OF DETECTIVE GAME ON THE STUDENTS WORKING MEMORY CAPACITY AMONG SELECTED PRESCHOOLERS IN HEBEI PROVINCE, CHINA

ABSTRACT

Memory is an essential part of intelligence and various studies have shown that working memory is an even stronger predictor of academic success than intelligence. While parents recognize the importance of memory development, they are unclear with the children's memory development. This research involved the investigation of children's memory improvement by using animation games. This research aims to determine the impact of different methods on children's interest in improving their memory, investigate the types of games that will enhance children's problem-solving, and examine those new games that will enhance children's memory. The research experiments are conducted in rural and urban public kindergartens in Shijiazhuang City, Hebei Province, China.This study utilize mixed method research design that involved observation method and real time interview method toward study groups. Thirty children are selected to participate in this experiment and divided into two groups, with each group consists of fifteen children respectively. The first group is trained with a picture book, while the second group is trained with an animated detective game. Each experiment is carried out once a week, and it takes four weeks to complete the entire experiment study. The results would determine the effectiveness of different games in term of attracting children's attention and improve children's memory. If the method of using animation games is effective in strengthening children's memory, it will provide another type of game guidance for preschool education, allowing for better ways of teaching. Subsequently, student would be much easier to master memory, therefore have their memory level improvement, leading to

their further memory development, and thus resulted in their overall academic level being enhanced.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The working memory of children is uniquely different among each other. Some children have a good memory, while other can only remember the general content partially. There are even some who cannot remember any memory at all. This corresponding study is set to determine the factor of memory quality by using the games and animations approach toward children. As children are very interested in games and animations, such approaches will improve children's short-term memory as well. Children study group involved in this study were in the age bracket of 5-6 years old.

1.2 Background of Research

Memory is an essential part of intelligence. However, many studies have shown that working memory is an even more effective indicative precursor of academic success compared to intelligence. While parents recognize the importance of memory development, they generally have no idea about developing children's memory. Working memory refers to a storage system with limited capacity that maintains and manipulates information in a short period of time (Baddeley, 2002) and is the focus of game research. (Cardoso-Leite et al., 2016) (Colzato et al., 2013) both found that players had higher accuracy and shorter reaction times in working memory tasks. Zhang Jing, (Zhang Jing, 2021) indicated that there is substantial number of studies on working memory training, and several meta-analyses have reviewed the effects of

working memory training. The results proved that the training of working memory can improve the performance of tasks related to working memory, and the training effect is moderate. At the same time, the training of working memory can also improve other cognitive functions, including verbal memory, intelligence, and executive functions.

1.2.1 Memory

Memory is an important part of intelligence, and having a good memory contributes toward higher learning efficiency. Working memory is one of a critical system in the brain that allows humans to navigate and recall a finite number of reserved chunks of information over a short duration of time. Many studies have shown that working memory is an even stronger predictor of academic success than intelligence (Alloway & Alloway, 2010). Intelligence query (IQ), short-term memory and study habits are significantly related to academic achievement (Quilez-Robres et al., 2021). Therefore, working memory should be considered an important predictor of academic success that can lead both to unexpected overachievement and failure at school (Maehler & Schuchardt, 2016). Generally, children with poor memory are cognitively considered to possess low intelligence level, which will negatively impact their physical and mental development as they grow.

1.2.2 Animation Games for Children

Animation and game are two of the most popular forms of entertainment for children and both had significant impact on children's development. Cultivate aesthetic education through animation characters, language, and storey themes in order to

develop aesthetic cognition, aesthetic ideals, and aesthetic taste for beauty, and advance some research into "incorporating happy learning" into a happy environment and innovating children's animation (Jiang, 2020). The age interval between children of three years old and eight years old is fundamentally critical for developing children's brain function. Children's brain, and it's functionality are highly plastic during this stage. Deprivation of premature brain development experience could result in central nervous system stagnation, or even atrophy and irreversible harm. Children gain the majority of their early experiences through games that require adult participation. Numerous studies have established the critical impact of games on brain function (Dang, 2021).

