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**ACQUAINTANCE WITH GEOMETRY AS ONE OF THE MAIN GOALS** **OF TEACHING MATHEMATICS TO**

**PRESCHOOL CHILDREN**

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**INTRODUCTION**

Young children "do" math spontaneously in their lives and in their play. Mathe­matical learning for young children is much more than the traditional counting and arithmetic skills. It includes a variety of mathematical sections of among which the important place belongs to geometry. We've all seen preschoolers exploring shapes and patterns, drawing and creating geometric designs, taking joy in recognizing and naming specific shapes they see. This is geometry — an area of mathematics that is one of the most natural and fun for young children.

Geometry is the study of shapes, both flat and three dimensional, and their relationships in space.

Preschool and kindergartenchildren can learn much from playing with blocks, manipulatives (Jensen and О'Neil), different but ordinary objects ( Julie Sarama, Douglas H. Clements), boxes, snacks and meal (Ellen Booth Church). Also card games, computer games, board games, and others all help children learn geometry.

This problem is relevant because the geometrical concepts should be formed since early childhood. Geometrical concepts help children to perceive the world. Also it will provide future success in academic achievement : as the rudiments , children learn in primary school, from the basis for further learning of geometry. Game methods help children to understand some complex phenomena in geometry. They also are necessary for the development of emotionally-positive attitudes and interest to the mathematics and geometry.

**I. HISTORICAL PATTERNS AND PERSPECTIVES OF TEACHING MATHEMATICS IN PRIMARY SCHOOL**

Throughout history, mathematical concepts and systems have been de­veloped in response to real-life problems. For example, the zero, which was invented by the Babylonians around 700 в.с, by the Mayans about 400 a.d., and by the Hindus about 800 a.d., was first used to fill a column of numbers in which there were none desired. For example, an 8 and a 3 next to each other is 83; but if you want the number to read 803 and you put something between the 8 and 3 (other than empty space), it is more likely to be read accurately (Baroody, 1987). When it comes to counting, tallying, or thinking about numerical quantity in general, the human physiological fact of ten fingers and ten toes has led in all mathematical cultures to some sort of decimal system.

History's early focus on applied mathematics is a viewpoint we would do well to remember today. A few hundred years ago a university student was considered educated if he could use his fingers to do simple operations of arithmetic (Baroody, 1987); now we expect the same of an elementary school child. The amount of mathematical knowledge expected of children today has become so extensive and complex that it is easy to forget that solving real-life problems is the ultimate goal of mathematical learning. The first grad­ers in Suzanne Colvin's classes demonstrated the effectiveness of lying in­struction to meaningful situations.

It’s possible to recall that more than 300 years ago, Comenius pointed out that young children might be taught to count but that it takes longer for them to understand what the numbers mean. Today, classroom research such as Su­zanne Colvin's demonstrates that young children need to be given meaning­ful situations first and then numbers that represent various components and relationships within the situations.

The influences of John Locke and Jean Jacques Rousseau are felt today as well. Locke shared a popular view of the time that the world was a fixed, mechanical system with a body of knowledge for all to learn. When he ap­plied this view to education, Locke described the teaching and learning pro­cess as writing this world of knowledge on the blank-slate mind of the child. In this century, Locke's view continues to be a popular one. It is especially popular in mathematics, where it can be more easily argued that, at least at the early levels, there is a body of knowledge for children to learn.

B. F. Skinner, who applied this view to a philosophy of behaviorism, re­ferred to mathematics as "one of the drill subjects." While Locke recommended entertaining games to teach arithmetic facts, Skinner developed teaching machines and accompanying drills, precursors to today's computerized math drills. One critic of this approach to mathematics learning has said that, while it may be useful for memorizing numbers such as those in a telephone listing, it has failed to provide a powerful explanation of more complex form: of learning and thinking, such as memorizing meaningful information or problem solving. This approach has, in particular, been unable to provide a sound description of the complexities involved in school learning, like the mean­ingful learning of the basic combinations or solving word problems (Baroody, 1987).

