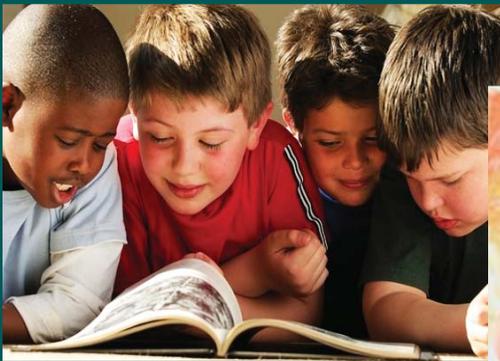


# Nebraska Early Learning Guidelines



## KINDERGARTEN Mathematics



The Kindergarten Early Learning Guidelines were created for Nebraska's kindergarten teachers and school administrators to help enrich the work that takes place in classrooms every day. These guidelines incorporate the Nebraska Standards in language arts and mathematics within each domain, and provide examples of how the state standards can be intentionally taught and informally integrated throughout a range of daily experiences to support optimal learning outcomes for young children. They are a practical resource to support the teacher; they also provide examples of authentic activities and assessments which can be incorporated into the existing curriculum to aid the child's academic and social growth. Within the guidelines, examples of what the learning environment should include, what children should be doing in the classroom, and the role of adults within the school and home community are provided so the reader is able to see how adults, materials, and environments can work together to achieve optimal learning and positive lifetime outcomes for young children.

Knowledge about child development and learning and evidence-based practices in kindergarten guided the writing of this document:

- Teaching and learning environments should encompass the holistic developmental needs of the child including academic concepts and skills along with social and emotional development.
- The kindergarten teacher has a complex and complicated role in the kindergarten classroom which includes providing opportunities and experiences that allow children to come together as a community of learners.
- Learning experiences should be integrated and connected throughout the day. Literacy and other academic activities can occur throughout the day across all content areas and should not be segregated into separate time frames and experiences.
- Opportunities to express new information in a variety of ways (e.g., pictorially, through storytelling, emergent writing), are an essential element of the kindergarten classroom, both for the child to show an understanding of concepts, and as a way for the teacher to assess the child's understanding.
- Academic learning and social and emotional development occur through a variety of daily experiences including teacher directed experiences, child initiated experiences, play experiences, and frequent interactions with adults and peers.
- Observation and documentation, as well as other forms of formative and summative assessment, are essential for effective curriculum planning and instruction.
- Daily opportunities for play provide children with practice of newly acquired skills taught in the classroom, along with supporting the child's development of self-regulation, creativity, and problem solving.

***Most of what I really need to know about how to live, what to do, and how to be, I learned in kindergarten. Wisdom did not lie at the top of the graduate school mountain, but there in a kindergarten classroom.***

***~Robert Fulghum***

These guidelines are dedicated to all kindergarten teachers in Nebraska. Thank you for your passion and dedication to education through your work with our youngest students.

# Kindergarten Early Learning Guidelines

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## Kindergarten Standards

# Mathematics

Number System  
Measurement  
Display

Operations  
Relationships  
Analysis

Characteristics  
Modeling in Context

Spatial Modeling  
Procedures

Most children come into the kindergarten classroom already having begun to build a foundation in mathematical understanding with real-life experiences. Through manipulating objects, stacking toys, building with blocks, and making comparisons through observations, children have experienced mathematical concepts first hand. Teachers can continue to build on this foundation in the classroom by offering a balance of explicit guided instruction within large and small group settings, and through purposeful play.

Quality kindergarten mathematics is not elementary arithmetic pushed down to younger children. The approach to teaching math should be experiential and playful rather than didactic. Children should be invited to experience mathematics through peer initiated and teacher-led activities that allow them to manipulate and experiment with the materials, and then be able to transfer that knowledge to their play activities as they use the concepts and language of math while interacting with peers. Mathematical experiences can also be integrated throughout the daily schedule to promote mathematical thinking and skills as a practical application.

Long periods of time for play and enriched environments are critical for developing children's mathematical ideas and skills (Sarama and Clements, 2009). Effective teachers use both real and pretend situations to encourage children's mathematical thinking. They try to capture teachable moments using open-ended questioning techniques to expand mathematical concepts. The teacher's role also includes encouraging families to continue to develop and extend mathematical learning outside of school.



Assessment of mathematical skills occurs in many different forms. Effective teachers carefully observe children's actions, listen to children's words, and collect a variety of work samples in order to gain insight into the child's level of mathematical understanding. Through this type of observation and collection of documentation, the teacher can assess the child and plan lessons which build upon that current knowledge, while making connections to new concepts.