Animation improves children's interest and attention (Rice et al., 2013). Animation has a promising effect on children's interest and attention. Well-designed educational animations are effective to engage children through vivid images, music, and storylines, helping them understand better and retain information. Such mean of media can make the learning process livelier and more interesting, helping to increase children's engagement and concentration. Animation improves children's cognitive ability (Li et al., 2018). These animations often include helpful educational content such as letters, numbers, shapes, colors, social skills, and more. Children can understand these concepts much easier through the visual and auditory elements of animation. In addition, animation can stimulate their curiosity and promote the cultivation of problem solving and thinking skills. Animation can be effectively used to promote learners' understanding (Mayer & Moreno, 2002). Interactive animation improves children's memory (Zipke, 2017). Interactive animations can also stimulate children's curiosity and allow them to explore stories and themes more deeply, therefore enhancing learning outcomes. Animation can attract children's attention

better, and children have more memories than picture books (Kocak & Goktas, 2021). Animation often captures children's attention with vivid images, sounds, and dynamic effects. Animations can capture children's interest more easily due to the variety of visual and auditory elements, so they are often more appealing toward children's attention. At the same time, animation can also stimulate children's curiosity and participation through vivid plots and characters.

This research article mainly focused on memory development based on animated games platform, and it is devoted to enhancing the memory of school-aged youngsters. It has become a very common symptom within the children that they tend to be forgot specific words after they return home from school or learning nursery. This phenomenon clearly indicates poor memory consequently. Ultimately, there is a lack of systematic training aimed at improving thinking, nurturing intellect, and establishing a solid memory foundation. Games can help youngsters develop their ability to observe, pay attention, remember, and think creatively (Xu, 2013). Children are highly potent to be taught to explore, acquire, and master knowledge through animation games as a means of real-time realistic learning medium. This study emphasizes that strong memory creates the fundamental groundwork for children cognitive development.

Currently, conventional school learning methods such as old-school lectures and book models are still widely being used as primary learning media. However, with more and more cutting-edge technology being rapidly developed, the landscape of learning methods is about to be revolutionized. Using technology as a learning medium is very important to attract students' interest in learning (Lamrani & Abdelwahed, 2020). Children still prefer to learn while playing. Sari et. Al (2018) proposed to use

animation as a learning medium for elementary school students. However, such measures are still rarely being exposed and implemented toward pre-schoolers. Media as such of kind can be utilize by educational personnel as effective media of learning. Such kind of animation media aims to entice and develop student's learning interest, especially in particular subjects such as mathematics. Visualization of moving images on mathematical subjects becomes one of the aspects that need to be optimized in animation approach. Animations are recognized as an effective medium to increase children's academic performance. Children continuously experience impression deepening and memory stimulation while watching animation. This would result in firmer memories in the process. Based on this aspect, (de Koning et al., 2007) added prompt information to improve children's attention so that they can pay more attention to important information, resulting in higher effective memory achievement.

1.2.3 Animation Game In China

Animation game development in China has been an interesting history of evolution, and it is closely tied to the preschool kindergarten's education. In Hebei Province, there are approximately 18,800 kindergartens. Among them, Shijiazhuang City has about 1,500 kindergartens. The surveyed city of Xinle belongs to one district of Shijiazhuang. Xinle has 65 kindergartens, including 32 public ones. In randomly sampled rural areas, there is only one public kindergarten.

Public kindergartens generally tend to cultivate children's basic cognition, where children perceive, memorize, and understand their surroundings through senses, memory, and reasoning. Private kindergartens, on the other hand, lean towards imparting academic knowledge such as addition, subtraction, and phonetics. Both

public and private kindergartens require a standard intelligence test for children before enrolment, often using the Wechsler Intelligence Scale. This test includes 5 categories and 11 basic tests, with the first focusing on working memory, assessing children's ability to retain and process information under distraction (Li, 2024).

Children who meet the normal criteria are admitted, while those who don't must seek education in special kindergartens. During kindergarten, emphasis is placed on memory development, and graduation typically involves a similar intelligence assessment before entering elementary school (Huang & Liu, 2024). National regulations mandate pre-elementary school intelligence tests, with only children meeting the norm allowed to proceed to primary education (Zhuang, 2012). Testing formats vary between schools, but memory tests are particularly significant and weighted heavily compared to other assessments. This requirement causes concern among some parents and kindergarten teachers, unsure of the best methods to effectively enhance children's working memory (Huang & Liu, 2024).