Rousseau's views of how children learn were quite different, reflecting his preference for natural learning in a supportive environment. During the late eighteenth century as today, this view argues for real-life, informal mathemat­ics learning. While this approach is more closely aligned to current thinking about the way children learn than is the Locke/Skinner approach, it can have the undesired effect of giving children so little guidance that they learn almost nothing at all.

The view that seems most suitable for young children is that inspired by cognitive theorists, primary among them Jean Piaget. Three types of knowledge were identified by Piaget (Kamii and Joseph, 1989), all of which are needed for understanding mathematics. The first is physical, or empirical, knowledge, which means being able to relate to the physical world. For example, before a child can count marbles by dropping them into a jar, she needs to know how to hold a marble and how it will fall downward when dropped.

The second type of knowledge is logico-mathematical, and concerns rela­tionships as created by the child. Perhaps a young child holds a large red marble in one hand and a small blue marble in the other. If she simply feels their weight and sees their colors, her knowledge is physical (or empirical). But if she notes the differences and similarities between the two, she has mentally created relationships.

The third type of knowledge is social knowledge, which is arbitrary and designed by people. For example, naming numbers one, two, and three is social knowledge because, in another society, the numbers might be ichi, ni, san or uno, dos, tres. (Keep in mind, however, that the real understanding of what these numbers mean belongs to logico-mathematical knowledge.)

Constance Kamii (Kamii and DeClark, 1985), a Piagetian researcher, has spent many years studying the mathematical learning of young children. After analyzing teaching techniques, the views of math educators, and Ameri­can math textbooks, she has concluded that our educational system often confuses these three kinds of knowledge. Educators tend to provide children with plenty of manipulatives, assuming that they will internalize mathemati­cal understanding simply from this physical experience. Or educators ignore the manipulatives and focus instead on pencil-and-paper activities aimed at teaching the names of numbers and various mathematical terms, assuming that this social knowledge will be internalized as real math learning. Some­thing is missing from both approaches, says Kamii.

Traditionally, mathematics educators have not made the distinction among the three kinds of knowledge and believe that arithmetic must be internalized from objects (as if it were physical knowledge) and people (as if it were social knowledge). They overlook the most important part of arithmetic, which is logico-mathematical knowledge.

In the Piagetian tradition, Kamii argues that "children should reinvent arith­metic." Only by constructing their own knowledge can children really under­stand mathematical concepts. When they permit children to learn in this fash­ion, adults may find that they are introducing some concepts too early while putting others off too long. Kamii's research has led her to conclude, as Su­zanne Colvin did, that first graders End subtraction too difficult. Kamii argues for saving it until later, when it can be learned quickly and easily. She also points to studies in which place value is mastered by about 50 percent of fourth graders and 23 percent of a group of second graders. Yet place value and regrouping are regularly expected of second graders!

As an example of what children can do earlier than expected, Kamii (1985) points to their discovery (or reinvention) of negative numbers, a con­cept that doesn't even appear in elementary math textbooks. Based on her experiences with young children, Kamii argues that it is important to let chil­dren think for themselves and invent their own mathematical systems. With Piaget, she believes that children will understand much more, developing a better cognitive foundation as well as self-confidence: children who are confident will learn more in the long run than those who have been taught in ways that make them distrust their own think­ing. . . . Children who are excited about explaining their own ideas will go much farther in the long run than those who can only follow some­body else's rules and respond to unfamiliar problems by saying, "I don't know how to do it because I haven't learned it in school yet."

In recent years, the National Council of Teachers of Mathematics (NCTM) has given much consideration to the international failure of Ameri­can children in mathematics, and has devised a set of standards that echo, in many ways, the Piagetian perspective of Kamii. The Curriculum and Evaluation Standards for School Mathematics (1989) prepared by the NCTM addresses the education of children from kindergarten up. Some of the more important standards are:

