




OFFICE OF
Early Learning
LEARN EARLY. LEARN FOR LIFE



Understanding
the Math

Mathematical Thinking: Rethinking Calendar Time



FLORIDA DEPARTMENT OF
EDUCATION
fldoe.org

www.floridaearlylearning.com

In a traditional calendar time activity, many important math concepts and skills are being addressed such as number sense, patterning and geometric shapes. The question is, does this activity successfully teach these math skills?

The purpose of this PowerPoint Presentation is to understanding the math that teachers may think they are addressing in the calendar time activity and offer more effective instructional strategies to address number sense, patterns and geometric shapes.

Understanding the Math

What is calendar time?

Calendar time is typically a whole group instructional opportunity whereby children can practice “calendar math.”



Calendar time is typically a whole group instructional opportunity where children can practice “calendar math.” Often a wall or poster is set up with an elaborate display of calendar related materials with a 31-day calendar for the present month with possibly a weather bear or even a graph to record windy or sunny days. Months of the year and days of the week posters may be displayed.

Understanding the Math

Temporal (time-based) patterns – hours, minutes, days of the week, etc.

Understanding of temporal (time-based) patterns doesn't emerge for children until around third grade.



The typical calendar time includes asking children “What is today, yesterday, and tomorrow,” reciting the days of the week and months of the year.

It's important for teachers to understand that childrens' understanding of temporal (time-based) patterns doesn't emerge for children until around third grade. Ethridge and King, (2005) reviewed Kindergarten through third grade math curricula and discovered that often in calendar math, the same “script” is used in K-3. This implies that even authors of math curricula do not believe that children will “get” *today*, *yesterday* and *tomorrow* before third grade.

See Resources: Elizabeth Ann Ethridge and James R. King; *Calendar Time in the Preschool and Primary Classrooms: Questioning the Curriculum*.

https://www.researchgate.net/publication/226683017_Calendar_Math_in_Preschool_and_Primary_Classrooms_Questioning_the_Curriculum

What can I do instead? PICTURE SCHEDULES



Children in the pre-operational stage of development (ages 2-7) can think about past and future events but have difficulty in labeling them with yesterday or tomorrow. Their reality of time is more like we have a snack *before* going outside and eat lunch *after* story time.

Picture schedules will support and reinforce children's concepts of *later*, *before*, and *after* throughout the day. Be sure to place them at the child's eye-level and make them interactive.

What can I do instead? WEEKLY ACTIVITIES



A simple representation of the 7 days of the week.



In the calendar time activity, children often sing the “days of the week” song. This will help children learn the names of the days – like singing the alphabet, and are fun for children. However, children will be able to understand what a “week” is when the days are displayed simply, and in order. A simple representation of the 7 days of the week will help children “see” the number of days that make up a week.

A good way for children to begin to understand the difference between, “when I am at school,” and “when I am at home,” is to have Saturday and Sunday a different color or add an icon to represent “home.” Some teachers will begin with Monday and have Saturday and Sunday at the end of the week.

Another way to help them understand each “day of the week,” would be to add an icon for an activity that associates each day of the week with a different activity that takes place, such as *Musical Monday*, *Toss-the-Bean Bag Tuesday*, and so on.

What can I do instead? LINEAR CALENDARS

“The main problem with the calendar is that the groups of seven days in the rows of a calendar have no useful mathematical relationship to the number 10, the building block of the number system.”



Linear calendar



“The main problem with the calendar is that the groups of seven days in the rows of a calendar have no useful mathematical relationship to the number 10, the building block of the number system.” (National Research Council 2009, p.241) Preschoolers will better understand the repetitive nature of counting if a chart is displayed demonstrating the base-10 structure of our number system.

A **linear calendar** is a better representation of the passing of time and looks very similar to a number line. The numbers are placed on the wall in a straight line at eye level for children. The number of days in the month (29-31) provide the opportunity to see the numerals in a row and to understand how numbers begin to repeat. This is an excellent way to address the Mathematical Thinking standard A. Number Sense #2. Counts and identifies the number sequence “1 to 31.”

