

Instructional Strategies based on Early Childhood Mathematics Core Experience Mastery

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Abstract

Early childhood core experiences in mathematics are the basic mathematical concepts and competencies that young children need to master in the process of learning mathematics. These experiences are very important to the development of young children. Before designing mathematics teaching activities for young children, teachers need to fully understand the age, cognitive level and interest characteristics of young children, as well as the teaching objectives and the content of teaching materials. In this way, teaching strategies and methods can be better adjusted to promote the overall mathematical development of young children. Finally, some teaching strategies are proposed to stimulate young children's interest and motivation in learning. These strategies include the use of teaching environment creation, mathematical living, mathematical gamification and regular teaching seminars, with a view to promoting young children's effective participation and understanding in mathematics learning.

Keywords

Core Math Experiences; Young Children; Math Activities.

1. Introduction

The core experience of teaching mathematics to young children is to enable them to successfully bring what they have learned into their lives, to guide them to think and analyze when they face problems and difficulties, and then to correctly apply what they have learned to solve problems, to improve their ability to make use of the knowledge points, to strengthen their interest in learning mathematics, and to continuously cultivate young children's ability to learn knowledge and make use of it.

2. Core Experiences in Mathematics

2.1. Concept of Core Experiences in Mathematics

“Core experience refers to a number of concepts, abilities, and skills that are essential for children to master and understand a subject area.”[1]“Mathematical core experiences are the foundational key concepts and competencies that young children need to engage in mathematical learning, and the extent to which teachers know and master these core experiences determines the quality of their support for young children's mathematical thinking and competence development.”[2]The core experience of mathematics covers a series of basic concepts, such as quantity, shape, spatial relationship, sequencing, pattern, measurement, and so on. These concepts are experienced and understood in young children's daily life through various practical situations and activities, such as counting objects, comparing sizes, constructing models, and solving simple problems. Through these experiences, young children

gradually form the basis of mathematical thinking and develop their powers of observation, reasoning, problem solving and abstract thinking.

2.2. The Role of Instructional Activities based on Core Math Experiences

2.2.1. Cultivating Mathematical Thinking

Mathematics core experiences help young children develop mathematical thinking, including the ability to observe, categorize, compare, reason and solve problems. By interacting with mathematical concepts such as quantity, shape, and spatial relationships, young children are able to develop logical and abstract thinking, their problem-solving skills and creative thinking. In addition, positive experiences with core math experiences contribute to young children's intellectual development. Through interaction with mathematical concepts, they develop observation, classification, reasoning, and problem-solving skills. These intellectual skills are not only useful in the field of mathematics, but also have a wide range of applications in other subjects and daily life. And, the experience of core math experiences helps young children gradually develop abstract thinking skills. They abstract mathematical concepts from concrete objects and situations and are able to apply them to different situations and problems. This development of abstract thinking helps toddlers better understand and apply abstract mathematical concepts in subsequent math learning. The core math experience also develops children's problem-solving skills. By interacting with mathematical concepts such as quantity, shape, and pattern, young children learn to observe, analyze, and solve problems. They are able to apply the math knowledge and strategies they have learned to find solutions, and to reason and verify them.

2.2.2. Building a Foundation in Math

Core math experiences build a foundation in math for young children. Through exploration and hands-on practice, young children are able to understand and apply mathematical concepts, such as quantity, sequence, and pattern, etc. These foundational concepts provide a solid foundation for subsequent, more in-depth mathematical learning, helping. Mathematics education at the kindergarten level begins with recognition of numbers and quantity. Through core math experiences, young children can develop an understanding of the meaning of numbers and the concept of quantity. For example, through activities such as counting objects, observing quantitative relationships, and comparing sizes, young children can build concepts of the numbers 0 through 10 and understand the quantities each number represents. By asking interesting questions, such as how to distribute toys, how to line up, etc., children are guided to think and try out ways to solve problems. Such an interactive process can help children develop problem-solving skills and mathematical thinking.