* *Children will be actively involved in doing mathematics.* NCTM sees young chil­dren constructing their own learning by interacting with materials, other children, and their teachers. Discussion and writing help make new ideas clear. Language is at first informal, the children's own, and gradually takes on the vocabulary of more formal mathematics.
* *The curriculum will emphasize a broad range of content.* Children's learning should not be confined to arithmetic, but should include other fields of mathematics such as geometry, measurement, statistics, probability, and algebra. Study in all these fields presents a more realistic view of the world in which they live and provides a foundation for more advanced study in each area. All these content areas should appear frequently and throughout the entire curriculum.
* *The curriculum will emphasize mathematics concepts.* Emphasis on concepts rather than on skills leads to deeper understanding. Learning activities should build on the intuitive, informal knowledge that children bring to the classroom.
* *Problem solving and problem-solving, approaches to instruction will permeate the cur­riculum.* When children have plenty of problem-solving experiences, partic­ularly concerning situations from their own worlds, mathematics becomes more meaningful to them. They should be given opportunities to solve problems in different ways, create problems related to data they have col­lected, and make generalizations from basic information. Problem-solving experiences should lead to more self-confidence for children.
* *The curriculum will emphasize a broad approach to computation.* Children will be permitted to use their own strategies when computing, not just those of­fered by adults. They should have opportunities to make informal judg­ments about their answers, leading to their own constructed understanding of what is reasonable. Calculators should be permitted as tools of explora­tion. It may be that children will compute by using thinking strategies, es­timation, and calculators before they are presented with pencils and paper (Adapted from Trafton and Bloom, 1990).

The National Association for the Education of Young Children, in its position statement regarding *Developmental / Appropriate Practices* (Bredecamp, 1987), arrives at views of teaching mathematics to young children that reflect those of Constance Kamii and the NCTM. Their position regarding infants, toddlers, and preschoolers is that mathematics should be part of the day's natural activities: counting children in the class or crackers for snacks, for example. For the primary grades they are more specific, identifying what is appropriate and inappropriate practice. Table 1 summarizes their guide­lines.

Table 1.APPROPRIATE MATHEMATICS IN THE PRIMARY GRADES (THE NAEYC POSITION)

|  |  |
| --- | --- |
| APPROPRIATE PRACTICE | INAPPROPRIATE PRACTICE |
| Learning is through exploration,  discovery, and solving meaningful problems | Noncompetitive, impromptu oral  "math stumper" and number games are played for practice. |
| Math activities are integrated with other subjects such as science and social studies | Learning is by textbook, workbooks, practice sheets, and board work |
| Math skills are acquired through play, projects, and daily living | Math is taught as a separate subject at a scheduled time each day |
| The teacher's edition of the text is used as a guide to structure  learning situations and stimulate  ideas for projects | Timed tests on number facts are given and graded daily |
| Many manipulatives are used  including board, card, and  paper-and-pencil games | Teachers move sequentially through the lessons as outlined in the teacher's edition of the text |
|  | Only children who finish their math seatwork are permitted to use the few available manipulatives and games |
|  | Competition between children is  used to motivate children to learn  math facts. |

The NCTM Standards, the NAEYC position statement, and studies with young children carried out by such researchers as Constance Kamii and Su­zanne Colvin bring us to today's best analysis of how children learn mathematics. The conclusion these researchers and theorists have reached are based not only on their work with children, but on their understanding of child de­velopment [6, pp. 426 - 436].

**II. THE PURPOSES AND THE CONTENT OF MODERN MATHEMATICAL EDUCATION IN PRIMARY SCHOOL**

Often children question the importance of learn­ing mathematics. Now that handheld calculators and home computers are commonly available, questions about the relevance of learning math have become louder. Nevertheless, educators continue to make math the second most time-consuming subject in elementary school (after reading). The reasons for teaching math are many, and the goals of general education require that math be a major part of the curriculum.

The goals of math education change slowly from grade to grade. Most children require all the time from preschool through the end of grade 6 just to learn the meaning of whole numbers, fractions, and decimals and how to perform operations with them (Of course, a number of other mathematical ideas are also taught along the way). Although actual computations can of­ten be done with a calculator, answers are of no use without an understanding of basic math processes.

Businesspeople who are involved in setting prices find that elementary algebra is helpful. Geometry is more than useful in planning many sewing projects. Scien­tists of all kinds, including biologists and social scien­tists, need calculus to solve problems and do research.

As a result, high-school math courses are largely designed to provide the basics that are needed in such situations and to prepare students for college. Some colleges require all students to take mathematics, but many have math requirements only for students of sci­ence, engineering, and advanced planning for business.