# Number Sense Standards

- |                 |   |
|-----------------|---|
| 1 Number System | 3 Computation (Mastery not expected at this time) |
| 2 Operations    | 4 Estimation (Mastery not expected at this time)  |

**MA 0.1 Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

Young children develop mathematical concepts through meaningful and active learning experiences throughout their day. These experiences encourage them to engage in the language and properties of mathematics, which helps to create a strong foundation upon which children can build.

Teachers intertwine meaningful ways to incorporate math activities in a variety of contexts and curriculum areas in the kindergarten day. Children graph attendance, measure plant growth, count blocks, and go on a shape hunt to reinforce mathematical concepts. In a classroom where play is part of the curriculum, children have many opportunities to try out new learning with hands-on materials and re-enact real-life situations where mathematics is applied.

Teachers can support the children's learning by encompassing teachable moments in the classroom as well as intentional teaching of mathematical concepts. Teachers also need to plan activities that incorporate the children's natural curiosity and enthusiasm for learning about objects in their environment—both indoors and out.



## Strategies to support inclusive learning environments:

- ❖ Simplify the activity by teaching smaller parts, reducing the number of steps, or using smaller amounts.
- ❖ Provide a variety of manipulatives, including those which provide sensory cues such as texture, bright colors, sounds, etc., to attract the child's interest.
- ❖ Use everyday activities and materials that are available throughout the child's day to provide additional practice opportunities, e.g., how many crackers should Johnny give you.
- ❖ Make sure materials are stable or contained, if necessary, by using a tray, Velcro, or clips.

# Number System

## Scenario

Pedro and Kayla are sitting next to each other during snack time, when Pedro begins counting his crackers, one, two, three, ...twelve. He then counts Kayla's crackers and yells out, "Kayla has more crackers than I do! She has fourteen and I only have twelve!"

## The Learning Environment

*Number sense is defined as "good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating in ways that are not limited by traditional algorithms." (Howden, 1989, 11)*

The classroom environment encourages mathematical understanding through activities that are built into every part of the school day. Manipulatives are accessible to stimulate interest and play upon children's natural curiosity and further their mathematical comprehension of our number system.

Classroom materials:

- Materials for sorting and counting (small blocks, colored bears, colored beads, magnetic shapes)
- Objects that include numbers and number words (clocks, timers, calendars, thermometers, calculators, measuring cups, number lines)
- A variety of writing materials
- Dramatic play props for themed centers (store, bank, and post office)
- Classroom calendar
- Card games, board games, counting books, number lines, manipulatives, play money

## Number System - Standards

**MA 0.1.1 Number System: Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.**

MA 0.1.1a Count, read and write numbers 0-20

MA 0.1.1b Count objects using one-to-one correspondence 0-20

MA 0.1.1.c Sequence objects using ordinal numbers (first through fifth)

MA 0.1.1.d Match numerals to the quantities they represent 0-20, using a variety of models and representations

MA 0.1.1.e Demonstrate and identify multiple equivalent representations for numbers 1-10 (e.g., 10 is 1 and 9, 10 is 6 and 4)

MA 0.1.1.f Demonstrate relative position of whole numbers 0-10 (e.g., 5 is between 3 and 10; 7 is greater than 3)

## Math throughout the day

**Creative Arts:**  
Using clay or playdough to create objects that can be sequenced using ordinal numbers.



**Language Arts:**  
Create a class book using photos showing numbers of items in the classroom: 1 chair, 2 books, 3 children.



**Physical:**  
Play Simon Says (stomp three times, hop two times).

# Number System

## Learning in Action

### The Child

- Explores/discovers number sense through manipulatives, games, books, and play
- Participates in meaningful counting opportunities throughout the day
- Recognizes, writes, and matches numerals to the quantity represented
- Compares and orders the position of numbers

### Adults in the School Community

- Offer counting opportunities through graphing, cooking experiences, finger plays, books, songs, games, and cards
- Provide opportunities to think mathematically, and problem solve through story problems and real life situations (attendance, lunch count, days until vacation)
- Provide opportunities to write numerals using air writing, markers, sand trays, Magna Doodle™, clay, Wikki Stix™, crayons, colored pencils

### Adults in the Home

- Have the child set the table using one-to-one correspondence and counting
- Ask your child to help cook (counting and measuring quantity of ingredients: 1 cup, 2 cups)
- Encourage the child to count items in the home: socks, toys, crackers.
- Create a numbered "to do" or "shopping list"

## Approaches to Assessment

- Collect work samples of number writing
- Listen and record how high children count
- Document mathematical knowledge during daily experiences (How many blocks did it take to build that tower? How many children have returned from the restroom? How many students are taking hot lunch today?)

# Operations

## Scenario

Julia is playing with two dolls in the house area. When Sophia joins her with two more dolls, Julia says, "I have two, you have two, now we have four dolls!"

## The Learning Environment

The classroom provides opportunities throughout the day that will help strengthen the child's understanding of math operations. The teacher can support the student by paraphrasing children's activities, as well as naming the operation and providing the vocabulary words for what they are doing.