A linear calendar is easily made using a long sheet of paper with the numbers displayed as a number line. Events for the month are noted or added as they occur throughout the month. When linear calendars are displayed around the room following each month, children will begin to understand how “time” passes.

Understanding the Math

Counting



While counting, patterning and geometric shapes are important skills for preschoolers to learn, doing so using the calendar “does not emphasize foundational mathematics.” (National Research Council, 2009.)

Patterns



Geometric Shapes

During a traditional calendar time, children will often count, use the calendar grid for patterning and sometimes identify shapes.

While counting, patterning and geometric shapes are important skills for preschoolers to learn, doing so using the calendar “does not emphasize foundational mathematics” (National Research Council, 2009, p. 241).

The following slides provide information in helping instructors understand the math for these counting, patterns and geometric concepts and provides suggestions in providing developmentally appropriate and authentic instruction on the skills like counting, patterning and geometric shapes, typically targeted during calendar.

Number Sense is defined as the ability to:

- to understand the quantity of a set
- to know the name associated with that quantity “three”
- to identify the numeral that represents the set.



3



During calendar time, children are asked to count and then to know “how many” and then the find that numeral that represents that number. That process includes many number sense concepts that children are not ready to do especially at the beginning of the year.

In order to understand “how many,” children must understand the quantity of a set and be able to name the word associated with that quantity and to identify the numeral that represents the set. Developing number sense requires children to have a meaningful sense of a number’s quantity. To do so, they need experience using number names to **describe “how many” objects are in a set before using numbers to represent that set.**

Understanding the Math



How many are happy?

What can I do instead? ASK, HOW MANY?



How many girls?, boys?



How many jumps?

#1. Create a class sign in a area where children choose their picture to indicate they are present or answer a “question of the day.” During circle time count the groups reinforcing one-to-one correspondence and comparison vocabulary like more and less and identifying the matching numeral.

#2. During morning circle, count the number of boys (one-to-one correspondence) and then girls. Write the numeral that represents the number of boys and girls.

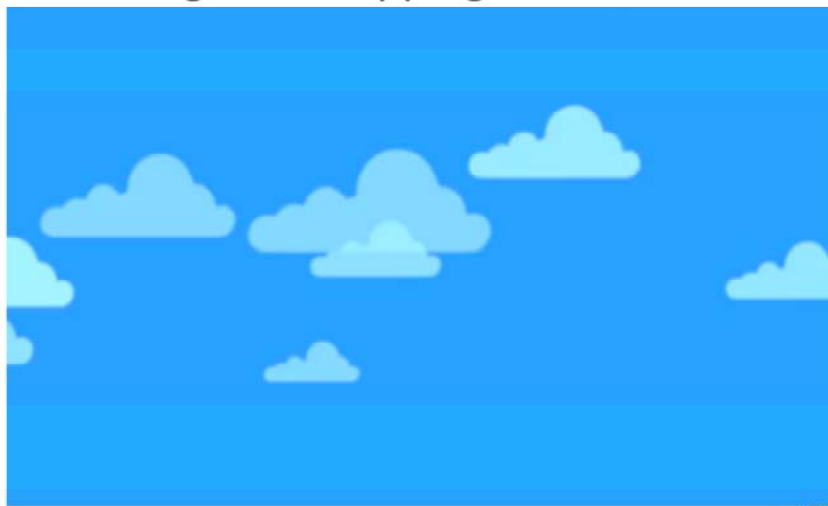
#3. Incorporate music and movement into circle time by rolling a dice and choosing a movement to do that many times (e.g. 4 claps, 6 jumps).

Be sure to display the numerals on a number chart – up to 10 at the beginning of the program and to 20 later in the program.