Nearly everyone starts learning mathematics before going to school. When television first became popular in the 1950's, some people joked that children were coming to kindergarten already able to count at least as high as the numbers on the channel selector. But the joke turned serious when people realized that very young children really were learning to count from TV, especially if they watched educational shows such as today's "Sesame Street." The tots also learned colors, shapes, and directions—subjects that usually form a large part of the kindergarten mathematics program [7, p. 13].

Mathematics learning is sequential—one idea builds on another. Consequently mathematics is taught in nearly the same sequence in almost every school in the United States [7, p. 29].

In preschool (с 2 till 5 years) the children gain informal practice with count­ing and shapes. So, one of the first goals of a kindergarten mathematics program is to present numbers and counting in ways that show how words, meanings, and the symbols that represent them are related. The symbols, such as the numerals 1 through 10 are especially important because many children can count correctly before they are able to get any meaning from the symbols [7, p. 14].

They also learn the meaning of words such as top, in, and left. Preschools put much empha­sis on games and activities that use simple counting. Reading and writing numerals are almost never taught.

Not all children go to preschool. All of the topics covered at that level are taught again in kindergarten and grade I. The schools cannot assume that all children will have had the same early math experi­ences.

Today, nearly all children in the United States go to kindergarten (с 5 years). The beginning part of kindergarten fo­cuses on informal experiences similar to those in preschool. Later in the year, more formal experiences start. Sometimes books or kits are used to organize mathematics learning, but many kindergarten teachers believe that it is too early to ask children to work with books or even with specific mathematics materials. Some classrooms may have a computer with math-related software to help teach early math concepts.

Children learn two ways to compare numbers. Thus, even before they learn the order of the numbers, children can un­derstand that some numbers are larger than others and that some numbers are smaller [7, p. 30].

Another important early skill is writing numerals. This skill is essential because it enables children to communicate on paper with their teachers and with others in later life.

Although understanding the meaning of numbers is the main goal of beginning mathematics education, it is not the only goal. There are numerous subgoals. In kindergarten or grade 1, the first subgoal may be to teach such basic concepts as top, left, and before. These ideas have many important uses both inside and outside the classroom. For example, a teacher will lose much time explaining if children do not understand a simple direction such as "Look at the picture at the top of the page."

Another early goal is to teach children to understand patterns. Because mathematics is the study of patterns, the teaching of pattern recognition has be­come a part of the standard curriculum in kindergarten through grade 3. At first, children are presented with simple patterns to complete. Then they move on to more complex patterns of the same kind.

These exercises are sometimes called attribute studies because such attributes (or characteristics) as being colored or not and being square or not are the focus of attention in addition to the attribute of pat­tern. Students may use blocks or pictures to do these exercises.

At the same time, students may begin some simple work with geometry. One goal of beginning geometry is to teach children to recognize the most simple shapes—the square, the circle, the triangle, and the rectangle. Teaching such basic terms simplifies class­room explanations and lays the foundation for future work with geometry. Also, some shapes are used when fractions are introduced.

Children respond better to three-dimensional shapes than they do to two-dimensional pictures in books. This probably occurs because, aside from printed materials and television, the shapes around them actually are three-dimensional. Therefore, most educators believe that early experiences with geometry should include such solid shapes as the cube, sphere, cone, cylinder, and pyramid. In fact, the solid figures are often taught first, and the two-dimensional shapes are explained in terms of the solids. A square, for example, is one face of a cube. This "analytic" approach to geometry is usually not tried in kindergarten, but it may be started as early as grade 1.

Another geometric concept that is nearly always taught early is symmetry, specifically what mathemati­cians call line symmetry. The reason for including sym­metry at this level is that it is useful in design. Also, it is not difficult for young children to recognize the dif­ference between symmetrical objects, such as the capi­tal letters A and B, and an asymmetrical object, such as the letter F.

It is clear that for A and B, the dotted line separates two parts that are identical. One part is the reflection of the other. No such line can be drawn for F.

Another goal of early elementary education is to teach children about measurement. This involves many skills and concepts. Often the first notion taught is that a measurement is a number of standard units. It is eas­iest to explain this idea by measuring straight lines [7, pp. 15-17].