Using animated games as a medium to enhance children's memory can stimulate their interest and curiosity, thereby improving their focus (Xiao, 2024). Interactive and feedback skills within animated games help children better understand and memorize information, enabling them to integrate more effectively with the medium. Animated games can promote children's thinking and reasoning abilities (Yang & Wang, 2024), helping them organize and memorize information more effectively.

The development of animated games in China is ongoing. The history of serious games in China can be traced back to the 1980s (Yang & Tu, 2024), with the continuous advancement of gaming technology and the gradual maturation of gaming

culture. This evolution has seen the emergence of serious games with educational, cultural, and artistic significance. In the 1990s, with the popularity of computer games and the rise of online gaming (Liu, 2024), some serious games with public welfare purposes began to appear, such as "The Opium War" and "Yuanmingyuan". These games aim to educate players about historical, cultural, and societal realities, serving educational purposes.

Since the 21st century, with the popularity of smartphones and tablets, serious games have encountered new opportunities and challenges. In addition to the portability and widespread adoption of mobile platforms have provided a broader space for the promotion and dissemination of serious games. the limitations of mobile platforms have raised higher requirements for the design and production of serious games.

In recent years, with the continuous advancement of gaming technology and the expanding gaming market, China's serious games market has been growing (Guo & Wang, 2024). More and more game developers are focusing on the development and promotion of serious games, introducing a series of works with educational, cultural, artistic, medical, and other significances, such as "Chinese Parents" and "The Forbidden City".

The history of Chinese animation (Li, 2005) can be traced back to the late Qing Dynasty, when Chen Shizeng published improvisational works in the "Pacific News" in Shanghai (Li, 2005). These works were characterized by small forms, economical use of ink, and rich artistic charm, considered as the sprouting stage of Chinese animation history.

The pioneers of Chinese animation were the Wan brothers (Lan, 2016), who in 1922 produced China's first animated advertisement film "Shuzhendong Hua Wen Typewriter" for the Commercial Press Film Department, marking the inception of Chinese animation. The development of Chinese animation can be roughly divided into the following stages:

1. 1922 to 1949: Animation in China was in its infancy and exploration phase, primarily focusing on animated advertisements.

2. 1950 to 1976: Chinese animation developed and matured with a distinct national style.

3. 1977 to 1989: China entered a new phase of animation development, producing a series of films with national characteristics, reflecting the spirit of the times, and achieving high artistic levels.

4. 1990 to 2002: Chinese animation experienced rapid development with continuous updates in production technology and concepts.

5. 2003 to present: With the advancement of digital technology, Chinese animation entered the digital age, with more advanced production techniques and diversified works.

Animation and games can complement and support each other (Chen, 2024). They complement each other and work together. Animation and games are two different art forms, each with unique charm and expressive power. Animation tells stories through continuous images and plots, presenting rich visual effects and emotional expressions. Games attract players through interactivity and participation, allowing players to influence the game's progress and outcomes through their actions.

For games, animation provides richer visual effects and emotional experiences (Qu, 2023). Animated characters' actions, expressions, and emotions in games enhance player immersion. Animation also creates vivid atmospheres and environments in games, making players feel deeply immersed in the game world.

For animation, games offer richer interactivity and participation. Games allow audiences to participate in the story through their choices and actions, influencing its development and ending (Ying et al., 2024). This interactivity enhances audience engagement and can bring more creativity and possibilities to animation (Zheng, 2023). Therefore, animation and games are interdependent, complementing each other to provide richer and more exciting experiences for audiences and players.

1.3 Statement of the Problem

Nowadays in the current modern era, majority of the children with poor memory will be labelled as attention deficit, because memory is one of the important manifestations of attention deficit. (Chen Caiqi, 2013)