Classroom materials:

- Manipulatives for sorting, patterning, seriating and counting (small blocks, colored bears, magnetic shapes, linking cubes)
- Objects that include numbers and number words (clocks, timers, calendars, thermometers, calculators, measuring cups, number lines)
- A variety of writing materials
- Dramatic play props for centers such as shoe store, bank, and post office
- Classroom calendar
- Card games, board games, dice, dominoes, counting books, number lines, manipulatives, play money, pretend play

## Operations - Standards

**MA 0.1.2 Operations: Students will demonstrate the meaning of addition and subtraction with whole number.**

MA 0.1.2a Use objects and words to explain the meaning of addition as a joining action (Two girls are sitting at a table. Two more girls join them. How many girls are sitting at the table?)

MA 0.1.2b Use objects and words to explain the meaning of addition as parts of a whole (Three boys and two girls are going to the zoo. How many children are going to the zoo?)

MA 0.1.2c Use objects and words to explain the meaning of subtraction as a separation action. (Five girls are sitting at a table, two girls leave. How many girls are left sitting at the table?)

MA 0.1.2d Use objects and words to explain the meaning of subtraction as finding part of a whole. (Jacob has 5 pencils. Three are blue and the rest are red. How many red pencils does Jacob have?)

## Math throughout the day

**Creative Arts:**  
Plan dramatic play or pretend play scenarios that involve addition and subtraction.



**Language Arts:**  
Make a class book of story problems using addition and subtraction.



**Science:**  
Measure the children's growth throughout the year using non-traditional units of measure.

# Operations

## Learning in Action

### The Child

- Investigates addition and subtraction in everyday activities through the use of manipulatives, visual models, or hands-on exploration
- Participates in meaningful counting opportunities throughout the day, adding boys and girls in attendance, charting the growth of a plant, and adding new growth amount onto the old
- Calculates the days until coming events (how many days until winter break)

### Adults in the School Community

- Offer addition and subtraction opportunities through graphing, cooking experiences, finger plays, books, songs, games, and cards
- Provide opportunities to think mathematically and solve problems in real-life situations (Three children are at a lunch table and one more joins them. How many are at the table all together?)
- Encourage adding and subtracting using recyclable materials such as buttons, plastic milk caps, keys, and old stamps

### Adults in the Home

- Encourage children to count during play. (Let's count the cars I have and the cars you have. How many do we have all together?)
- Include the child in family cooking activities
- Use dice, dominoes or similar items for addition and subtraction. (Roll two dice and add the dots all together)
- Tell addition and subtraction stories using objects from home (snack, silverware, books)

## Approaches to Assessment

- Take a picture of a child during daily experiences showing an understanding of math operations. Dictate what the child said during the activity. (Each carton of milk is \$1.00, so you owe \$2.00)
- Observe and document children using objects to show an understanding of addition and subtraction concepts
- Collect student samples that represent an understanding of operational concepts



# Geometric Concepts and Measurement

- |   |                    |
|---|--------------------|
| 1 Characteristics   | 4 Spatial Modeling |
| 2 Coordinate Geometry<br>(Mastery not expected at this level) | 5 Measurement      |
| 3 Transformations (Mastery not expected at this level)        |                    |

**MA 0.2 Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

Learning about measurement and geometric concepts is no different than learning in any other area of the curriculum. Children learn best through meaningful experiences that are connected to and integrated within their daily life.

Measurement is a concept that can be directly taught within a large group setting, then applied to activities that can be continued throughout the school year. Measuring the children with a non-standard unit of measurement such as crayons or blocks can take place at the beginning, middle, and end of the year as a way to chart and compare their growth over time.

Literature can also be used to link direct instruction of mathematical concepts such as spatial awareness to classroom immersion. For example, after reading the book "Rosie's Walk," have the children re-create an obstacle course that imitates Rosie's journey through the barnyard, around the pond, over the haystack, and under the fence. This can also lead to a story written by the class where they take a journey through the school, and they go "down" the stairs, "around" the corner, "through" the doorway, and "into" the classroom!



## **Strategies to support inclusive learning environments:**

- ❖ Have available a variety of non-standard and adapted units and real life items for measuring such as ribbons, tubing, yard sticks with larger numbers.
- ❖ Use symbols, pictures, or everyday materials/props to allow the child to demonstrate his ability to represent time, days, etc., in whatever manner is understandable to him.
- ❖ Provide opportunities for using objects or the child's own body to demonstrate positional concepts.

# Characteristics

## Scenario

Diego and Hannah are sitting on the floor in the math center with a basket that includes a variety of shapes. Hannah and Diego start to sort and stack the shapes, creating four separate stacks when they have finished. Hannah says "We have one stack of circles, one of squares, one of rectangles and triangles."

