SCRIPT

Magical Math Experiences for Early Childhood Classrooms

Slide # 1 Introduction

Welcome to Collaborative for Children’s Online Child Care Provider Training Program, hosted by the Texas AgriLife Extension Service. “Magical Math Experiences for Early Childhood Classrooms” is a course designed to help you learn more about math in the early childhood classroom in preschool settings. In addition to providing you with an overview of the topic, this course will offer some practical tips on how to best support children in the classroom.

Slide # 2 Course Objectives

During this module we will:

• Explore the concept of mathematics in an early childhood setting,
• Understand how mathematical concepts develop from the simple to the complex,
• Examine and identify the five math content areas,
• Develop strategies for integrating mathematical concepts throughout the day,
• Understand the importance of connecting mathematical concepts to literacy, and
• Understand the process for creating a math rich environment in the classroom.

Slide # 3 Position Statement from the National Council of Teachers of Mathematics and NAEYC

Let’s start by looking at what the National Council of Teachers of Mathematics and the National Association for the Education of Young Children have to say about mathematical experiences for young children:

“The National Council of Teachers of Mathematics and The National Association for the Education of Young Children affirm that high-quality, challenging, and accessible mathematics education for 3 to 6-year-old children is a vital foundation for future mathematics learning. In every early childhood classroom setting, children should experience effective, research based curriculum and teaching practices. Such high quality classroom practice requires policies, organizational supports, and adequate resources that enable teachers to do this challenging and important work (2002).”

The purpose of this module is to help the classroom teacher develop an understanding of what this should look like in his/her classroom.

http://www.nctm.org
http://www.naeyc.org

Slide # 4 How Children Learn
Each and every day, people learn something new. Children are no exception. How children learn, however, is important to consider. Children learn through:

- **Experience.**
  - As children go through their daily lives, they construct their knowledge of the world from the experiences they, and others around them, have. They learn about their world by doing or not doing something, and experiencing the results of their choices. They learn by actively trying something over and over again to see if there is ever any variation in the outcome, and why or why not.

- **Interaction.**
  - They take the knowledge that they have constructed and try it out through interacting with other children, adults, and their environment.

- **Observation.**
  - Children learn through observing what happens, other people’s reactions, reflecting on their findings, imagining endless possibilities, asking questions, and formulating new answers.

Children must be active participants in their own learning in order to build a strong foundation of knowledge – one they can build new knowledge on.


**Slide # 5    How Children Approach Learning**

Children who are **enthusiastic** and **engaged** in learning tend to be more successful at learning. These children are:

- Interested in what they are doing.
- Take pleasure in what they know and have learned.
- Are willing to take risks to discover what they want to know.
- Are motivated to expand their knowledge level.
- Have developed the persistence necessary to reach the end of a task.
- Have the ability to focus their attention on a small concept (rather than becoming overwhelmed by too much information), and
- Have begun their ability to regulate their emotions (feelings, thoughts and behavior).

Understanding how to be supportive of young children in their learning development is important in helping children become successful learners.


**Slide # 6    Math in the Early Childhood Setting**
In an early childhood classroom, mathematical experiences should be embedded in all that the children do. It should be a part of other activities you are doing.

Remember:

- Young children are natural learners.
  - As they go about their daily experiences in the classroom, children should be counting, comparing, sorting, and describing as they play. “Math is helping them to make sense of the world around them and teaching them to reason and problem-solve. It's not limited to a specific period or time of day,” says Marilou Hyson, associate executive director for professional development at the National Association for the Education of Young Children (NAEYC), (Townsend-Butterworth, n.d.). One-to-one correspondence (this is the matching of one thing to another, such as the matching of the number “3” to three buttons) can be demonstrated as they set the table for snack or pass out crayons and paper. Sorting animals by common attributes or features demonstrates an understanding of how to develop sets and groupings. As children interact with each other and the environment, mathematical concepts become a natural part of their play. This is something that teachers can plan for and encourage.