Note: Use numbers as *adjectives* (e.g. 4 blocks, 2 friends, 5 goldfish) rather than *nouns* (e.g. rote counting number names), **also known as “naked numbers”** (Brownell, Chen, & Ginet, 2014).

See Mathematical Thinking standards A. Number Sense.

Counting - The Hopping Game Video



During circle time, Letia plays the hopping game in which the children choose a numeral and hops the number of times that is indicated. This game provides children many skills – recognizing numeral, matching the numeral to the number of hops and hopping that number (one-to-one).

What do we know about counting?

1. Counting is part of a young child's daily life.
2. We count because we want to know "how many."
3. Counting may seem to be simple but it is really quite complex.



Children do need to know the name of the numbers and the order. During calendar time, however, reciting the numbers together as a group can be frustrating and instructors may not know who actually knows how to count.

Counting is part of young children's daily life.

#1. The boy counts the number of swings as he pushes his friend because it will be his turn when he gets to 10.

We count because we want to know "how many" or the quantity of a collection.

#2 These children sort the animals then count how many of each animal they have in their barnyard.

Counting may seem simple but it is really complex.

#3 The teacher is helping the child understand the concept of one-to-one correspondence when counting.

Two Types of Counting

Rote Counting:

Reciting the number names in order from memory.



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Rational Counting:

Matching each number name in order to an object in a collection.



The main problem with the calendar is that the groups of seven days in the rows of a calendar have no useful mathematical relationship to the number 10, the building block of the number system.” (National Research Council 2009, p.241)

Rote counting is reciting the number names in order from memory.

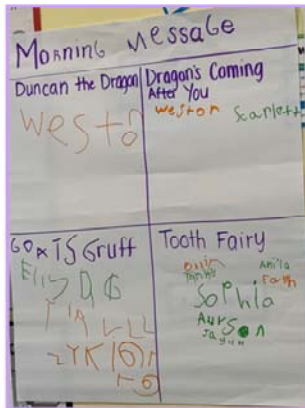
- It is important for children to know the number names.
- Rote counting has its place in the process of learning to count, just as children learn to memorize the alphabet with songs and games.
- However, if group rote counting without meaning is the **ONLY** way you are counting then children are probably bored and you don’t really know who is actually able to count.
- Preschoolers will better understand the repetitive nature of counting if a chart is displayed demonstrating the base-10 structure of our number system.

Rational counting involves matching each number name in order to an object in a collection. (One apple, two apples, etc.).

- Rational counting skills arm children with a tool that enables them to understand the concept of Numerosity.
- Numerosity is knowing that when I count, each number is always one more than the number before it and one less than the number after.
- As children are able to do rational counting, they will begin to compare quantities of different sets, and eventually to engage in “operating” with numbers.
- Rational counting is the foundation for children’s early work with numbers.

What can I do instead? AUTHENTIC REASONS TO COUNT

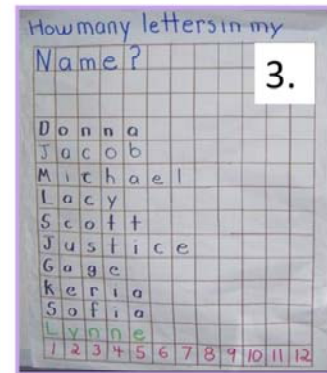
1.



2.



3.



What does “authentic reasons to count” mean?

- Counting for a purpose
- Participate in counting activities that are meaningful
- Use real problem situations

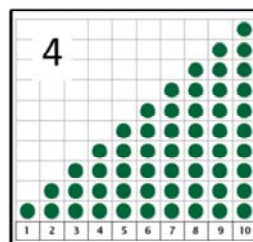
Here are a few examples

#1. The children sign their name for their favorite book, later they count to find out which book was the favorite of most children.

#2. Using daily routines can also offer opportunities to do meaningful counting. These children are counting to 30 as they wash their hands.