So, а formal kindergarten math program usually starts at least six weeks into the year and often as late as the beginning of the second term. It generally includes counting; ordering and comparing numbers; prepara­tion for addition and subtraction; comparing size: prep­aration for telling time; the concept of a penny; recognizing squares, triangles, and circles; such concepts as top, bottom, front, back. in. on, between, left, and right (which are needed to explain lessons); classifying objects; and recognizing patterns. Most time is spent on counting and learning to understand numbers through one-to-one matching and comparing and order­ing numbers.

Every grade has a major goal for mathematics achievement, although it is not always formally de­fined. Thus, for kindergarten, the major goal is counting [7, p. 31].

**III. THE METHODS OF** **CHILD’S ACQUAINTANCE WITH GEOMETRIC SHAPES**

Preschoolers' intuitive knowledge of geometry frequently exceeds their numerical skills. By building on strengths and interests that are already present, you can foster enthusiasm for math and provide a logical context to develop number ideas.

By age six, children often have stable yet limiting ideas about shapes. Four-year-old Tina tells her mother, "That's not a square. It's too big. A square looks like this." Her friend Charlie adds, "Triangles have to be this way. That's not a triangle. It's too upside down." Broaden child's understanding by pointing out a variety of examples — squares that are many sizes and triangles that are "long," "skinny," "fat," and turned in many directions. You can also encourage deeper thinking about shapes not just through hands-on activities and discussions, but through picture books such as The Greedy Triangle by Marilyn Burns [1, pp. 5-6].

Geometry is the study of shapes, both flat and three dimensional, and their relationships in space. Geometry enters infants' lives from birth as they attempt to make sense of the shapes in their environment: crib bars, stuffed animals, mother's breast and face, the door to the bedroom. Geometric shapes become some of the first intentional scribbles made in young children's drawings, and they delight in their awareness of the shapes around them.

Such natural interest deserves encouragement and informal teaching in­tervention. In the 1950s, two Dutch educators developed a theory of stage development in geometric understanding. The van Hiele theory has gained acceptance in the United States in recent years, and applies to children from the early years through high school. An important tenet of the theory is that children do not grow through the stages automatically but, with teacher as­sistance, will do so competently (Teppo, 1991). What children are exposed to in the early years sets the stage for learning in geometry throughout their en­tire school experience. Through the primary grades, children are at the earliest, visual, stage in which they explore their environment to learn to identify the shapes within it. Activities such as describing, modeling, drawing, and classifying help them develop a spatial sense [6, p. 457 ].

Douglas H. Clements offers such reception for formation of knowledge of children about shapes. In a preschool classroom you might see a scene like this: A teacher challenges Michelle and Debbie to use their bodies to make a shape together. The girls sit down facing each other and stretch their legs apart. With feet touching, they create a diamond. Another child takes a look, sees the diamond shape, and says: "If we put someone inside, we can make two triangles." Immediately, they ask Ray to scrunch in and lie across the middle.

It works. A diamond can be divided into two triangles. Michelle notes that there's a shape that has six sides, and she wants to try making one of those. Another child may even know that the shape is called a hexagon. After a brief discussion, Michelle gets five other children together. Then, under her direction, they all lie down on the floor and create a six-sided shape [1, p. 5].

Ellen Booth Church ( a former professor of early childhood )suggests parents to apply following receptions in the course of acquaintance of children with shapes:

* Sort the house: Collect a variety of household objects, like bottle caps and envelopes, and invite your child to sort them into different piles — one for circles, rectangles, and so on. Invite her to go on a treasure hunt around the house to find "one more thing" for each pile.
* Cut shape sandwiches: Use cookie cutters to make dainty tea sandwiches for a Shape Tea Party! Cut the bread with the cutters, then spread the shapes with cream cheese. Try filling the bread slices with foods of different shapes, like a round tomato slice on square bread or a triangle of cheese on round bread.
* Make puzzles: Use large, colored file cards, folders, or poster board to make shape puzzles together. Cut out big basic shapes, like circles or triangles, and then cut each into two or three pieces. Your child can decorate the shape puzzles with crayons and then put the puzzles back together.
* Explore letters: Hunt for shapes within the letters of the alphabet. Write out the alphabet in capital letters, and have your child find which shapes make up each. You can also show her how shapes form as you write; invite her to experiment by drawing large shapes of her own and turning them into letters.
* Paste a picture: Provide your child with paste and a variety of cut-out paper shapes in different sizes and colors for creating pictures. Encourage him to combine shapes to create designs or familiar images. For example, he might make a shape person with a circle head, a square body, and rectangle legs.
* Search through stories: Many children's picture book author-illustrators boldly use basic shapes in their illustrations (books by Tana Hoban, Eric Carle, and Leo Lionni are particularly good places to start). As you read with your child, ask her to point out the shapes she finds in each picture.
* Take a walk: Move shape play outside by taking a walk with cardboard cut-outs of a triangle, circle, square, and rectangle. Your child can match them to objects like signs, plants, doors, and car tires. Take along your digital camera to snap photos of the shapes. Then print them and make a family shape book [2, p. 12].

Ellen Booth Church considers that boxes are the raw materials of creative thinking. Exercises: «Big and Little Sorting», «Boxes and Lids Matching», «Serial Boxes», « Fill 'Em Up», «Make a Shape Feely-Box», «Treasure Boxes», «Shadow Box Collages», «Play Store», «You-in-the-Box» and others [3, pp. 9-10].

Also Ellen Booth Church offers to use snacks and mealtime to teach big ideas with taste and ease. The kitchen is filled with many wonderful foods and cooking tools in a variety of colors, sizes, and shapes. It is the perfect laboratory for exploring some of the first topics children learn in school: color, shape, and size. Understanding these concepts is important because your child uses them in observing, comparing, and discussing all she sees and encounters. The ability to notice, use, and voice similarities and differences are at the heart of beginning math, science, and reading skills. For example, reception for acquaintance with the shape. Eat a square meal. We have all heard of the importance of eating a square meal of healthy foods, but why not have a really "square" meal? Serve waffles (big and little squares) with a side dish of pineapple chunks for breakfast. Have a snack of square cheese slices on square crackers placed on a square napkin. As you are preparing and enjoying your meals, ask your child to notice the similarities and differences between the different squares. Help her notice that all the squares have four sides, but can be various sizes. For a fun challenge, give your child a slice of pre-wrapped American cheese. As she unwraps it, ask her how she can fold her cheese square into a triangle (point to point). One way to focus on a particular color is to have a meal all in the same color. This will help your child to not only focus on learning the name of a particular color, but also it will help her see the many different shades of a particular color. For example, not all oranges are the exact same shade and so on [4, p. 3].

Julie Sarama, PhD, and Douglas H. Clements, PhD offer are some activities parents can try at home to support math learning:

1. Play with many different but ordinary objects. Children stretch their imaginations when they play with ordinary objects. Many of these have interesting geometric properties. For example, some cylindrical objects, such as paper towel rolls and toilet paper rolls, can be looked through, rolled, and used to represent objects such as towers in a castle. All these activities develop the foundation of understanding three-dimensional shapes.

2. Play with the same objects in different ways. Creativity and thinking are enhanced if children play with the same object in different ways. When the box is a container, then a house, then stairs, then cut apart into a track for a car, children see the relationships between shapes, real-world objects, and the functions they serve.

3. Play with the same toys again and again. Some materials are so beneficial that all children should play with them again and again throughout their early years. Blocks for all ages, Duplos, and Legos, at the right age, can encourage children to build structures, learn about shapes and combine them, compare sizes, and count. They also learn to build mental images, plan, reason, and connect ideas. Sand and water play are invaluable for learning the foundations of measurement concepts. Creating patterns and designs with stringing beads, blocks, and construction paper develop geometric and patterning ideas. Puzzles develop spatial thinking and shape composition.

4. Everyday objects can be fun, as is playing with constructive toys again and again. However, buying too many different types of commercial toys can decrease children's mathematical thinking and creativity. Less can be more! Rotating toys keeps children interested.

5. Count your playful actions. Many games and playful activities just call out for counting. How many times can you bounce a balloon in the air before it touches the ground? How many times can you skip rope?