- Young children can begin to understand many concepts through experience.
  - Many experiences, especially when they are new or unfamiliar, are actually easier to comprehend when they are physically experienced. Think back to how you learned about building towers. Did you learn about how to build them from reading books, and looking at pictures? Or did you learn from actually building one? Initially, you come to understand the physics of tower building by actually building one. How many towers had to fall before you discovered that the little blocks had to go on top? When did you figure out that a large flat block worked best for the bottom? Once you understood the physics of how towers are built, then you could build on that knowledge in other ways, such as by looking at books or pictures. For many people, children especially, being able to physically experience concepts helps them make sense of what they are learning. Talking about these concepts during play enhances this. Ask children questions about why they are doing things and why things did or did not work.


**Slide # 7  How Math Concepts Develop**

Here are a few important mathematical concepts to remember:

Math concepts...

- Are sequential.
  - Mathematical concepts build on each other in a logical, predictable way. They are like building a house. You must have a good foundation to hold up the windows and doors. For children to be successful in understanding mathematics,
careful consideration must be given to teaching each concept in the correct order and not jumping around. Once children feel comfortable with a concept, they will naturally move on to the next level themselves. A good strong foundation in the early years can lead to future school success.

Math concepts…

- Build on each other.
  - In counting skills, for example, children need many opportunities to orally count and recite numbers before they are ready to write the number symbol. They need to count and manipulate objects to form various amounts to cement their understanding of what the value of a numeral means. Once they are comfortable with the value of a number, then the number symbol can be assigned. A number symbol is an abstract idea. Someone a long time ago decided that a wiggly line shaped in a certain way would be called “three.” It is an accepted fact that everyone has agreed on, and in order to use it, you must memorize it. Children must go through the various stages and construct their understanding of value before they are ready to move to the understanding of abstract symbols. The good news is once they have had enough experience (and only the child knows when that happens) it is easy for them to move up to the next level. The bad news is, unless the child is ready, moving to the next level will not be successful and the child will have difficulties.

Finally, math concepts…

- Move from the simple to the complex
  - Piaget wrote extensively on how children develop concepts and the four stages of cognitive development that all people go through. In the Sensorimotor stage (birth - 2 years old), a child interacts with his/her environment through physical actions (sucking, pushing, grabbing, shaking, etc.) This interaction helps build the child’s cognitive structures about the world and how it functions or responds. Object permanence (knowing that things still exist when out of view) is also discovered. In the Preoperational stage (ages 2-7), a child is not yet able to form abstract conceptions, but must have hands-on experiences and visual representations in order to form basic ideas. Typically, these experiences must occur repeatedly before the child grasps the cause–and-effect connection. Once the child feels comfortable in his/her understanding, then he/she is able to move into more symbolic or abstract thought. Hands-on experiences are the key to a child’s success. Moving into abstract or symbolic thought before the child is ready keeps the child from being successful. Hands-on experiences cannot be rushed or skipped. The child will demonstrate when he/she is ready to move on by showing an interest in the next level.

http://ripon.edu/macs/summation

A detailed list of specific mathematical concepts would be very extensive. For the purposes of this module, we will examine five groups of concepts that are important for young children to build a solid foundation of formal mathematics, as outlined in the Texas Prekindergarten Guidelines (2008). It should be noted that these guidelines are written as outcomes to show what a child should know by the end of the prekindergarten year. This is the minimum expectation, however. Most children know much more.

All children come to school with some level of informal or intuitive mathematical concepts already present (Copley, 2010). These intuitive concepts have been developed through the child’s experiences, interactions with, and observations of his or her world. For example, many children come to school with the idea of what counting is or the ability to recognize simple shapes. It has been a natural part of their daily play since they were very little. It is the teacher’s job to help them build on what they know, develop a deeper understanding, and then extend their knowledge into new understandings. It should also be noted that, just because a child has constructed an understanding of a concept, does not mean it is a correct understanding. Their level of understanding is directly related to their level of cognitive maturity. A young child might tell you that they are 3 years old, but hold up five fingers. This demonstrates that they have a general understanding that everyone is a certain age, but no idea what three means or what its value is. This is not a problem, but just demonstrates that they need more opportunity to explore number concepts.