## The Learning Environment

The classroom should offer several opportunities throughout the day for sorting and patterning. The teacher should utilize teachable moments within the schedule to reinforce these concepts.

Classroom materials:

- Objects of various sizes, colors, textures, and shapes that can be sorted and arranged in groups or patterns (blocks, dinosaurs, counting bears, leaves)
- Shape posters created by the children of various pictures found of circles, squares, triangles and rectangles
- Real life objects that are in the shapes of squares, rectangles, triangles, or circles (hula hoops, graham cracker, yield sign)

*"Young mathematicians need to be able to use concrete objects to demonstrate their mathematical thinking. Provide a variety of manipulatives for students to use and allow them to work in small groups to solve the problem. Assist them by asking thought-provoking questions as they work. Ask students to verbally share with others how they solved the problem."*  
According to Jacobs and Crowley (2010)

## Characteristics - Standards

**MA 0.2.1 Characteristics: Students will identify two-dimensional geometric shapes.**

MA 0.2.1.a Sort and name two-dimensional shapes (square, circle, rectangle, triangle)

## Math throughout the day

Language Arts:  
Go on a shape hunt and create a book about the shapes that you find.



Science:  
Find naturally-occurring shapes in the environment. Take pictures of them and post them in the science area.



Health & Physical Development:  
Have the children make shapes with their fingers, hands and body. Have them make shapes with a partner.

# Characteristics

## Learning in Action

### The Child

- Sorts objects in the classroom by shape (geometric and non geometric shapes)
- Draws shapes using templates
- Names and identifies shapes around the school and in nature
- Creates and extends patterns using geometric shapes

### Adults in the School Community

- Encourage children to sort, group, and classify materials and also explain the reason for doing this
- Include opportunities for the child to see shapes throughout the school and in nature
- Provide opportunities for children to create their own shapes (chalk, styrofoam and toothpicks, shaving cream)
- Read books that help students learn about shapes
- Use computer programs to let children draw and label shapes on the computer
- Describe attributes of shapes
- Incorporate language of geometry while teaching and interacting with children
- Provide opportunities to feel shapes hidden in a bag, with encouragement to describe and guess the shape

### Adults in the Home

- Sort objects at home (books, toys, cookware/bakeware, etc.) by geometric shapes
- Call attention to the shapes of cereal, crackers, snack items when the child is eating them
- Go on a shape hunt at home and have the children document their findings to share with their peers at school

## Approaches to Assessment

- Observe a child sorting objects in a center and ask the child to explain what she did. Then record your observation
- Provide a tray of objects that are of different shapes and ask the child to name the shapes
- Have the children create pictures with the four shapes: triangles, circles, squares, and rectangles. When sharing about the picture, have them identify the shapes they used
- Play a memory game using various shapes

# Spatial Modeling

## Scenario

Children are at recess. Carlos is climbing across the monkey bars and yells, "Logan, don't go under me 'cause I might fall on you!"

## The Learning Environment

The teacher intentionally incorporates positional words and models them for the children through literature, songs, finger plays, and learning center activities.

Classroom materials:

- Tables, chairs, shelves, counters that can be used as reference to position
- Rhythm sticks or similar instruments which can be used with positional terms
- Literature and nursery rhymes that include positional words, and support materials that allow for retelling
- Manipulatives such as beads that can be strung "through," and blocks that can be built "up"

*"Teachers recognize children's desire to make sense of their world through mathematics. They build on children's intuitive, informal notions and encounters relating to math, making a point to supply math language and procedures. In other words, teachers "mathematize" children's everyday encounters."*

Copple and Bredekamp (2009)

## Spatial Modeling - Standards

**MA 0.2.4 Spatial Modeling: Students will communicate relative positions in space.**

MA 0.2.4.a Demonstrate positional words. (e.g., above/below, near/far, over/under, in/out, down/up, around/through)

## Math throughout the day

**Language Arts:**  
Create a class book with pictures showing the children demonstrating over, under, behind, in front of.



**Health & Physical Development:**  
Have the children create their own obstacle course which incorporates the various spatial elements.



**Creative Arts:**  
Have the children re-create nursery rhymes on a felt board that include positional words as found in Jack be Nimble, Hickory Dickory Dock, Jack and Jill.

