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To promote the cultivation of mathematical thinking skills and strategies in games for the senior class of kindergarten children

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Abstract:

With the advancement of quality education and an increase in research into preschool education, early childhood education is becoming more focused on individual physical and mental development, as well as the development of comprehensive quality education. Mathematical thinking ability represents a significant aspect of young children's cognitive development. Given that young children's brain development is not yet fixed, so their capacity for "plasticity" is considerable. The period between the ages of three and eight represents a critical phase in developing mathematical thinking ability in young children. Children undergo rapid growth in their mathematical understanding and reasoning abilities during this time. This paper will look at promoting the development of mathematical thinking and strategies in play for the senior class of kindergarten children, based on practice, in order to provide new strategies for preschool education. Through the research on the combination of games and mathematics education, we can provide better ideas and methods for the use of games in mathematics education, help the senior class of kindergarten children to develop their mathematical thinking skills, and help them to recognize, articulate, and generalize the quantitative relationships and spatial forms that exist in their daily lives so that they can be well-prepared for the next step of entering the primary school.

Keywords: The senior class of kindergarten children, Mathematics thinking, Games, Strategies

1. Introduction

Nowadays, preschool education is beginning to pay attention to the individual physical and mental development of young children and the development of comprehensive quality education. The cultivating of children's mathematical thinking skills in the senior class of kindergarten children enables them to comfortably face the mathematical logic and learning that occurs in their daily lives in the future, and cultivating children's mathematical thinking skills in a playful environment is the key to this. This paper uses the literature method and the interview method to explore how to get the senior class of kindergarten children interested in learning mathematics by designing play strategies that have fun, in order to enhance their mathematical thinking skills, thus promoting the development of mathematical thinking skills in a play environment.

2. The current status of mathematical thinking skills in the senior class of kindergarten children

In 2012, China published *The Learning and Development Guidelines for Children Aged 3-6*, which separates mathematics education from science education as an important part of it. At present, mathematics education is gradually gaining importance in the education of the senior class of kindergarten children, and opening up young children's mathematical thinking will help them in their future learning and life.

The senior class of kindergarten children are able to classify objects based on their observed characteristics, including color and shape. Through educational activities, they can perceive the four seasons, distinguish between front and back, right and left, and recognize numbers within the range of 5-10 for various mathematical operations, including sorting, addition, and subtraction. This reflects the emergence of abstract thinking in young children. According to Resnick's theory, the development of number concepts in young children is highly dependent on perceptual experience. At the age of five or six, children begin to pay attention to an understanding of the concept of quantity, which is to say that they are able to perceive changes in the number of objects. This is evidenced by their ability to perform operations involving numbers, such as addition, subtraction, combination, and separation. Furthermore, they are also able to use number words (For example, "three dolls" or "two cars") to describe the quantity of objects. Children are beginning to understand

fundamental mathematical terms such as 'add one' and 'take one', but these understandings are still closely linked to concrete objects and actions. In the process of counting, children are able to count accurately and often use gestures and other actions to assist them. These actions not only help to establish a one-to-one correspondence between objects and counting words but also improve their accuracy in counting and differentiating between counted and uncounted objects. In addition, they can perform simple logical reasoning, such as reasoning based on changes in quantity, and understand basic spatial relationships such as up and down, left and right, and front and back, and apply these concepts in their lives.[1]

A study of young children's mathematical thinking ability shows that the mathematical thinking ability of the senior class of kindergarten children has gradually demonstrated their mathematical arithmetic ability, mathematical logic ability, and mathematical analysis ability, children need to refine and enhance their skills on the basis of existing abilities, and there is still room for improvement in focusing on cultivating children's mathematical thinking skills.[2]Children aged five and six are an important period for children's thinking to shift from visual logical thinking to early abstract logical thinking. This is an important time to carry out maths education for the senior class of kindergarten children, which is an important time to explore, stimulate, and cultivate their abstract thinking potential. At present, there is a general lack of the use of mathematical elements in the play activities of older children, which leads to a limited effect on the enhancement of young children's mathematical thinking ability.[3]