#3. Names are meaningful to children, it shows them how the number of letters in their name is a quantity, it provides a real problem situation to find out who has the most number of letters in their name. and also demonstrates quantity.

Patterns All Around!



Patterns are predictable sequences. Our brains are “wired” for patterns. It helps us put seemingly unrelated information together as a whole. Patterns are a foundational skill that supports children in learning the relationship between things.

Think about a baby who drops a spoon over and over again. A pattern is being established and reinforced by his parents facial expression or words or actions as they pick up the spoon and return it to the table. The child is building communication and relationships because he keeps dropping the spoon and you keep picking it up – the child learns how to interact and communicate and build relationships by exploring and controlling his world through this repeated action and reaction which soon becomes predictable. Because, the child keeps doing it and gets the same action!

#1. Patterns are in nature.

#2. This is a pattern even if it is an—/a,a,a,a,a,/ pattern.

#3. Music has patterns – or you can create one with the drumbeat! /boom, boom, bam;/ /boom, boom, bam;/ /boom, boom, bam;/...

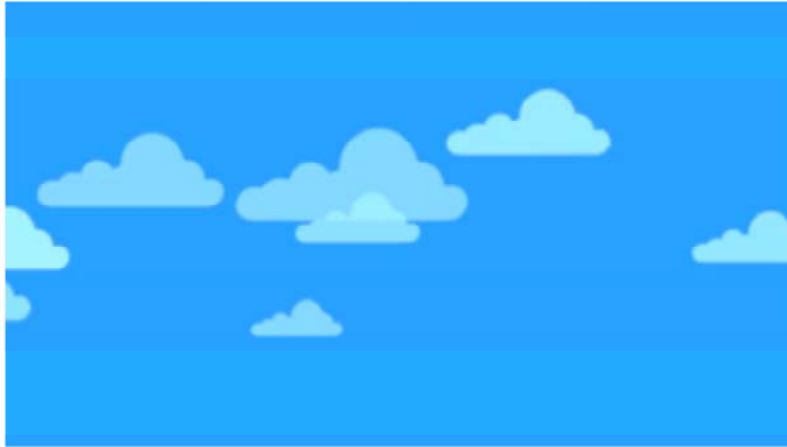
#4. Our counting system is a growing pattern – one number is one more than the one before.

#5. Stories, rhymes, fingerplays often will have a phrase that repeats. For example, “Brown Bear, Brown Bear, What do you see?” has a similar phrase repeated on each page of the book that children quickly learn after several readings.



Understanding the Math

Patterns and Seriation: Learning from an Expert Video



In this video Dr. Sharon M. Carver, Ph.D. from Carnegie Mellon University Children's School served as the expert when the Florida Department of Education Office of Early Learning Voluntary Prekindergarten program developed the Mathematical Thinking online course. She talks about patterns and why knowing patterns supports children math knowledge in school and life.

What can I do instead? EXPERIENCE PATTERNS



Music, Songs
and Fingerplays

Math Concept Books



Patterns in Nature

Children learn about patterns by experiencing patterns. At the beginning of the year children need multiple opportunities and a variety of activities that help children “feel” and understand patterns.

#1 – Many songs and fingerplays have repeating patterns. At first instructors need to point at the pattern when the phrase repeats by saying, “that’s a pattern.” Children will eventually begin to understand what is meant by the word “pattern.”

#2 – There are many books that have a repeating phrases they create language patterns and help children understand about patterns. There are also a variety of math concept books available that focus on patterns.

#3 – Seeing and talking about patterns in nature, for example will help children notice patterns. Be sure to have a variety of pictures that show patterns in nature.