The five concept groups in the Mathematical Domain are:

- Counting Skills
- Adding To/Taking Away Skills
- Geometry and Spatial Sense Skills
- Measurement Skills, and
- Classification and Patterns Skills

Each domain will be examined individually in the following slides.

Texas Prekindergarten Guidelines 2008
www.tea.edu

Slide # 9 Counting Skills

Children learn about numbers by counting things and talking about the results. They might say, “Mary has five barrettes in her hair. Tamisha has four.” They read counting books like Richard Scarry's *Best Counting Book Ever* (2010) and recite finger plays about numbers, such as *Five Green and Speckled Frogs*. They count how many people are in their classroom and how many carrots are on their lunch tray. Their day is spent counting, gathering the data, and comparing the results. Counting concepts that will be covered in prekindergarten include teaching children:
• That objects or part of an object can be counted.
• To recite number words in order up to 10.
• To count 10 items with one count per item.
• To demonstrate an understanding that the order of the counting sequence is always the same, regardless of what is counted.

Video: *Coloring Water*

The water table has long been a staple in preschool classrooms. Children find the large scale and immediate effects of their actions on water well suited for group play. These same attributes may serve to generate an occasional game of “Let’s see what will happen if…” Watch this clip to see how one teacher uses the water table as a giant color-mixing bowl. The children decide what color to use and how many drops of food coloring to add. They are asked to predict what will happen when red is added to blue. “Purple!” a young girl cries out. The drops are added and together the children vigorously stir the water. Each time, the children want to add ten drops and count out in unison as the drops are added. A different number is offered, “four,” by a boy outside the group. The teacher makes the game fun by allowing the children to pick the number and count out the drops together. This allows practice of counting in a fun way that adds a cause and effect educational instructional component. What activities do you do through the day in the classroom where children can practice their counting skills?

Texas Prekindergarten Guidelines 2008
www.tea.edu

**Slide # 10  Count Skills Continued**

Other concepts covered in prekindergarten include teaching children:

• To count up to 10 items and demonstrate an understanding that the last count indicates how many items were counted.
• To demonstrate an understanding that items can be counted in any order.
• To use the verbal ordinal terms “first” to “fifth” and “last”.
• To verbally identify without counting, the number of objects from 1 to 5. And,
• To recognize one-digit numerals 0-9.

Let’s watch some children as they try and determine how much to price cartons of eggs based on how many are in each carton. What counting skills do they understand, and which ones have they not quite mastered? In the end, does their strategy make sense?

Pause the video as needed to write down your answers.
Slide # 11  Adding To/Taking Away Skills

Very young children can add (join) and subtract (separate) objects and count the results. This experience needs to be done using concrete manipulatives so that children can see it as they talk it out and move the pieces. Children must be comfortable with counting objects and naming numbers to begin adding or subtracting. They will discover that when adding numbers, the answer is always bigger than what was started with. With subtraction, the answer is always smaller. This is a concept that should be discussed with children as they do the activities. To understand this, they must understand what the value of a number is. In the classroom they might say, “John has five Lego blocks and I have four Lego blocks. John has more than me,” or “How many more do I need to equal John?” The understanding comes from manipulating the pieces to solve the problem. Please remember that preschool children are not ready to work in the abstract of number problems written out for them to solve. Save the paperwork and workbook pages for later grades. Preschool children need to work with real objects to solve mathematical problems. According to the National Council of Teachers of Mathematics (Copley, 2010, p.46), counting and adding to/taking away skills should be the most emphasized concepts in an early childhood math curriculum.

Adding to/taking away skills include when the child is able to:

- Solve or makes a verbal word problem for adding up to five items.
- Solve or makes a verbal word problem for subtracting 1 to 5 items from a set.
- Use informal strategies to share or divide up to 10 items equally.

What kinds of activities do you do in your classroom to help children develop these concepts? If this is an area that you need to develop, work on a few activities for each concept.