In mathematical activities, the senior class of kindergarten children need to use mathematical thinking to identify, formulate, analyze, and solve problems, demonstrating the diversity of their thinking skills, including analysis, synthesis, comparison, classification, judgment, and reasoning. Now children's math education has some problems, parts of teachers too much emphasis on the inculcation of math knowledge and overlook the development of mathematical thinking, which limits the expansion of children's thinking and the training of mathematical interests. At the same time, the development of mathematical thinking in kindergarten children has individual differences, which requires teachers to teach according to their aptitude and pay attention to the developmental needs of each child. However, due to the large number of children in the class, it is often difficult for teachers to take each child's development into account when teaching. Therefore, it has become an important task of early childhood mathematics education to reform teaching methods and pay attention to the cultivation and development of children's mathematical thinking.[4]

3. Factors influencing the development of children's mathematical thinking ability

Interviews with 15 kindergarten teachers from Kindergarten T, Kindergarten Y, and Kindergarten X in Wuhan City, Hubei Province, discovered that there are four main influences on the development of young children's mathematical thinking skills: the influence of kindergarten teachers on young children's mathematical teaching and learning, family factors, environmental factors, and their own factors.

Table 1 Factors affect the development of children's mathematical thinking ability

Samples	Teachers Teaching	Family	Environments	Individuals
Influential	9	6	3	8
No Influential	6	9	12	7

Presently, the content of early children's mathematical education is relatively shallow, and it does not satisfy the needs of children's intellectual and thinking development in terms of breadth and depth. Furthermore, the content is often repetitive, making it difficult for teachers to grasp. When teaching mathematics to young children, early childhood teachers often focus only on teaching mathematical knowledge, while neglecting the development of important thinking skills such as observation, analysis, judgement, reasoning, emotion, and so on. This practice can lead to a lack of interest in learning mathematics and have a negative impact on the development of young children's mathematical thinking skills.

In kindergarten, there are many types of math play materials and some teachers find it difficult to integrate these materials into math play activities due to a lack of relevant knowledge. The operating materials used in play activities are often repetitive or limited in quantity, which may lead to boredom in young children, which can have a negative impact on the effectiveness of teaching activities.[5] In kindergarten mathematical game activities, choosing appropriate and correctly distributing the number of game materials, as well as a relatively pleasant, free psychological environment and a rich material environment can positively influence the development of young children's mathematical thinking ability, effectively foster their in-

terest in learning mathematics, and in accordance with the interests of young children in their game activities, actively insert the links of mathematical learning, and happily carry out mathematical learning operations. In addition, it can avoid their psychological fear of learning mathematics.[6]

According to the teacher's interview records, what are the factors that affect the development of children's mathematical thinking ability in the class. Most teachers think that family factors negatively affect the development of children's mathematical thinking ability, as well as parents do not pay much attention to the cultivation of children's mathematical thinking ability, and parents give teachers feedback that they only need to learn in kindergarten, and do not guide the cultivation of children's mathematical thinking ability at home, which leads to a certain gap between the children's mathematical thinking ability and that of other children or they think that young children in kindergarten are just playing and think that teachers are "nanny".

Individual children's own factors also affect the development of their mathematical thinking skills. Children learn various aspects of mathematics according to their own interests and levels of concentration, and the emergence of individual interests is a positive influence on the development of children's mathematical thinking skills. The feeling of playfulness mainly involves interest experience, autonomy experience, and achievement experience, and the acquisition of experience is closely related to the activity process, which figures out the value of the activity for young children.[7]

4. Research on Promoting the Development of Young Children's Mathematical Thinking Skills in Games

4.1 Children develop mathematical thinking skills through playing games

Plays are the most basic form of learning and a foundational activity for young children. [8]

Guidelines for Learning and Development for Children Aged 3 to 6 pointed out that young children's learning is based on direct experience and takes place in play and daily life. We should attach importance to the unique value of play and life, create rich educational environments, and organize daily life in a meaningful way to support and satisfy, to the maximum extent possible, young children's need to gain experience through direct perception, practical manipulation, and hands-on experience.