2.2.3. Cultivate Interest and Self-confidence in Math

Through active participation in math activities and experiences, young children are able to develop interest and curiosity in math. They discover the fun and practicality of mathematics through hands-on experience and practical manipulation, thus building up a positive attitude towards mathematics. This positive experience in mathematics helps to develop young children's self-confidence in mathematics and stimulates their positive motivation in mathematics learning. Teachers will make use of diversified teaching resources and tools, such as math games, math extension activities, math experiments, etc., in their activities, so that children can learn math in a relaxed and interesting atmosphere. It increases the fun of learning and attracts children's attention. Young children have the opportunity to participate in the process of exploring and discovering math problems during the teaching and learning activities of the core experience. With teachers providing open-ended problems and challenges, children can think about and try different solutions, develop their spirit of exploration and interest, and experience the fun and sense of accomplishment in math. Teaching activities such as group

work, team competitions or contests will be conducted to enhance interaction and cooperation among children, develop their teamwork spirit and sense of competition, and at the same time increase their motivation and enthusiasm for learning.

3. Instructional Preparation for Core Mathematics Experiences

3.1. Provide Rich Mathematical Materials and Resources

Provide children with a variety of rich mathematical materials and resources, such as counting boards, shape puzzles, molds, and blocks. The use of these materials stimulates children's curiosity and desire to explore, and helps them to acquire core math experiences through hands-on practice and observation. For example, counting boards can help children understand the concept of number and order, and by placing pieces on corresponding squares to count, children can visually experience the increase and decrease of numbers. Shape puzzles allow children to recognize different geometric shapes. By putting shapes together, they can explore the characteristics and properties of shapes. Molds and blocks develop children's spatial imagination and modeling skills, and they can build, combine, and decompose to understand basic concepts in mathematics. Math resources and materials provide rich learning opportunities for children. They actively participate in mathematical activities through practical manipulation and observation, and develop mathematical thinking, problem-solving skills and creativity. This type of learning not only excites and engages young children, but also lays a solid foundation for them to acquire solid core math experiences. Math is no longer boring memorization and abstract concepts, but part of a fun exploration that is closely integrated with their daily lives. They no longer see math as dry memories and abstract concepts, but as part of an interesting exploration that is closely connected to their daily lives. This connection stimulates young children's interest and motivation in math, and allows them to unconsciously improve their math foundation in an enjoyable learning atmosphere.

3.2. Creating Mathematical Contexts and Activities

First of all, teachers should design diversified mathematical situations and activities so that children can experience mathematical concepts in an interesting environment. For example, organize mathematical games, mathematical puzzles, mathematical exploration activities, etc., so that children can actively explore and apply mathematical concepts through participation and interaction. Encourage toddlers to engage in hands-on practice and exploration to experience math concepts through their own practice. For example, children can count objects, construct models, and solve problems on their own, so that they can acquire core math experiences through hands-on experiences. Second, teachers also encourage children to engage in cooperative learning by exploring and solving math problems with other children. Cooperative learning can promote the exchange of ideas and cooperative problem-solving skills among children, provide diverse ideas and methods, and enrich their mathematical experiences. Teachers can provide appropriate mathematical challenges according to children's ability level to motivate them to learn. Challenges can be solving more complex problems, completing more complicated tasks or trying out new mathematical concepts. Such challenges can motivate young children to go beyond themselves and continue to improve their math skills and thinking abilities. In addition, teachers can guide young children to review their math learning experiences and encourage them to share their thoughts and discoveries. Through reflection and discussion, young children can deepen their understanding of math concepts and gain inspiration and new insights from the experiences of others. Finally, young children are guided to apply mathematical concepts to their daily lives and relate them to their real-life experiences and situations. For example, in activities such as shopping, playing games, and time management, children can use mathematical concepts and experience the value of practical use of mathematics.

3.3. Use of Language of Instruction

Provide appropriate guidance and questions to guide children's thinking and exploration of mathematical problems during their mathematical activities. By asking open-ended questions and guiding children to make comparisons and classifications, etc., we stimulate their thinking and observation, and help them to establish mathematical concepts and relationships.