What can I do instead? PRACTICE PATTERNS



Recognize a Pattern

Copy a Pattern



Complete or Extend a Pattern

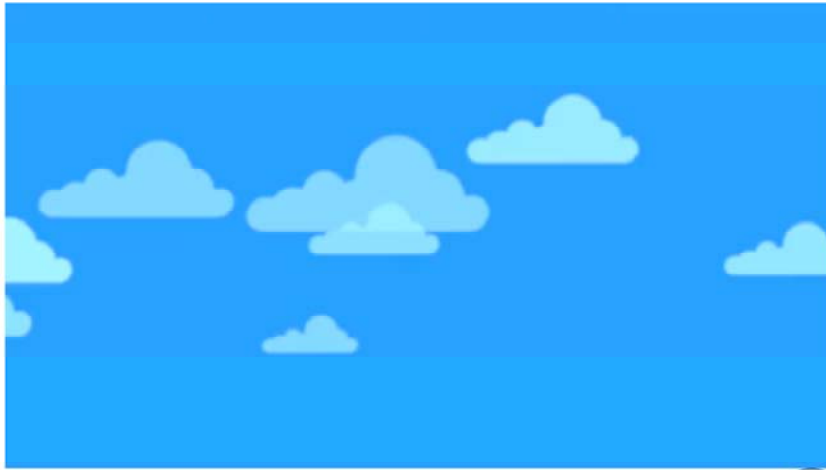
During the calendar time activity, children are asked to recognize a pattern and “extend the pattern” by answering “what comes next in our pattern.” There is a specific sequence for children to learn about patterns. First they need many experiences to recognize and copying patterns before completing or extending them – which usually happens towards the end of a program experience.

#1 When children are playing in learning centers, point out the pattern when you see a child create one during play. Read the pattern with the child to help them hear and feel the regularity (beat, rhythm) of the pattern.

#2 Provide a variety of models for children to use to practice copying patterns. Legos, small cubes, beads, are just a few of the materials that will support children in copying patterns.

#3 When children are ready, you will see them making their own patterns. Be sure to ask them, “what is the unit of repeat?”

Sequence of Patterns – Video



In the following video, the sequence for learning patterns is demonstrated.

REMEMBER...

In order to *recognize* or *extend* a pattern, it must have at least three iterations, i.e., three units of repeat.



In order to recognize or extend a pattern it must have at least three iterations, (three units of repeat). It isn't possible for children to recognize the repeating nature of a pattern when the pattern is displayed on a 7- day calendar grid.

This is a – aab,aab,aab, pattern.

Geometric Shapes



Cubes



Spheres



Prisms



Cones



Square



Circle



Rectangle



Triangle

Geometric Shapes – Geometry is a natural and intuitive part of mathematics. Children understand the spatial world by knowing shape, structure, location and transformation of objects in space (Copley, 2009 pg. 99). The important point is children need to have a strong foundational awareness that there is a close connection between the shapes we see on paper and the shapes of objects in the world.

In the calendar time activity, in order for children to be able to do an activity such as finding the “next shape in the pattern sequence” during calendar time, children need to be able to recognize and name a shape. Learning about shapes happens best when children have many hands-on investigations of two- and three-dimensional shapes and many opportunities answering questions about what makes a shape that shape.

What can I do instead? EXPERIENCE SHAPES



Pattern Blocks



Clay



Grocery Store

Planning activities for children to explore and learn about shapes will provide them with opportunities to see that shapes – both two-and three- dimensional – are defined by rules.

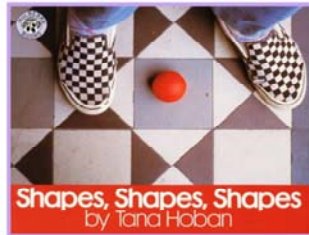
Pattern blocks: Playing with pattern blocks will give children the satisfaction and joy of making shape discoveries for themselves. Activities such as sorting by size, color and shape support children's understanding of attributes as well as the name of the shapes.

Clay is a great way for children to feel how 3-D shapes are different from 2-D shapes. Be sure to have pictures of 2-D shapes along with the 3-D shape it may represent.