# Spatial Modeling

## Learning in Action

### The Child

- Explores the language of positional words (above/below, near/far, over/under, in/out, down/up, around/through) as they interact with materials (such as; blocks, beads, tools), each other, and the environment
- Demonstrates the position or direction if directed by the teacher

### Adults in the School Community

- Model language of positional terms when children are lining up, picking up materials, building, playing on equipment outside
- Point out positions in an illustration or concepts about print
- Incorporate positional terms in activities when participating in physical education
- Use positional terms when conferring with children about artwork and style

### Adults in the Home

- Use positional terms in day to day activities
- Use positional terms as the child helps with chores: Dad might ask for the tool that is **under** the bench; parent might tell child to put the plates **on** the table

## Approaches to Assessment

- Observe children following verbal directions using positional words
- Take anecdotal notes while children work and play to see if they use positional words
- Create an obstacle course for the children and have them tell you what they are doing as they move through it—going under the table, around the chair, over the basket

# Measurement

## Scenario

When connecting a train track, Derek said, "My train is longer than yours." When asked how he knew, he said, mine is 7 blocks long and his is only 5."

## The Learning Environment

Materials are readily available to measure anything during a center time activity or teachable moment. Teachers model non-standard ways of measuring as a part of inquiry within the curriculum. Various theme-based play centers (restaurant/grocery store/retailer, beauty shop) allow children to learn and apply the concepts of measuring length, time, and money.

Classroom materials:

- Yardsticks, rulers, tape measures, measuring cups and spoons, scales, unit blocks, clocks, timers, calendars, sand timers, work bench with measuring tools, portable measuring buckets
- Non-standard materials (ribbon, tongue depressors, string, geometric shapes)
- Play and real money
- Unifix cubes and bear counters

## Measurement - Standards

**MA 0.2.5 Measurement: Students will measure using nonstandard units and time.**

MA 0.2.5a Identify the name and amount of a penny, nickel, dime and quarter

MA 0.2.5.b Identify time to the hour

MA 0.2.5.c Measure using nonstandard units

MA 0.2.5.d Compare objects according to length

## Math throughout the day

Language Arts:  
The teacher writes the children's hypothesis and observations how much water will be left in a jar after the snow melts.



Math:  
Design activities where children are asked to recognize, describe, and extend patterns of coins.



Math:  
Have the children measure themselves using a nonstandard unit of measure such as books, blocks, markers.

# Measurement

## Learning in Action

### The Child

- Works at sand table with containers of varying sizes and shapes
- Uses words relating to time in play (deciding what time the store is open and closed)
- Uses standard and nonstandard items (lengths of string to measure body parts, unit blocks to measure how far children can jump, rulers to measure plant growth)

### Adults in the School Community

- Use and write words related to time throughout the daily schedule. "We go to gym in 15 minutes when it is 10:00."
- Show children how to use objects to measure things, "Look, this table is 5 pencils long."
- Create price tags for items in the pretend grocery store, with the price on one side of the tag and pictures of varying coins on the back side reflecting the price amount
- Involve children in school fundraisers and encourage them to count or graph money

### Adults in the Home

- Have children take home a piece of chalk and a request that the parent trace the child's shadow at 9:00 am, 1:00 pm and 5:00pm and then measure and discuss the change
- Have child sort and count pocket change
- Read books to children about measurement and time such as "Inch by Inch," Leo Lionni, "Too Many Tomales," Gary Soto

## Approaches to Assessment

- Children document their measurements of a variety of materials and graph their findings
- Adults prompt, "How many ways can you think of to make 20 cents?"
- Children play, "What time is it Mr. Fox?" A child says "It is 8:00." Before they take eight steps, each child shows what 8:00 looks like on their own analog clock
- Develop a checklist which names coin value for penny, nickel, dime, and quarter



# Algebraic Standard

- 1 Relationships
- 2 Modeling in Context
- 3 Procedures

**MA 0.3 Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

Children in the kindergarten classroom have multiple opportunities throughout their day to experience numbers informally, through teachable moments, and also through direct instruction. The environment should be set up so that children can practice the skills and language that they learn through the direct instruction in their play and center time opportunities.

The role of the teacher is to bridge the gap of the experiences that the children bring to the classroom, and the more formal operations of academic math. Because the math concepts develop over time with young children, they need to experience numbers and problem solving in many different ways, and should begin to see that many situations can be turned into a math equation.

By using common everyday materials to demonstrate math concepts, such as pizza boxes to demonstrate size (small, medium, and large) or having the children sort a variety of nuts and bolts according to an attribute, helps create a connection of the learning from the home to school environment.



## **Strategies to support inclusive learning environments:**

- ❖ Provide a variety of materials for sorting, matching, patterning, seriating and grouping, including things from the children's everyday environments, with texture and bright colors, contained in trays.
- ❖ Encourage children working in groups or with partners to promote problem-solving.

# Relationships

## Scenario

Diego and Hannah are sitting on the floor in the math center with a basket of counting bears. Hannah grabs some yellow bears and puts them in a pile. Diego says his favorite color is blue and starts collecting the blue bears. Hannah notices there are green and red bears left and sorts them into two separate piles.

## The Learning Environment

The classroom should offer several opportunities throughout the day for sorting and classifying (weather calendar; time). The teacher should utilize teachable moments within the schedule to reinforce these concepts: grouping materials when putting them away, sorting crayons by color, classifying books.