Teachers need to use precise and concise language to clearly communicate mathematical knowledge to children. When children learn how to measure length, teachers need to use precise and concise language to guide them. However, some teachers may lack precision in their delivery, resulting in unclear or confusing concepts. This may hinder young children's understanding and application of length measurement. In order to effectively guide young children to learn this concept, teachers can adopt the following strategies: first, teachers should give a concise definition to explain that length refers to the length of an object. For example, one could say, "Length is the distance from one end of an object to the other." Second, the teacher can use an actual object, such as a pencil, book, or string, to demonstrate how to take a length measurement. During the demonstration, the teacher needs to clearly state the starting and ending points and use appropriate units (e.g., centimeters or meters) for the measurement. In addition, teachers can guide children to compare the lengths of different objects and help them to sort them. Through comparing and sorting activities, children can further understand the concept of length and begin to use appropriate terminology, such as 'longer' and 'shorter'. Finally, teachers can design real-world activities that allow children to apply the concepts of length measurement. For example, children can be asked to choose appropriate lengths for a drawing or construction activity and explain their choices. By using these strategies, teachers can help young children clearly understand and apply the concept of length measurement. At the same time, accurate and concise verbalizations can enhance children's learning and provide a solid foundation for them to build their mathematical thinking and problem-solving skills.

3.4. Focusing on Children's Interests and Developmental Levels

Personalized mathematical activities and tasks are designed according to children's interests and developmental levels so that they can actively participate in mathematical learning and acquire core experiences in an appropriately challenging and comfortable environment. By creating interesting learning environments, providing varied activities, personalized learning content, and positive encouragement, teachers can stimulate children's interest in mathematics and help them actively participate in the development of core mathematical experiences.

3.4.1. Enriching Instructional Formats

Teachers can carry out math games in accordance with the requirements of the Guidelines and the Outline, as well as the rules and levels of physical and mental development of young children, and the content of the activities includes number concepts, spatial shapes, and so on. For example, in the outdoor activity "Jumping Grids", children can jump into different shapes of grids when instructed to do so, and the grids are designed by the children themselves. In addition, they can also prepare different shapes of sandbags, and then throw the sandbags into the designated shapes of the box when instructed to do so. Teachers can enrich and diversify the forms of group instruction for young children to stimulate their interest in mathematics. For example, using games, stories, and fun competitions, children can participate in math learning in a pleasant atmosphere and develop their interest and curiosity in math.

3.4.2. Mathematics Corner Games

Teachers can make full use of math corner games to create challenging and interesting math experiences. By designing interesting math games, children can explore the mysteries of mathematics, stimulate their enthusiasm for math activities, and cultivate their problem-solving and cooperation skills. Math games not only stimulate children's curiosity and desire to

explore, but also develop their problem-solving and cooperative skills. They apply their mathematical knowledge and skills to solve a variety of interesting challenges by thinking, observing and practicing. At the same time, these games create fun and interesting mathematical experiences for the children. Through such activities, children gradually see math as a fun way to explore and learn, stimulating their enthusiasm for math and laying a solid foundation for future in-depth study of math.

3.4.3. Personalized Mathematics Interaction

Teachers can also provide personalized mathematics learning content and activities according to children's interests and strengths. By understanding children's interests, teachers can design mathematical tasks related to their favorite themes so that children feel happy and confident in learning. For example, in one corner of the Maths corner, teachers set up a personalized interactive math activity called 'Maths Explorer'. This activity aims to provide children with mathematical tasks related to their favorite themes according to their interests and strengths, so that they can feel pleasure and confidence in learning. Through the personalized interactive math activities, children can combine their favorite themes with their mathematical knowledge to enhance their learning fun and motivation. As they explore and solve problems, they not only develop mathematical thinking and skills, but also enhance their self-confidence and problem-solving abilities. Teachers' attention and personalized design enable children to develop their mathematical potential and enjoy the sense of achievement and fun brought by mathematics in an enjoyable learning atmosphere.

3.4.4. Positive Encouragement and Affirmation

Finally, teachers should give positive encouragement and affirmation to young children to stimulate their self-confidence and motivation in math learning. Teachers play an important role in the math corner; they are not only instructors, but also encouragers and supporters. When children excel in math learning, teachers praise their efforts with warm smiles and words of encouragement. By praising children's efforts and achievements, teachers can enhance children's interest in mathematics and motivate them to participate more actively in learning and exploring core mathematical experiences.