Through games, children can perceive and understand the applications and roles of mathematics in their lives and stimulate their interest in mathematics. Also, they can help young children establish mathematical concepts and develop their spatial thinking. Combined with the educational practice of constructive games, we study the best strategies for inspiring young children's mathematical thinking in constructive games, so that young children can learn and master the methods and promote the development of their mathematical thinking ability in the game activities. [9] In the context of block play, children are required to recognize that the items they place within the enclosed space must be of a similar or corresponding size to the space itself. For example, if a toddler builds a garage with blocks that are much smaller than a toy car, and when he finds that he has to put the toy car into the garage and realizes that it won't fit in the garage, he realizes that the garage is 'small' and understands the meaning of the word 'small'.

The senior class of kindergarten children are more imaginative in their play, their problem-solving ability is gradually increasing, their autonomy has improved, and they are able to complete their games according to a plan, in addition to choosing according to their own wishes. In the process of playing, children's creativity has improved, they can reasonably create new games according to their own life experiences; they have a clearer concept of the rules of the game, they can follow the basic rules of the game in the process of playing, and they can rely on the cooperation of their peers to solve problems together.[10] For example, in the construction game "Build a House", 5 children are in a group, and one child as the leader leads the remaining 4 children to divide the work to build a house because the building blocks are used to build a house, so the children will count to confirm how many blocks they need to build a house. For example, in the construction game "Build a House", 5 children in a group, one child is a leader to leads the remaining 4 children to divide the work to build a house, because the use of blocks to build a house, the children will start the game before the start of the count to confirm how many blocks they need to build a house and emphasize that the rules of the game comply with the child leading the team to the other children to divide the work to complete the game together. The child leading the team divides the work among the other children to complete the game.

4.2 Teachers' Strategies for Teaching Mathematical Thinking Skills to Young Children

Through research on the strategy of cultivating young children's mathematical thinking ability, early childhood teachers can use the concept of Montessori education to take young children's interest in learning as a guide, focus on novel learning methods, take good learning habits as a basis, create a good learning environment, and enrich

young children's play operation activities, which can improve young children's scientific literacy as well as their thinking ability, and effectively cultivate young children's mathematical awareness and mathematical perception so that young children can appreciate the importance of mathematics.[11-12]

Research has shown that the use of problem-based teaching methods addresses the development of young children's thinking and mathematical skills, enriches the content of teaching, stimulates young children's interest in learning and exploration, and promotes deeper learning. [13]

According to the teacher's interview records, how young children's mathematical thinking skills can develop through play. Some teachers suggested integrating mathematics education into everyday activities, and we can use fruit counting to develop children's mathematical thinking skills. We can also use playing cards to add and subtract numbers up to 10 in outdoor play activities, and we can also play "rock, paper, scissors", which is a version of "rock, paper, scissors", to guide children's understanding of numbers and number sequencing.

5. Conclusion

Advanced the senior class of kindergarten children of mathematical thinking abilities in games are a top priority for the development of thinking skills in the senior class of kindergarten children and is a key part of science for the senior class of kindergarten children. Promoting the development of mathematical thinking skills in kindergarten children through play is a highly effective educational method that makes learning fun. Through well-designed mathematical games, children can, in a relaxed and enjoyable atmosphere, stimulate their interest in mathematics, naturally meet and understand mathematical concepts, develop their logical thinking skills, and lay a solid foundation for their future learning. In the process of implementation, teachers need to flexibly use a variety of teaching strategies, such as setting up problematic situations, guiding children to explore on their own, and providing timely positive feedback and encouragement, all of which can help cultivate young children's mathematical thinking and problem-solving skills. Overall, cultivating the senior class of kindergarten children's mathematical thinking skills through gamification can not only stimulate children's interest in learning but also promote the overall development of children's mathematical thinking skills. In future educational practice, we should continue to explore and improve this teaching strategy to provide more high-quality educational resources for young children's development. At the same time, we should also pay attention to the differences in the development of mathematical thinking among different children, and tailor the teaching to the needs of each child to ensure that each child can improve his or her development of mathematical thinking skills through games.

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