Attention Defects Hyperactivity Disorder (attention deficit hyperactivity disorder, ADHD) is one of the common mental disorders in childhood. Children with ADHD often possess normal or near-normal intelligence, and are usually characterized by traits such as inattention, hyperactivity, and impulsivity. In year 2007, a survey in 6 cities including Beijing and Harbin showed that the detection rate of ADHD children was 5.4%, and the main manifestations were in the type of attention deficit. With the extreme rapid development in term of economy and social life, the incidence of ADHD in China is gradually increasing. During the year 2012, the test results of primary

school students in Shanghai showed that the detection rate of high-risk boys for ADHD was 14.4%, while it was 17.4% for the girls (Chen Caiqi, 2013). ADHD will definitely pose a significant impact toward patients' learning, life, and interpersonal relationships. Besides that, some symptoms can even persist and last long progression into adulthood. Cognitive theory believes that the root cause of ADHD originated from executive dysfunction. Executive functions are various processes by which individuals monitor their own consciousness and behaviour to achieve certain goals. They are mainly affected by these 5 aspects of sexual constraints, namely inhibition, set transfer, working memory, planning and language fluency. Response inhibition and working memory are two of the core components of executive function, and impairments in these two areas are responsible for the production of other executive functions that will eventually become the basis of row dysfunction. Therefore, most research on executive dysfunction in ADHD focuses on two aspects, which are response inhibition and working memory (Grégoire et al., 2012).

Quality education can help children develop their intellect level. Intellectual progress is not just about acquiring knowledge; it is also about cultivating wisdom (Owen & Highfield, 2010). Wisdom creation is one of the most pressing issues in school education that has received scant attention. The transmission of knowledge involves both facet of intellectual education, and the formation and growth of intelligence to be of use in effective analytics. In our daily lives, wisdom manifests itself in our capacity to solve issues more effectively and having good memory is an essential part of wisdom. Logically, problem-solving skills depend heavily upon experience, which is something obviously that children did not possess. Most of the early experience is gained through games, and games are the source of children's wisdom (Zhu, 2020). Children enjoy playing games (Hsiao & Chen, 2016), and

playing games has benefited children's cognitive development and motor skills (Giannis Altanis, 2013) (Lin et al., 2014)

It is worth noting that pre-schoolers perform poorly on working memory tasks (Hou et al., 2023). While parents understand the value of memory, they also contribute a major factor on this issue (Fitamen et al., 2019). Most of the times, they are unaware on how to grow children's memory consciously due to their work commitment, thus limiting their time to accompany and exercise children's working memory. This would consequently, result in parent's confusion and dilemma as well.

Currently, few academic parties that are identified by Kefalis (Kefalis et al., 2020) are investigating the utilization of games to enhance memory, and the memory formed through the game process is specifically targeted and specialized. For example, certain game experiments are carried out solely for developing children's counting memory and painting language, but not intended for both children's thinking ability and problem-solving skill cultivation. However, improving children's memory also requires improvement in children's thinking ability and problem-solving ability as pre-requisite condition. Therefore, each child needed a unique way of games story to be committed to their effective memory rather than rote memorization.

There is no doubt that improving children's memory is an essential issue that must not be taken lightly. It is crucial to note that a strong memory foundation is critical for children's intellectual growth and gaining a head start can provide a dependable guarantee of more promising success.

Under the influence of this frame of thought, researchers developed an excellent programme for exercising children's memory, reasoning, and problem-solving abilities that begins with kindergarten students. Thus, investigating the

influence of detective narrative animation games on children's memory will close the gap in boosting children's critical thinking capacity and solve problems.

Children may become addicted to animated games, leading to poor time management and disrupting their normal learning and daily routines. This can weaken their involvement in other beneficial activities and negatively affect their overall memory development.

The quality of content in animated games is uneven: some games may lack educational value and even contain harmful information. This not only fails to effectively enhance children's memory but may also negatively impact their cognition and values.

Some animated games focus excessively on entertainment and stimulation, causing children to passively receive content without active thinking or memory training, making it difficult to genuinely improve their memory.

Compared to real-life interpersonal interactions and actual experiences, virtual interactions in animated games are limited and may not fully develop children's ability to apply and reinforce memory in real-world situations.

1.4 Research Questions

Question 1: What are the types of games that improve children’s working memory?

Question 2: What are the effects of different methods on children's interest in improving working memory?

Question 3: How effective are the introductory of detective-type animated games to improve children's working memory in rural and urban area.

1.5 Research Objectives

1. To investigate the types of games that improve children’s working memory.

2. To determine the impact of different methods on children’s interest in improving children’s working memory.

3. To analyse the effect of introducing detective-type with animated games on improving children’s working memory in rural and urban area.