In addition to individual praise, teachers can hold group activities and displays in the math corner to provide opportunities for children to show their achievements. For example, teachers can organize a math demonstration day for children to show their achievements and creativity in math learning. During this activity, teachers and other children encourage, praise and appreciate everyone's efforts and achievements. This collective affirmation and praise further strengthens the children's confidence and motivation to feel an integral part of their math learning. Through positive encouragement and affirmation, teachers created a warm and supportive math learning environment for the children. The children felt recognized for their efforts and achievements. They became more actively involved in mathematics learning and developed self-confidence, cooperation and problem-solving skills. Teachers' encouragement and affirmation became their motivation and power source in their math learning journey, keeping them enthusiastic and motivated to explore math all the time.

4. Implementation Strategies for Teaching Early Childhood Mathematics Core Experiences

4.1. Create a Math-rich Environment

4.1.1. Create a Mathematical Environment

In the kindergarten environment, add math-related children's drawings, pictures, charts, etc. to show math concepts and applications. The most common environments include weekly plans and children's sign-in sheets. Teachers and children work together to set up math corners,

make frequent adjustments to the math corners, and change the materials in them in a timely manner. As children get older, the difficulty level of the materials should increase. Children can use the things in the corner cabinet independently, and can also make or provide their own math materials, so that children can have a sense of pride in their own achievements, thus stimulating children's interest in independent learning. Putting in common materials in life, such as empty cardboard boxes and plastic water bottle caps, children can have a making contest. In addition, snowflake toys, blocks, milk powder buckets and other building materials can be used for creative construction. Diverse teaching materials can stimulate children's interest in sustained participation, but it is important to pay attention to children's use of the materials and to replace disliked and damaged materials in a timely manner. Constructive play also helps children make connections between objects and geometric shapes and develop a variety of experiences related to math.

4.1.2. Create Problematic Situations

To cater for the characteristics of children of different ages, provide children with mathematical tasks and materials of interest to them, such as chessboards, puzzles, blocks, mazes, etc., so that they can touch, explore and play freely, and develop core mathematical experiences through independent exploration and cooperative learning. Children can be guided to design and label the corner cabinets accordingly so that they can store and organize the materials independently. Such a design will encourage children's active participation and independent learning, and provide them with a fun and challenging environment for learning mathematics. Kindergartens that are able to do so can purchase some Montessori math teaching aids or Flaubert math teaching aids. For example, in the math corner, teachers carefully create a series of problem situations to meet the interests and learning needs of children of different ages. These problem situations combine materials of interest to children and specific mathematical tasks to provide them with a challenging and inspiring learning environment. In addition, teachers can guide children to design and organize problem situations on their own. They can choose their favorite mathematical themes, such as time, shapes, quantities, etc., and put the corresponding labels next to the corner cupboards to organize and group the related materials. In this way, children can choose and use the materials freely for independent learning and exploration. Teachers can provide inspiring questions and challenges to encourage children to think, practice and communicate, so as to deepen their understanding of mathematical concepts and principles. By creating problematic situations, teachers provide children with diverse and personalized mathematical learning experiences. Children develop core mathematical experiences, mathematical thinking and problem-solving skills through independent exploration and cooperative learning. Such a learning environment stimulates children's interest and motivation in learning, and allows them to participate happily in math learning and enjoy the sense of accomplishment and fun that math brings.

4.2. Mathematics in Daily Life

4.2.1. Integration of Mathematics into Daily Life

Integrating mathematics into the day-to-day life can expose young children to practical mathematics, and also make them subconsciously interested in mathematics. For example, children are guided to recognize the numbers in the ring creations of other classes and how many butterflies there are in the garden, and so on. This kind of activity enables children to access and apply numbers in a real environment and deepens their understanding of numbers. Children can try to identify numbers on roadside billboards, such as the license plate number of a bus, price tags in a store, or numerical directions on a street sign. Through such interactions, children will be able to integrate math with their everyday experiences and improve their number recognition skills.