Slide # 12  Geometry and Spatial Sense Skills

Our world is made up of shapes of various sizes, positions, directions, and forms. Sometimes, shapes can be combined to create new shapes (for example, when two triangles are placed
together a diamond is formed.) In contrast, regardless in what direction a square points, it is still a square. The study of geometry revolves around the study of shape, and it is a foundational skill in the understanding of mathematics. When children first explore shapes, one-dimensional shapes (squares, triangles, and circles, for example) are appropriate. Once a child has mastered these, other shapes should be introduced. When a child has a firm understanding that a square has four equal sides, then it is an easy jump to understand that it becomes a rectangle when two of the four sides are longer than the other two. Once the child has an understanding of one-dimensional shapes, then three-dimensional shapes and models (such as spheres, cones, or cubes) can be added. The goal is to start with the simple and then move into the complex.

Just as geometry is used to describe the world around us, children describe their position in their world in relation to the people and objects around them. This sense of awareness of their location is called spatial sense. For children to develop spatial sense, they must experience it. In prekindergarten, location words help a child demonstrate their understanding of spatial knowledge or their position in relation to the people and things around them. To help children understand what “over” or “under” means, you might have them physically go under or over something. The words are abstract labels and have no meaning without an action being attached to them. It is the teacher’s job to provide the action and help the child link the word to it. Spatial sense activities need multiple opportunities and variety to help the children build their understanding. According to the National Council of Teachers of Mathematics (Copley, 2010, p.46), geometry and spatial sense skills should be the second most emphasized concepts in an early childhood math curriculum.

Geometry and spatial sense activities will include teaching the child to:

- Recognize common shapes.
- Create shapes.
- Demonstrate use of location words (such as “over,” “under,” “above,” “on,” “beside,” “in front of,” “near,” “far,” etc.) And to,
- Slide, flip, and rotate objects, understanding that the shape remains the same.

How do you develop these concepts in your classroom? Pick one activity for each and jot them down.

Texas Prekindergarten Guidelines 2008
www.tea.edu

**Slide # 13 Measurement Skills**

Children compare, measure, or judge things that they encounter in their world every day. They want to know how much something weighs, who has the biggest, or how far they have jumped, to bring order and help them understand their experiences. In everyday life, children use and develop their own concepts of volume, area, length or other attributes that involve measurement. They think in non-standard units and in general terms. Adults are different. We have been measuring the world for a long time and have standardized our understanding of measurement.
When we talk about a foot, we mean 12 inches. When a four-year-old talks about a foot, they mean that thing that is attached to the end of the leg. Standard measurement (1 cup = 8 ounces, a foot = 12 inches, or a pound = 16 ounces) is for adults who have a firm understanding of measurement and can think in the abstract. In Texas, standard forms of measurement are taught at the end of 2nd grade and are considered an abstract concept. For younger children, when we are teaching about measurement, we are talking about non-standard measurement (more or less, or tall or short, for example).

Young children should have ample opportunities to explore the following concepts. Sand/water tables are a great place to try these ideas out. Guessing, predicting, and estimating should be a regular part of the day. Right or wrong is not the point -- the objective is to have the experience and the discussion of what happened. According to the National Council of Teachers of Mathematics (Copley, 2010, p.46), measurement should be the third most emphasized concept in an early childhood math curriculum.

Measurement skills should include:

- Recognizing heights or lengths of people or objects.
- Recognizing how much can be placed within an object.
- Recognizing weights of objects or people. And,
- Using language to describe concepts associated with the passing of time.

Let’s look at a short clip of some children as they problem solve how to measure for curtains on the puppet stage. What concepts do the children understand from listening to their conversation? What do they not understand? How do they work out their solution?