1.6 Significance of the Study

It is of great significance to study animated games to improve children's working memory. Working memory is an important part of a person's short-term memory and thinking ability and is crucial to learning and daily life. Here are some studies on what animated games mean in this regard:

Cognitive development: Animation games can stimulate children's cognitive development and improve their thinking and problem-solving abilities, which is crucial for the improvement of working memory.

Learning effect: Through interactivity and entertainment, animated games can make the learning process more attractive and help children better remember and understand information.

Concentration and Patience: Games require children to stay focused and patient, which helps develop working memory skills as they need to retain and manipulate information in their minds.

Spatial perception and visual memory: Animation games involve spatial perception and visual memory tasks, which help children's development in these areas and also help improve working memory.

In general, the significance of studying animated games to improve children's working memory is to promote cognitive development, improve learning effects, and cultivate a series of working memory-related skills, which are crucial to children's comprehensive development. However, there is a need to ensure that the use of games is appropriately supervised and restricted to maintain the health and safety factor of children.

1.7 Limitations and Scope of Research

Similar to other studies, the limitation of this research work is that it only focuses on improving children's working memory solely in animated games aspect. Furthermore, it only working memory, not long-term memory. The scope of the study are also only targeting children in the age group of 5-6 years old and did not involve children in other age groups.

The population sample of 30 people was chosen because the capacity of a class in Shijiazhuang kindergarten is 30 people, and the maximum number of people in a class is 30 people, so I chose a population sample of 30 people. The location I chose is Shijiazhuang City, Hebei Province, which is in the north of China. It is one of the

first-tier cities in northern China. Shijiazhuang has a total population of 11.22 million, including about 800,000 children aged 5-6.

1.8 Operational Definitions

This section specifies the operational definition of the main key term used in this study. The term WM in this study refers to working memory.

The term IQ in this study refers to intelligence quotient.

The term ADHD in this study refers to attention deficit hyperactivity disorder,

Kindergarten: Public kindergartens are mostly operated and managed by the government or local education departments. They served to provide early childhood education services within the social community. These kindergartens usually possessed certain educational standards and qualification requirements to ensure high-quality early-stage education. Parents can opt to enrol their children in public kindergarten by abiding and adhering to local admissions procedures and requirements. Public kindergartens typically offer a range of educational activities and lessons designed to help young children progress in their social, cognitive and emotional development. These kindergartens often offer their services at relatively low tuition or for free to ensure that early education is accessible to more families. Public kindergarten offers vast range of benefits, including:

Quality of education: Most of the time, public kindergartens are strictly regulated by the government or local education department and therefore tend to provide high-quality early-stage education. This includes enrolment of experienced

teachers and tailored educational programs that provide extensive support toward children's emotional, cognitive and social development.

Social skills: Children can interact with their peers and learn to share, cooperate, and build friendships with the public kindergarten compound. This is very important for their social skills and emotional development.

Early learning: Public kindergartens often provide early learning opportunities to foster the children with regards to building reading, writing, math and other basic skills in order to lay a strong foundation for their upcoming school life.

Social equity: Public kindergartens often provide services at relatively low fees or even free of charge, which helps reduce educational inequality and allows more families to access high-quality early-stage education.

Safe environment: These preschools are usually accredited to ensure a safe learning environment, supervised classrooms and appropriate educational resources.

Parent support: Public kindergartens generally encourage parent participation and cooperation to promote the child's overall development and provide family support and resources.

Overall, public kindergartens provide children with a conducive learning and growth environment that act as a propulsion force to push them achieving success in future school life and society.

Private kindergartens are early childhood education institutions run by private institutions or individuals. Unlike public kindergartens, private kindergartens usually require parents to pay substantial tuition fee in return for the education services. Here are some features and benefits of private kindergarten:

Diverse education options: Private kindergartens often offer a variety of different education methods and curricular syllabus, granting parents the flexibility to choose the education method that best suits their children.

Smaller classes: Private preschools typically feature smaller number sizes of students per class, which allows for more individualized attention and education, making it easier for teachers to attend the needs of each child.

High-quality education: By collecting substantial amount of tuition fee from the parents, private kindergartens usually have more resources to devote into providing high-quality education, including recruiting experienced teachers and providing high-tech modern educational facilities.

Additional extracurricular activities: Some private kindergartens provide additional extracurricular activities, such as music, art, sports, etc., to enrich children's learning experience.