For example, during afternoon snack time in kindergarten, teachers encourage children to count how many cookies there are and discuss how to evenly distribute them. With the core math experiences they have already accumulated, children are able to follow the teacher's prompts to count and arrive at the total number of cookies. They are also able to carry out distribution activities effectively. Young children are able to regularly apply what they have already learned about mathematics in various aspects of their daily lives. Mathematical living helps to develop young children's interest in and understanding of mathematics, as well as to enhance their ability to think mathematically when solving real-world problems.

4.2.2. Utilize Local Resources

The use of indigenous resources in mathematics education in kindergarten is an important way to connect mathematics to young children's real lives and local cultures, providing more meaningful and hands-on learning experiences. Mathematics living should be linked to the actual life of young children and to the local resources of kindergartens. "Emphasis should be placed on providing young children with the opportunity to participate in local natural, living and cultural situations and even VR and AR artificial intelligence scenarios, practically guaranteeing the rights, opportunities and conditions for young children to be able to learn relevant mathematical experiences in an immersive manner (including ancient Chinese arithmetic tools with traditional Chinese cultural values such as counting chips and abacuses, as well as other folklore and cultural manipulation materials, etc.), and strongly supporting young children's participation in discussing and solving the problems of daily life in the local community, national cultural heritage and multicultural integration." [3] Utilizing local resources is a rich and lively approach to mathematics education. By connecting with young children's real lives and local cultures, teachers can create rich and varied mathematical learning contexts to develop young children's mathematical thinking and problem-solving skills, as well as to promote their understanding of and respect for local cultures. Such math learning experiences will result in more meaningful and profound learning outcomes for young children.

4.3. Gamification of Mathematics

"In order to enhance the effectiveness of mathematics education activities for young children and better promote the learning of their core experiences, gamification and contextualized instructional design are very necessary." [4] When children are engaged in outdoor activities, some small objects or pictures are hidden in a specific area or field, and children follow the teacher's hints, such as "find five red balls" or "find three animal images", to search and count. Such games can develop children's counting skills and concentration.

Through game design, we are able to create a fun and natural learning environment in kindergarten group teaching, area play and daily activities. Children will actively participate in real-life situations and gain a deeper understanding of the concept of spatial orientation through independent exploration and interactive experiences, rather than just engaging in mechanical training. This problem-led approach will stimulate children's thinking ability and creativity, and promote their in-depth understanding and application of mathematical concepts. For example, teachers prepare teaching aids for mathematical activities of interest with children and put them into role-playing corners. Through role-playing games, children's free activities and kindergarten-based activities, children can experience the joy of playing while practically applying their mathematical knowledge. The most common games include the supermarket game, in which children play the roles of sellers and buyers, and learn math skills such as counting, addition and subtraction in the use of money props. Allow children to work together to solve math problems and share ideas and strategies in a cooperative and interactive way.

4.4. Regular Teaching Seminars in Kindergartens

Diversified kindergarten teaching seminars are an important way to enhance the effectiveness and operability of teaching in the field of mathematics. Teachers' educational and teaching ability is crucial to the mastery of young children's core experience in mathematics, therefore, "the quality of teachers' education and teaching can be effectively improved by conducting quality kindergarten-based teaching and research." [5].

4.4.1. Expert Training

Kindergartens can provide professional guidance and support to teachers by inviting experts to conduct mathematics training to facilitate their professional growth and enhancement in the field of mathematics education. Expert training takes various forms, such as special lectures, seminars and workshops. Experts share the latest research findings, teaching methods and resources, and introduce effective mathematics education strategies and practice cases. Targeted training can also be provided to address the needs and problems of kindergarten teachers to help them better understand and apply the concepts and methods of mathematics education.

Teachers are able to interact and share with experts on key issues and challenges in mathematics education. They can share their practical experiences and doubts, listen to the experts' views and suggestions, and inspire and learn from each other. This process of colliding ideas and engaging in inquiry will stimulate teachers' innovative thinking and professional development drive.

In addition, teachers can help improve their professional competence through practical exercises and demonstrations. Experts can lead teachers in teaching observation and practical exercises, demonstrate excellent mathematics teaching cases, and guide teachers on how to effectively organize mathematics teaching activities and guide children's learning. Through practical participation and reflection, teachers can gain a deeper understanding of the nature and methods of math teaching and improve their own teaching skills.