Video: Measuring to Size

Texas Prekindergarten Guidelines 2008
www.tea.edu

Slide # 14 Classification and Patterns Skills

Children are bombarded daily with a huge amount of data to absorb and make sense of. Classification becomes a critical tool in helping a child organize their world. Consider how you feel when you first come into an unfamiliar room. Your senses immediately begin to classify objects in the room as something you know or do not know, things that are safe or not safe. Based on this information, you decide what to do. Children are the same way. What is unique to children is that they have limited experience in classification and need repeated opportunities and experiences to develop this skill. Piaget had a classic example of a young child who only has had experiences with four-legged animals that meow. He understands that four-legged animals who meow are called cats, but what happens when he encounters a four-legged animal that
barks? He calls it a cat, and an adult corrects him, saying it is a dog. Now the child has to assimilate (or add) that information into his understanding of a four-legged animal, making a new category. A child has a lot to understand when classifying.

Another component of classifying is organizing the data so that it makes sense to the child. There is no end to the possibilities of topics to organize into graphic representation. Who likes which color apples, how many boys or girls are in the classroom, or favorite characters in a story, are just a few examples. The point to the graphic representation is to provide order to a large amount of data.

Along with organizing data comes identifying and recognizing patterns in our daily lives. Patterns are predictable and can be easily identified by finding the repeat in whatever is being patterned.

Classification and Pattern skills include:

- Sorting objects that are the same and different into groups and uses language to describe how the groups are similar and different.
- Collecting data and organizes it in a graphic representation.
- Recognizing and creating patterns.

Let’s watch a video of a young girl as she sorts different color bears into matching cups. How does the teacher set up the activity? How does she know that the child has mastered the concept? How does the child demonstrate mastery?

Video: *Clever Mistakes*

Texas Prekindergarten Guidelines 2008
www.tea.edu

**Slide # 15 Strategies for Teachers to Promote Math Skills**

Children in preschool are learning new things and having new experiences at a rapid rate. Unfortunately, a child’s brain is not always ready to accept everything they experience or encounter, since it is still relatively immature and developing. When experiences and information are new, it may take a good deal of thinking for children to access that knowledge or skill set. The good news is, with enough active experiences, the necessary skills become more automatic and effortless.

The following ideas for strategies that promote math skills in the early childhood classroom are from Copple & Bredekamp, *Developmentally Appropriate Practice*. To maximize children’s experiences with math in the classroom, they say to:
• Create learning environments to ensure that children “bump into interesting mathematics at every turn,” (Greens, 1999, pg 46).
• Investigate with children, observing what they do and say.
• Answer children’s questions and pose interesting questions and ideas for them to think about. And,
• Introduce the language of mathematics into everyday situations, and serve as an example by modeling math communication and investigation.

Never miss an opportunity to engage children in conversations about what they are experiencing.


Slide # 16  Math Opportunities in the Classroom

Mathematical opportunities abound in the early childhood classroom, and it is the wise teacher who identifies and uses those times to help children deepen their understandings. For the next several slides, we will look at different times in a prekindergarten classroom schedule when the five mathematical concepts (Counting Skills, Adding To/Taking Away Skills, Geometry and Spatial Sense Skills, Measurement Skills, and Classification and Patterns Skills) might be supported. These examples are only the beginning. How many more ideas do you have?


Slide # 17  Math Opportunities in the Classroom – Circle Time

Circle time is whenever the teacher and children come together to discuss the calendar, weather, classroom events, or other such things. Mathematical opportunities can include:

• Counting Skills
  o Count how many days we have been in school.
• Adding To/Taking Away Skills
  o Compare how many boys and girls are here today. Ask questions like, “Are there more girls than boys?” or “How many children are not here?”
• Geometry and Spatial Sense Skills
  o Do a finger play about different shapes.
• Measurement Skills
  o Talk about the weather and discuss how it might change as the day goes on.
• Classification and Patterns Skills
  o Make a chart of what the weather has been each day.
Slide # 18  Math Opportunities in the Classroom – Center Time

Center time is organized around small groups of children working cooperatively in areas developed by the teacher to highlight a specific skill, concept or subject. Math skills are not just for the math center – they can be incorporated into all of the traditional centers, or highlighted in a center designed to provide the children with a specific experience. Here are some ideas for ways mathematics can be either incorporated into or actually become the center:

- Counting Skills
  - Put large number signs on your centers, asking children to count the children already in the center, to see if there is room for them to come and play.