Classroom materials:

- Objects of various sizes, colors, textures, and shapes that can be sorted and classified (blocks, dinosaurs, counting bears, leaves)
- Materials for sorting, grouping, and classifying
- Post examples of patterns children have created or classifying with a variety of materials

## Algebra - Standards

**MA 0.3.1 Relationships: Students will sort, classify, and order objects by relationships.**

MA 0.3.1.a Sort by color, shape, or size

MA 0.3.1.b Create own rule for sorting other than color shape, and size

## Math throughout the day

**Language Arts:**  
Have children create their own class book on classifying and sorting.



**Science:**  
Sort objects in nature by a common attribute: sink/float, size of leaves, length of stems.



**Creative Arts:**  
Sort and classify musical tones by sound.

# Relationships

## Learning in Action

### The Child

- Sorts beads, attribute blocks, or counting bears into egg cartons, with each compartment holding a different color, shape, or size
- Sorts materials found in centers (food from the house center, animals, cars, or blocks) into different baskets using various attributes
- Sorts shoes into different groups (example: laces or no laces)
- Finds and sorts leaves, shells, or other nature objects into groups
- Provides explanations for groupings

### Adults in the School Community

- Provide a variety of objects for students to sort, classify, pattern, count and order
- Invite children to help sort books into the appropriate book baskets (animal books, Clifford books, I Spy books)
- Ask children to line up according to color groups (Example: If you're wearing red, line up)
- Encourage children to describe their groupings and identify attributes that enable items to be sorted into specific categories

### Adults in the Home

- Sort objects at home (laundry, toys, silverware)
- Classify attributes using cereal, crackers, fruit snacks
- Look for similarities and differences in nature among flowers, animals, rock formations

## Approaches to Assessment

- Observe a child sorting objects in a center and ask the child to explain what he did. Record your observation
- Provide a tray of objects and have child classify and state their rule for classification
- Document the interaction of a child with graduated sizes of materials when asked to put them in order

# Modeling in Context

## Scenario

Andrew recognizes a 4 on a card, he says, "I can make a 4 with train cars" and he counts out 4 cars. Then he says to Alex, "If I can have your 3 train cars, I will have 7 train cars all together."

## The Learning Environment

The teacher provides a variety of materials that the children can interact with in all areas of the classroom. The teacher can model adding and subtracting with these materials (setting a place setting in the house area).

Classroom materials:

- Shoe boxes containing a variety of items (pencils, rocks, erasers, milk caps, rubber bands)
- A variety of collected materials such as rocks, shells, leaves, and insects, along with small containers for sorting, and laminated mats with number sequences on them that can be filled in by the student
- Felt pieces or figures that can be used to reenact fingerplays, songs, or books such as *The Doorbell Rang*
- Abacus, calculator, number sentence games and puzzles

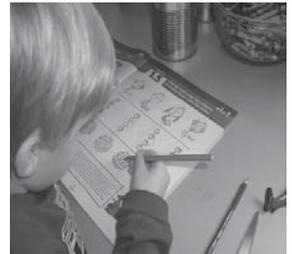
## Modeling in Context - Standards

**MA 0.3.2 Modeling in Context:** Students will use objects as models to represent mathematical situations.

MA 0.3.2a Model situations that involve the addition and subtraction of whole numbers 0-10 using objects

## Math throughout the day

**Language Arts:**  
Create finger plays with finger puppets using addition and subtraction.



**Science:**  
Measure and track the growth of a plant or animal. Make a number sentence to show how many inches the plant or animal has grown.



**Social Studies:**  
Count and create a number sentence to show how many children have green eyes, blue eyes... how many total.

# Modeling in Context

## Learning in Action

### The Child

- Uses props while doing fingerplays; for example, using tongue depressors with frog cutouts for "Five Little Speckled Frogs"
- Uses numbered cards and manipulatives to represent the numbers while creating number sentences
- Plays "War." Tommy turns over two cards and counts the amounts of them, while his partner does the same. The higher amount would win that round
- Play games using dice or dominoes
- Engages in mathematical "play" using real life context activities like shopping and cooking

### Adults in the School Community

- Create and use a number line to show number of days in school
- Provide daily opportunities to create number sentences with attendance, lunch count, milk count
- Model math story problems with addition and subtraction
- Incorporate math vocabulary through modeling mathematical situations in the context of childrens interest and topics of study

### Adults in the Home

- Use real world word problems; for example: There are 3 plates on the table and 4 plates on the counter. How many plates all together
- Count fruit snacks while eating to show how many orange ones, red ones, yellow ones there are
- Read books that include addition and subtraction (The Cheerios Book, The M&M's Book)

## Approaches to Assessment

- A child is given a set of 10 frogs and is asked to divide the set into two smaller sets and then describe the addition equation
- Have the child perform "Five Little Ducks," to see if the child uses the correct correspondence between the props and number in the song or rhyme

# Procedures

## Scenario

Frankie and Dante were at the block center making a zoo. Tyrone and Bobby came over and asked, "Can we play?" Frankie said, "If you came in, there would be four and we can only have three." The teacher overheard them and said, "You just made a number sentence. Two boys in the center and two more would make four boys in the center."