Flexibility: Private preschools often offer more flexible class schedules and care options to accommodate parents' work schedules.

Pay attention to special needs: Some private kindergartens have dedicated special needs support to cater for children with special educational needs.

It should be noted that private kindergarten tuition fees may incur a substantially high cost, which may not be viable for all families. Parents often need to consider the balance between their own financial condition and their children's needs when choosing a private kindergarten in order to make the most appropriate decision.

Children of the age group in between 5 to 6 years' old belongs to the critical stage of early childhood, where they experienced various physical, cognitive,

emotional and social developments. Here are some key characteristics of children of this age:

Physical Development: Children typically continue to grow rapidly during this age, and their muscle control and coordination gradually improve, making them more capable of participating in a variety of sports and physical activities.

Cognitive Development: Children in between the ages of 5 to 6 year's old begin to demonstrate higher-level of cognitive abilities, including better problem-solving, memory, and logical thinking. They also begin to develop their interest in letters, numbers and reading which would lay the foundation for their later learning.

Social and Emotional Development: Children in this age group are better performing at interacting with peers, beginning to form friendship relationships, and learning to share and cooperate. At the same time, they may also experience emotional fluctuations, prompting their need to understand and process their emotions.

Self-Identity: Children starting to form their own self-identity at the age of 5 to 6 years old, coming to realize that they are unique individuals. They are starting to explore their own interests and preferences.

Language Development: Language abilities grow rapidly at this age, and children are able to use further complex language structures to express thoughts and emotions. Children in this age group will be more actively participate in conversations and story reading.

Curiosity and exploration: Children between the ages of 5 and 6 years old often display a strong sense of curiosity. Such curiosity are usually shown in the form of

their eagerness to explore the world, ask questions, and find answers. This kind of curiosity would greatly help facilitate their learning and development.

Independence: Children this age starting to show more independence and prefer to be able to do certain task on their own, such as dressing, washing hands, or tidying their own room.

A very important point to note is that every single child is unique in the pace of growth development, so different children may show different maturity level in respective areas. Understanding the characteristics of children in this age group can help parents and educators to provide better support and guidance toward children's growth and development.

Children aged 5 to 6 years old possess many advantages and some challenging disadvantages. These characteristics may vary from individual to individual, but the following are the advantages that generally observed:

Curiosity and learning ability: Children of this age are usually very curious and eager to learn and explore the world. They show a strong interest in all kinds of new things and knowledge.

Social skills: Children between the ages of 5 and 6 begin to interact better with peers, build friendships, and learn to share and cooperate. They begin to understand social norms and emotional expression.

Language development: Language abilities grow rapidly at this age, and children are able to use further complex language structures to express thoughts and emotions, which helps them communicate with others.

Self-identity: Children begin to develop their own self-identity and become aware of their own interests and characteristics, which helps them build self-esteem and confidence.

Hands-on ability: Children of this age usually developed good hands to eye coordination and can perform various manual and artistic activities. Their creativity will also get shown in this period of age.

While children starting to experience the advantage of growth, they will also get exposed to the disadvantage side of development. Such short-comes include:

Emotional swings: Children aged 5 to 6 years old may experience emotional swings, becoming emotional unstable and exhibit emotional outbursts or fussy behavior occasionally.

Challenging behavior: Some children may exhibit challenging behavior, such as being stubborn and defying rules as they seek independence and explore boundaries.

Dependency: Even though children are starting to develop their sense of independence, they may still need to rely and depend on adults, especially when dealing with difficult or unsecure situations.

Inattention: Children's attention span is usually not yet mature at this age, making it difficult to concentrate over a long period of time. This means children will easily get distracted.

Competition and Jealousy: Some children may experience the feelings of competition and jealousy, especially among siblings or friends of the same age.

Understanding these strengths and challenges can help parents and educators to provide better support and guidance toward children aged 5 to 6 in order to promote their all-round development.

Shi Jiazhuang City

Shijiazhuang City is the capital city of Hebei Province, China, located in North China. Some basic information about Shijiazhuang City is disclosed here, including:

Geographical location: Shijiazhuang City is located in the middle of Hebei Province, bordering the Chinese capital Beijing to the east and the Taihang Mountains to the west. It is the prominent political, economic and cultural center of Hebei Province.