Grocery Store: Set up a grocery store in the drama area to help children solidify their understanding of the attributes of shapes by exploring things in the world around them, like boxes, cans, balls, etc. Remember, the “face” of a 3-D shape mirrors the 2-D shape, for example, when looking at the box of Cheerios from the front, side, or the top, you see the rectangle shape.

What can I do instead? TALK ABOUT SHAPES

Shape Pictures



Math Concept Books

Play Guessing Games



Here are some ways to talk about shapes.

Shape pictures Making pictures using shapes engages children in exploring how rotating, combining, and changing size can produce very different effects and how they can be combined and separated to make new shapes.

Math concept books about shapes with real world pictures help children to notice shapes all around them. Take children on nature walks so they can notice and identify the shape of things. Just look on the playground, “Can you see the shapes that make up the play equipment?”

Play Guessing Games – The shape game is a simple one that children enjoy – see the next slide for directions. Other guessing games could be included during the morning circle whereby different objects from the room (like blocks, toys, etc.) can be put in a bag and children feel them and talk about their shape. This helps children use the “language” of shapes.



What Can I do Instead? PLAY the SHAPE GAME

Directions

1. Fill a bag with a variety of shapes.
2. Display all the shapes for the children and discusses the attributes, i.e. a triangle has 3 sides.
3. Return the shapes to the bag.
4. Each person takes a turn to guess a shape by feeling and describing the shape.



Key Points

- By putting the emphasis on the defining attributes, children avoid common misconceptions about what triangles or rectangles actually are. They gain awareness that not all rectangles are the same, even though they have four sides and four corners. Some are sometimes very different depending on their orientation and on the lengths of the sides.
- When we rely on a “superficial” understanding of a shape such as saying a rectangle is “like a door,” or a triangle is like a “piece of pizza”, we rob children of the knowledge they need to generate real working definitions of shapes that will support them later in the study of geometry. .

Understanding the Math

Children learn math by doing math!



Teacher-directed instruction during a whole group setting (like calendar time) typically implies that most of the time, children are sitting, watching and responding when prompted. There are times when whole group instruction is acceptable and provides a balance of learning opportunities.

In the calendar time activity, most of the time children are responding as a group, i.e. providing a choral response. During a choral response, teachers may hear correct answers and assume most children understand the concept or skill. However, usually, only a few are answering, others are parroting answers, if they are participating at all.

Children learn best by doing, in this activity children are mostly watching their peers engage in a routine exercise that repeats daily. Not an enriching learning opportunity for children.

What is the long-term impact on children when they engage regularly in an activity they do not fully understand? They may lose confidence in their intellectual powers and give up hope of understanding many of the ideas teachers present to them. (Beneke, et al, 2008, p.15)

REMEMBER... Math activities need to be FUN!

PLAYFUL

ENGAGING

FUN

EXPLORE

THINK
AND
TALK

Effective math instruction needs to be planned throughout the day with many opportunities for children to participate in math activities.

Be sure activities are playful with engaging materials and plenty of time for children to explore math concept and ideas. It's important that instructors sit with children and allow them to think about and talk about math during play experiences. Most important, math should be FUN for you and your children.

Rethinking Calendar Time

1. Reflect on your current practice of calendar time and make a few notes on how you might change this activity based on what you learned in this module.
2. Reflect on your current math instruction, how will you change your instructional practices?



Rethinking Calendar Time

1. Review the Support Documents and Instructional Resources in the module.
2. Find a teacher/partner, director or coach to support you as you rethink your calendar time activities.





OFFICE OF
Early Learning
LEARN EARLY. LEARN FOR LIFE

Questions?

VPKQuestions@oel.myflorida.com



FLORIDA DEPARTMENT OF
EDUCATION
fldoe.org



Shan Goff

Executive Director, Office of Early Learning
250 Marriott Drive Tallahassee, FL 32399
850-717-8550 • Toll Free 866-357-3239

www.floridaearlylearning.com