- Adding To/Taking Away Skills
  - Set up a pan with about 1 inch of rice covering the bottom. Gather an assortment of scoops and bowls. Have the children estimate how many scoops it will take to fill up the bowls. Put in and take out rice to try out answers.

- Geometry and Spatial Sense Skills
  - Set up an obstacle course as one of your centers. Give the children directions (go over, under, behind, etc.) that will demonstrate their understanding of spatial sense.

- Measurement Skills
  - Set up a measurement center with a variety of objects to be measured. Give the children white boards on which to record their measurements and results. And,

- Classification and Patterns Skills
  - Set up a center with a variety of colorful macaroni and beans. Have the children sort the macaroni and beans into different categories. Once they have explained how they sorted the materials, have them make a pattern using the materials.

Slide # 19  Math Opportunities in the Classroom – Transitions

A transition is the time when children change from one activity to another. This might require them to leave the room or move to a different area of the classroom. Regardless, transitions need to be well-planned and organized to help the children move smoothly into the next activity. Well-planned transitions help the children remain focused and ready for instructions. Examples include:

- Counting Skills
• Have a child clap his/her hands and the other children count and identify how many times the child clapped.

• Adding To/Taking Away Skills
  o Give the children a word problem and have them physically act it out. For example, “Today we have 5 girls and 4 boys in class. How many children are here in all?”

• Geometry and Spatial Sense Skills
  o Play Simon Says using location words, such as, “put your hand on top of your head”.

• Measurement Skills
  o Ask children to line up by height, shortest to tallest, or tallest to shortest. And,

• Classification and Patterns Skills
  o Ask children to line up by certain attributes, such as the color of their shoes.


Slide # 20  Math Opportunities in the Classroom – Lunch/Snack

Whether you are in a full or half-day program, eating together can provide many mathematical opportunities and discussions. When trying some of these activities, the children should understand that we are not playing with the food; we are having mathematical discussions about what we are eating. Examples include:

• Counting Skills
  o Count how many you have of each food. For example “I have six raisins and five pieces of cereal. How many do you have? How many do other children have?”

• Adding To/Taking Away Skills
  o Count how many you have of each food. For example, “I have six peas on my spoon. I am going to eat two of the peas. How many will I have left?”

• Geometry and Spatial Sense Skills
  o Look for shapes in the food that is being served. “What shape is your sandwich cut up into?”

• Measurement Skills
  o Compare the different lengths of your food. Which is heaviest or lightest? And,

• Classification and Patterns Skills
  o Make a pattern with your food. For example, take one bite of your sandwich, one bite of carrot and a sip of milk. What would come next?


Slide # 21  Math Opportunities in the Classroom – Recess

13
While recess should be a time for children to run around and get rid of excess energy, it can still be a time for mathematical opportunities. Everyone does not need to participate in the following activities - they are great opportunities for one-on-one time with students. These include:

- **Counting Skills**
  - Count how many times you can hop on one foot.
- **Adding To/Taking Away Skills**
  - Make a pile of acorns that you have gathered. Divide them up and leave them under a tree to feed the squirrels.
- **Geometry and Spatial Sense Skills**
  - Paint shapes on the sidewalk with water.
- **Measurement Skills**
  - Count how many steps it is between each piece of equipment on the playground. And,
- **Classification and Patterns Skills**
  - Line the class up in a pattern to go inside (for example, alternating boys and girls).


**Slide #22  Literature Connection**

Integrating your curriculum provides many benefits for children. Learning how various domains impact a topic helps children develop a deeper understanding about the subject. For example, if children are learning about bugs in science, it is a natural progression to graph various types of bugs in math, or write stories about bugs in language arts.

Questions that should be considered in building a literacy connection are:

- Why is it important?
- How do children benefit?
- How do I choose books? And,
- Where can I get them?

We will address each of them in the following slides.