Population: Shijiazhuang City is one of the most populous cities in China, housing an approximately 11.22 million of population. According to the latest statistics, Shijiazhuang City shows a continuous positive growth in terms of population size.

Economy: Shijiazhuang City is the economic engine of Hebei Province, with multiple industrial zones and development zones, including crucial industries such as steel, building materials, and equipment manufacturing. The city has contributed substantial economic influence in the northern region of China.

Culture: Shijiazhuang City has a rich cultural heritage, including traditional opera, folk art and cuisine. Local operas such as Hebei Bangzi and Pingju Opera had deeply cultivated a strong tradition here in the local society.

Tourism: Shijiazhuang City hosted some historical and cultural attractions, such as Zhaozhou Bridge, Zhengding Ancient Town, and etc. In addition, the Taihang Mountain area also attracts seasoned mountaineer and outdoor enthusiasts.

Transportation: Shijiazhuang City, as the transportation hub of Hebei Province, has a developed railway, highway and aviation network. It is located at the intersection of Beijing-Guangzhou High-Speed Railway and Beijing-Guangzhou Expressway, therefore enabling convenient transportation to Beijing and other cities.

Overall, Shijiazhuang City is an important city in China, rich in cultural and economic activities, and constantly developing and growing.

China

China is a country located in eastern Asia and is referred as People's Republic of China officially. Some information about China is disclosed below:

Geographical location: China harboured the borders of the Yellow Sea, East China Sea and South China Sea to the east, Central Asia to the west, Southeast Asia to the south, and Russia and Mongolia to the north. China has a vastly diverse geography, including mountains, plains, rivers, lakes, deserts and an abundant of coastline.

Capital: Beijing is the capital city of China. It is also officially recognized as the central political, cultural and economic centre of China.

Population: China is the country with most population in the world, with an enormous population of more than 1.4 billion people. According to the latest statistics, the population size of China continues to grow.

Political system: China is a country practicing socialism and running a single-party political system led by the Communist Party of China. The head of the state is the president of the country.

Economy: China is currently the second largest economy powerhouse in the world and has one of the largest consumer markets in the world. It has experienced a period of sustained economic growth and has become an important manufacturing and exporting nation in the world.

Culture: China has a long cultural history, including rich cultural traditions such as Chinese characters, traditional paintings, music, philosophy, and literature. These renowned China's cultural influence has widespread and well rooted around the four corners of the world.

Natural resources: China is rich in natural resources such as iron ore, coal, natural gas, water resources, oil, and etc. These resources are vital to the country's industry sector and energy production.

Tourism: China has quite a number of famous tourist hotspot, such as the Forbidden City, Great Wall, Terracotta Warriors, Zhangjiajie, etc. All these famous tourist hotspots are attracting a large number of domestic and foreign tourists.

Technology: China has made significant advancement progress in the field of science and technology, including innovations in space exploration, artificial intelligence, e-commerce and other fields.

Overall, China is a country with a deep history footprint and rich cultural traditions, and it is also an important player on the global economic and political stage. China is constantly developing and evolving, which plays a major role in all areas of the world.

1.9 Conclusion

This chapter has displayed fundamental background of the corresponding study. The problem state, research objectives, and research questions are also being briefly introduced in this chapter. Additionally, this chapter explained the significance of the study and the definition of the main key terms used in this study.

Working memory is an important component of human cognitive function and involves the ability to save and handle information in short-term memory. For children, having a strong working memory is critical for learning and development. In recent years, a growing number of studies have shown that animated games may help improve children's working memory abilities.

First, let’s clarify what working memory is. Working memory defined as the ability to store and process information in short-term memory. It plays an vital role in daily life. For example, working memory is used extensively when children read a book, solve math problems, or learn new information. It is also closely related to academic performance and intellectual development. Therefore, improving children's working memory capacity can effectively enhance their learning and cognitive development.

So why are animated games so important for improving children’s working memory? First, animated games usually have complex tasks and challenges that require players to remember and manipulate various information in the game, such as maps, mission objectives, enemy locations, etc. This prompts children to continually use and exercise their working memory. In addition, many animated games require players to make decisions in a short period of time, which further increases the load on working memory. By continually engaging in these challenges, children can