## The Learning Environment

The environment includes opportunities throughout the day to call attention to naturally occurring opportunities for addition or subtraction problems, and having the teacher use those as teachable moments. Intentional teaching in using addition and subtraction with objects should also take place on a daily basis. Problem-solving situations may include number of chairs needed to seat a group of children at snack time, children lining up at recess, or the number of children in an area.

Classroom materials:

- Objects such as beads, pegs, and small blocks
- Games such as Chutes and Ladders or Candy Land where counting occurs
- Materials for graphing by color, shape, size
- Manipulatives that correspond to a story or rhyme, e.g., felt cookies to go with "The Doorbell Rang"

## Procedures - Standards

**MA 0.3.3 Procedures: Students will use concrete and verbal representations to solve number stories.**

MA 0.3.3.a Use objects to solve addition and subtraction of whole numbers 0 - 10

## Math throughout the day

**Language Arts:**  
Create a classroom book depicting a story problem.



**Creative Arts:**  
Have a variety of cut-outs available for children to create their own story problem. Share with the class.



**Health and Physical:**  
Have the children pretend to be the characters in a fingerplay or story and recreate it.

# Procedures

## Learning in Action

### The Child

- Acts out stories in the dramatic play area, like, "The Doorbell Rang," "Little Red Hen" or "The Three Little Pigs."
- Creates number sentences using classroom objects
- Uses counting songs or finger plays to re-create stories with flannel or magnetic boards

### Adults in the School Community

- Read several stories that lend themselves to creating story problems.
- Supply materials for children to explore and create their own story problems
- Do "think alouds" to show how they see situations as learning opportunities for addition and subtraction
- Provide opportunities for children to problem solve real life situations; (Children are asked to search the room for a story problem, e.g., in the science center three chicks hatched yesterday. Today there two more. How many do we have?)
- Utilize teachable moments to bring attention to naturally occurring addition and subtraction problems. If we add two more children at this table, we will have  $2 + 6 = 8$  children altogether

### Adults in the Home

- Ask your child to make up a story with items from home, the grocery store or the park
- Make picking up toys a fun learning activity by having them create a math problem
- Ask your child to make a story out of cereal or snack items
- Use what the child is doing in her routine to highlight addition/subtraction opportunities (setting the table, picking out clothes, brushing their teeth)

## Approaches to Assessment

- Give children a story problem and have them create it with objects. (Mary has two dogs, her friend has five. How many in all? I have eight lollipops and I ate one. How many are left?)
- Observe children interacting with materials and document any addition or subtraction examples they exhibit



# Data Analysis and Probability

- 1 Display and Analysis
- 2 Predictions and Inferences  
(Mastery not expected at this level)
- 3 Probability (Mastery not expected at this level)

**MA 0.4 Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

Teachers reinforce children's understanding of data analysis and probability through informal experiences on a daily or weekly basis. Such activities include rearranging or replacing materials in the classroom, and asking such questions as "Where would these blocks best fit on the shelf?" "Which ones are they most like?"

Kindergarten children need time and opportunity to practice the skills they are learning in many different contexts, both in the classroom and at home. Children can collect data from peers by asking: "What type of pets do you have?" "How many buttons are on their clothing?"

The information gathered can then be incorporated into a graph and analyzed. The results can be shared with their peers, and the teacher can expand on their thinking by posing open-ended questions. What would happen if? Why do you think it is like this?



The basic language of probability can also be introduced through various activities such as estimating the chances of having your name pulled out of a hat for a drawing. The terms *little*, *some*, and *great* can be associated with probability chances in activities.

## Strategies to support inclusive learning environments:

- ❖ Provide hands-on experiences with three-dimensional materials for figuring out and explaining how things fit together.
- ❖ Use containers, trays, slots, to provide ways to organize materials and create graphing displays to help the child discover the differences between collections.
- ❖ Work in stages and with fewer materials to allow the child to come back to his work as often as he needs to.

# Display and Analysis

## Scenario

Amber and Tony are in the science center, sorting animals into groups. Tony notices that there are five animals with two legs in his group. "But I have more." Says Amber as she counts ten animals with two legs in her group.

## The Learning Environment

The classroom is a place where there are a variety of materials available to the students for sorting and graphing, with time given for analyzing and expressing their thoughts. The teacher can go to each area of the classroom and do a think-aloud while showing how anything can be sorted by various attributes: color of paper in writing, blocks in manipulatives, fruits and vegetables in the house area.