6. Play games. Card games, computer games, board games, and others all help children learn mathematics. They count dots on cards and spaces to move. Counting helps them connect one representation of numbers to another. They learn to instantly recognize patterns of numbers, such as the dot patterns on dice or dominoes. Some games involve using a timer. Concentration and Bingo involve matching. Checkers and Candy Land involve spaces and locations.

7. Play active games. Beanbag tossing, hopscotch, bowling, and similar games involve moving and distances. Most of the games involve numbers and counting for score keeping, too. Games such as "Mother May I?" involve categories of movement. "Follow the Leader" can be played using math concepts, such as announcing you will take five large steps backward, then two small steps to the side.

8. Discuss math playfully. Math will emerge when you help your children see the math in their play. Talk about numbers, shapes, symmetry, distances, sorting, and so forth. Do so in a playful way, commenting on what you see in the children's constructive play.

9. Provide ample time, materials, and teacher support for children to engage in play, a context in which they explore and manipulate mathematical ideas with keen interest [5, pp. 10-11].

*Preschool* and *kindergarten* children can learn much from playing with blocks (Jensen and О'Neil, 1982). They can

* compare and seriate shapes. Start with single shapes and have children compare two pieces according to size. Later, more pieces can be added un­til several items of one shape can be seriated;
* classify and name shapes. Provide two shapes at first then, after much practice, add a third and fourth. Make large loops of yarn on the floor or provide boxes to place the blocks in. A good game to play for naming is Pass the Block. Children sit in a circle and, as music plays, they pass blocks in one direction. When the music stops, each child names the shape he or she holds;
* trace and feel shapes. Children trace around a block with pencil, then color it in if desired. With a little practice, they can superimpose different shapes on one paper, coloring in some of the sections. Blocks can also be used as items in a "mystery bag." Two or three familiar shapes are placed in a bag and children take turns reaching in, feeling a block, and identifying its shape.

Plane figures can be explored through active interaction. Colored tape is laid on the floor in geometric shapes large enough for children to walk on. Ask the children to jump, walk, crawl, and so on across specific shapes. They might count the number of children who can fit in one triangle or the number of steps it takes to walk the perimeter of a square.

*Kindergarten* and *primary* children continue to learn best from working with manipulatives and may find the illustrations in math textbooks confus­ing. Some materials that are appropriate are tiles, pattern blocks, attribute blocks, geoblocks, geometric solids, colored cubes, and tangrams. Computer games in which geometric shapes appear from different angles help children overcome their misunderstandings of book illustrations, which may show a shape from only one or two viewpoints. Some appropriate activities are building structures with various types of blocks to enhance spatial visual­ization. Folding and cutting activities such as origami or snowflake making, exploring the indoor and outdoor environments to identify shapes and an­gles made by people and nature, reading maps, making graphs, playing Tic-Tac-Toe, Battleship, and other games that use grid systems [6, pp. 458- 459].

All day long there are opportunities for children to increase their awareness of mathematics in the world around them. Mathematical phe­nomena may not always be as obvious as those of language, however. Thus, the teacher must take extra care to include mathematical learning whenever natural learning situations arise. Often this means recognizing opportunities to incorporate mathematics into other areas of the curriculum.

**CONCLUSION**

Mathematical learning for young children is much more than the traditional counting and arithmetic skills; it includes a variety of mathematical concepts (classification, ordering, counting, addition and subtraction, measuring, geometry).

Children may begin some simple work with geometry in primary school. Main goal of beginning geometry is to teach children to recognize the most simple shapes—the square, the circle, the triangle, and the rectangle. Teaching such basic terms simplifies classroom explanations and lays the foundation for future work with geometry.

By age six, children often have stable yet limiting ideas about shapes. It’s possible to broaden child's understanding by pointing out a variety of examples — squares that are many sizes and triangles that are "long," "skinny," "fat," and turned in many directions.

Thus teachers must keep in mind that children learn geometry most effectively through active engagement with toys, blocks, puzzles, manipulatives, drawings, computers and teachers!

It’s possible to develop deeper thinking about shapes not just through hands-on activities and discussions, picture books but through playing. In primary school playing is used as the main method of teaching.

Huge experience of using games and playing exercises during the children’s studying of mathematics (and geometry) is accumulated in practice of working of preschool organizations.

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