Expert training not only helps to enhance teachers' professional competence, but also establishes a platform for professional learning and collaboration. Teachers can establish a close communication network through expert training, share teaching resources and experiences, and jointly explore innovative paths in mathematics education. They can learn from each other, support each other and form a learning community to jointly promote the development of kindergarten mathematics education.

4.4.2. Reflecting on Teaching Practice

Teachers should work together to analyze the data collected to assess the extent of children's understanding and mastery of core math experiences. Teachers can note which concepts young children have mastered, which concepts they continue to struggle with, and the possible reasons why. This helps teachers identify the learning needs and priorities of young children. Assess the effectiveness of instructional strategies and activities used. Teachers can consider which strategies and activities have had a positive impact on young children's learning and which need to be adapted or improved. This can be assessed by observing young children's engagement, interest and learning outcomes. Adapt teaching strategies and activities to better meet the learning needs of young children. This may include redesigning instructional activities, providing more hands-on and application opportunities, and introducing multi-sensory experiences. Teachers can also personalize instruction to meet the interests and learning styles of young children. Children's learning outcomes should be assessed regularly and the effectiveness of teaching strategies should be reflected upon. Based on the assessment results, teachers can further adjust and improve their teaching to ensure that young children can consistently master and consolidate the core experiences in Mathematics.

During the teaching workshops, teachers can regularly reflect on their teaching practice, thinking about what has achieved positive results and what needs to be improved from reviewing classroom activities, teaching methods and choice of resources. Teachers are able to improve their teaching skills through reflection by becoming aware of their own teaching preferences, styles and impact on young children's learning.

Teachers can share each other's reflections and assessment findings through communication and collaboration with colleagues. They can learn from and with each other and discuss effective teaching strategies and implementation methods. This kind of communication and cooperation among teachers helps to improve the teaching level of the whole team of teachers and promotes the development of teaching and research activities.

4.4.3. Timely Adjustment of Instructional Strategies

Based on reflection and assessment of teaching practice and children's learning, teachers can make timely adjustments to their teaching strategies. They can flexibly use different teaching methods and resources to provide personalized learning experiences according to children's learning needs and differences. Based on the assessment results, teachers can also provide additional support and guidance to address children's learning difficulties or challenges, and help them overcome them and make progress. Teachers can learn about children's progress and mastery through observation, recording and assessment. If young children are found to be struggling with a particular math concept or skill, teachers can target additional support and guidance. They can work one-on-one or in small groups with young children to provide additional practice and explanations to help them overcome difficulties and build confidence and interest in mathematics. In addition, teachers can adjust the pace and difficulty of instruction based on young children's performance and feedback. If children already have a good grasp of a concept, teachers can provide more challenging learning tasks to help them gain deeper understanding and application of mathematical knowledge. If children have high levels of anxiety or confusion about a concept, teachers can moderately reduce the level of difficulty, provide more modeling and guidance, and gradually help children build confidence and competence in mathematics. By constantly adjusting teaching strategies, teachers can better meet young children's learning needs and provide personalized learning experiences. Such teaching methods will stimulate young children's motivation and enthusiasm for learning, and promote their mathematical development and comprehensive abilities. Teachers' attention and concern will also allow young children to feel the joy of learning and a sense of accomplishment, fostering their interest in mathematics and an attitude of continuous learning.

5. Conclusion

Core experiences in mathematics should be taught in such a way that young children learn by doing, through play and in their daily lives in order to facilitate their mathematical learning. Young children are effectively guided to interact with teaching aids to stimulate their playful behavior and consciously identify and perceive potential mathematical points in their daily lives. Teachers also encourage young children to evaluate and extend their thinking related to math problems. Children are guided to apply their core mathematical experiences in their daily lives, so that they can have insights and experiences in their lives, emphasizing the close connection between mathematics and daily life. Through such practice, mathematics becomes an enjoyable and interesting experience, so that young children can discover more mathematical life phenomena, thus enjoying mathematics learning and realizing the effective development of mathematics core experience. In the game young children are able to build a mathematical foundation at an early stage and develop an interest in math and a positive attitude towards learning.

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