Classroom materials:

- Objects of various sizes, colors, textures, and shapes that can be sorted and arranged in graphs (blocks, dinosaurs, counting bears, leaves)
- Graph paper, laminated graphs, and large graphs to be used on the floor. (Hint: Use a shower curtain to create a large graph for students to graph objects)

*"Data analysis contains one big idea: asking and answering questions. To do this, children classify, organize, represent, and use information. The development continuum for data analysis includes growth in classifying and counting and in data representations." Sarama and Clements (2006)*

## Display and Analysis - Standards

**MA 0.4.1 Display and Analysis: Students will sort, classify, represent, describe, and compare sets of objects.**

MA 0.4.1.a Sort and classify objects according to an attribute (e.g., size, color, shape)

MA 0.4.1.b Identify the attributes of sorted data

MA 0.4.1.c Compare the attributes of the data (most, least, same)

## Math throughout the day

Language Arts:  
Create a class poster showing children or objects grouped by various characteristics and incorporating the vocabulary: more, fewer, less.



Science:  
Sort and graph objects in nature after a nature walk by size of plants, length of grass, color of flowers.



Social Science:  
Graph family data of the children, number of siblings, pets.

# Display and Analysis

## Learning in Action

### The Child

- Sorts beads, attribute blocks, or counting bears into egg cartons, with each compartment holding a different color, shape, or size
- Finds and sorts leaves, shells, or other nature objects into groups
- Sorts buttons according to the number of button holes, and counts to find out how many buttons are in each group
- Sorts counting bears and graphs these bears on a laminated graph, then makes comparisons from the graph.
- Practices recognizing, naming, building, drawing, and comparing two- and three-dimensional objects

### Adults in the School Community

- Provide opportunities for students to sort, classify, and graph school-wide information (graph total number of students in each grade, fundraisers, boys-girls)
- Create class graphs and teach children vocabulary for making comparisons on graphs: most, least, same
- Play games with the children, such as "How are they alike?" to teach this concept. Have three or four children with the same characteristic stand in front of the class; all have zippered shirts, all wear glasses, all have belts shoes, etc., and ask the rest of the class to observe what they have in common

### Adults in the Home

- Children sort coins from their piggy bank, or other objects at home. Compares the number of objects in each group (more, fewer, less)
- Have the child create a graph of their family (children, adults, pets, boys, girls) and bring it to school to compare and contrast to other children's families

## Approaches To Assessment

- Observe a child sorting and graphing objects in a center and ask the child to explain how they are sorting the materials. Record your observation
- Collect graphs or take pictures of graphs created by children

# Resources

Copley, Juanita. (2010). *The young child and mathematics*, 2nd ed. Washington, DC: National Association for the Education of Young Children.

Copley, Juanita. (1999). *Mathematics in the early years*. Reston, VA: National Association for the Education of Young Children and National Council of Teachers of Mathematics.

Copley, Juanita. (2004). *Showcasing mathematics for the young child*. Reston, VA: National Council of Teachers of Mathematics.

Copple, Carol, & Bredekamp, Sue. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8*. Washington, DC: National Association for the Education of Young Children.

Crowley, Kathy, & Jacobs, Gera. (2010). *Reaching standards and beyond in kindergarten*. Washington, DC: National Association for the Education of Young Children.

Fisher, Bobbi. (1998). *Joyful learning in kindergarten*. Portsmouth, NH: Heinemann.

Koralek, Derry. (2003). *Spotlight on young children and math*. Washington, DC: National Association for the Education of Young Children.

Sarama, Julie, & Clements, Douglas. (2006). *K today: mathematics in kindergarten*. Washington, DC: National Association for the Education of Young Children.

The Kindergarten Program. (2006). [1-61]. Retrieved from <http://www.edu.gov.on.ca>.

These books and many other resources may be borrowed by Nebraska residents from the Early Childhood Training Center. A web-based search of these media materials is offered at <http://ectc-library.education.ne.gov>.

# Glossary of Terms

**Anchor Charts**-Charts that teachers make with their students that represent and remind students of their learning.

**Rubric**-An established set of criteria upon which something is compared.

**Think Aloud**-The process of expressing your thoughts aloud while you are engaged in an activity, so others can hear them.

**Tier 1 Words**-Common words that students already know, e.g., the, happy, sad.

**Tier 2 Words**-Words that the teacher uses direct instruction in teaching them. These words will eventually become part of the child's receptive and expressive vocabulary.

**Tier 3 Words**-Words that are specialized to a particular field such as education, medicine, or psychology.

**WOW Word Wall**-A place where you would post interesting words your class comes across as they are reading. Examples might include: giddy, gigantic, bellowed. Words that you plan to teach directly to students can also be incorporated within this area.