**Slide #23  Why is the math/literature connection important?**

Building a connection between literacy and mathematics, when done properly will:

- Provide a meaningful context for mathematics.
• Demonstrate that mathematics develops out of human experience.
• Celebrate mathematics as a language.
• Integrate mathematics into other curriculum areas.
• Foster the development of number sense.
• Support the art of problem posing and solving. And will,
• Reinforce the idea that MATH IS EVERYWHERE.

Marilyn Burns
http://www.mathsolutions.com

**Slide # 24 How do children benefit?**

Using children’s literature to help children learn and extend their mathematical knowledge has many benefits. Books:

• Provide children with a structure within which they can explore the mathematical concept.
• Pose questions that encourage children to use higher level thinking.
• Encourage children to look closely at their world.
• Invite children to use the pattern of the story to create a new similar story.
• Encourage children to interact with the story and math concepts until they are comfortable in their understanding.

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**Slide # 25 How do I choose books?**

Consider the following guidelines when choosing a book to teach a mathematical concept:

• Select books that are good literature to begin with.
• Look for literature that presents mathematical concepts that make sense for the age student that you are working with.
• Consider whether or not the book is engaging and age appropriate. And,
• Be sure the mathematical concept is accurately presented.

There are many resources available on the Internet that compiles lists of books containing mathematical concepts. As a resource to this module, a list has been provided in the reference section that presents a variety of books that support the five mathematical concepts contained in the Texas Prekindergarten Guidelines.

http://www.mathsolutions.com

**Slide # 26 Where can I get them?**

There are a variety of sources for quality literature.
• Commercial Books
  o Internet sites such as, http://www.barnesandnoble.com, http://www.amazon.com/ and http://www.ebay.com are good sources of children’s books. Searching the sites with specific math concept words will help narrow down the hits (i.e. “measurement” in the children’s book section).
  o http://www.childrenspicturebooks.info/articles/picture_books_for_math.htm is an excellent site that has lists with description of books with mathematical concepts.

• Class Books
  o Making books as a class is a great way to combine math and literacy. For example, you might write a book about a trip your class took to the zoo. Each child writes a page about one kind of animal he/she saw, labeling it with how many he/she saw. For example: “Megan saw four lions,” - her drawing would be about four lions. Once compiled into a book, the children can read and count their way through their trip to the zoo.

• Student Made Books
  o Children can make their own mathematical concept books that help reinforce what they have learned. For example, they can make a book about their collections - each page has a numeral on it, and the children cut out that many pictures from magazines and glue them on the page. Then they can take the book home and share it with family members. And,

• Data Books
  o In the classroom, the children should have a wide variety of graphing or Venn diagram experiences. These experiences can be recorded into a data book for future reference and discussion.


Slide # 27  A Math Rich Environment

Every classroom should have a wealth of opportunities to enrich mathematical knowledge. The more children are exposed to mathematical symbols, signs, tallies and graphic organizations, the more mathematically confident they will become. Here are a few suggestions of ways you can develop a math rich environment in your classroom.

Teachers might include:

• Labels and advertisements by:
  o Including a variety of labels or advertisements that display numbers and mathematical symbols.
  o Bringing grocery advertisements for the children to use to develop shopping lists.
Collecting menus that show prices from various restaurants, or have the class make up their own. And,

Showing the children catalogs that come in the mail (or have them make their own).

**Centers**
- Set up a
  - Store center where children can price and purchase items.
  - Restaurant or coffee shop where the children can order off of a menu and pay for their food.
  - Grocery store center. Have the parents send in empty food boxes or can goods to stock the shelves. And a,
  - Feed/garden store. Stock with small bales of hay, rope, plants, etc.
- Items to consider putting in a center to encourage mathematics are:
  - A cash register
  - Stickers for pricing items
  - Paper and pencils for making lists
  - Balance scales
  - Adding machine tape
  - Adding machines or calculators, and
  - Abacus

**Calendars**
- Use the calendar in the classroom to keep track of:
  - How many days you have been in school.
  - The weekly or monthly weather.
  - How many children have been absent or present each week.
  - Who has brought their lunch and who is buying theirs? And,
  - How many days until a field trip, holiday, vacation, or someone’s birthday.

The calendar can also be used for identifying and making patterns.

**Number Charts/Graphs**
- Graphic representation of gathered data (graphs) should be done with children on a regular basis. Any subject with at least two different categories of information that can be collected can be graphed. Some simple ideas are:
  - The number of boys and girls in the class.
  - The kind of shoes everyone is wearing (tie shoes, Velcro, slip-ons, etc.).
  - The number of people in each child’s family. And,
  - What kinds of pizza the children in the class like.
- Venn Diagrams are another tool for graphically organizing information. Some simple subjects for this activity are:
  - Comparing two different versions of the same story (Little Red Riding Hood, for example).
  - Comparing two different cookies or recipes.
  - Comparing two different physical exercises. And,
  - Comparing two different books from the same author.
To make life a little easier (and to be able to respond to the need for a spontaneous mathematical moment), make a permanent graph and Venn diagram for your classroom.

- To make a permanent graph, take a shower curtain and divide it into equal segments along its length, drawing the lines with permanent magic markers or colored duct tape. Then place the horizontal lines with marker or duct tape. Have the children write their data on sticky notes, and place the notes in the appropriate places on the graph. When the graph is no longer needed, remove the sticky notes and the graph is ready to be used again.
- To make a permanent Venn diagram, you can, again, use a shower curtain and draw the Venn diagram on it. Children write their information on sticky notes, and place them on the shower curtain.
- Buy two hula hoops and overlap them to make an impromptu Venn diagram. Children write their information on sticky notes and place them where appropriate in the hula hoops. And finally,

- **Manipulatives**
  - Having a variety of concrete objects for children to count is critical for children to develop a complete understanding of number sense. Manipulatives can be purchased at teacher supply stores, but they can be pricey and the children tend to take them home as playthings. Low-cost counters can be found by repurposing found objects. Here are some examples:
    - Large lima beans. These can be painted a variety of colors and are fairly cheap. (Be sure to buy the large lima beans as they are easier for little fingers to manipulate and won’t fit into an ear or up a nostril.)
    - Large buttons. Ask parents for donations or go to your local craft or fabric store and look in their bargain bins. You should be able to find buttons that are sold very cheaply because a button is missing from the package or they are out of style.
    - Pebbles or plastic jewels used in flower arranging
    - Marbles
    - Miniature apples or pumpkins
    - Seasonal erasers
    - Large nuts or bolts
    - Plastic fishing worms from sporting goods stores, and
    - Caps from soft drink bottles
  - For different shapes, you can buy plastic canvas at craft stores and cut it into appropriate shapes. These can also be whip stitched into 3-dimensional models/shapes.


Slide #28  Math Rich Environments
A list of items that a teacher might gather to teach mathematical concepts in a preschool classroom would be quite lengthy. The following are some general ideas that would be appropriate. How many more can you think of?

- A variety of manipulatives (Buttons, bottle caps, beans, marbles, etc.)
- Scales, weights, and balances
- Pattern blocks
- Attribute blocks
- 3-dimensional models
- Standard measuring items
- Non-standard measuring items
- White boards
- Paper
- Adding machine tape
- Graph paper
- Sorting trays
- Sticky notes
- A cash register
- A permanent graph, or
- A permanent Venn diagram

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Slide # 29  Resources

- National Association for the Education of Young Children
  - [www.naeyc.org](http://www.naeyc.org)
- National Council of Teachers of Mathematics
  - [www.nctm.org](http://www.nctm.org)
- [www.mathsolutions.com](http://www.mathsolutions.com)

Slide # 30  Conclusion

This concludes the informational portion of the course. Please click on the “Next Section” button at the bottom of this page to proceed to the post-test. If you would like to review any of the previous sections, click on the desired title in the left menu bar.
References

http://www.mathsolutions.com

http://www.naeyc.org

http://www.nctm.org


Texas Prekindergarten Guidelines 2008 www.tea.edu


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