



Mathematics Curriculum – Early Childhood

May 2007

Introduction

Mathematics Curriculum

The Early Childhood mathematics program at Baker Demonstration School focuses on logical mathematical thinking, problem solving, strategies and applications to foster mathematical awareness in young children.

Teachers facilitate learning for understanding by:

- **Crafting, adapting and enriching solid instructional plans** which align with NCTM standards and meet individual students' needs.
- **Motivating students** to collaborate with and help one another.
- **Guiding individual students** who need expert assistance to be challenged to think more deeply or to consider a higher degree of complexity in their problem solving process, as well as students who need greater support to build understanding.
- **Presenting content and strategies** using a variety of methods acknowledging diverse learning styles and encouraging terminology, definitions, notation, concepts and skills to emerge in the learning process.
- **Designing assessment** that promotes student learning and assists teachers in making instructional decisions.
- **Providing a variety of mathematical tools** such as measuring devices, calculators, manipulatives, games, charts, reference books, etc.
- **Setting high expectations** for all students appropriate to their development, learning and experience.
- **Creating strong links between mathematical ideas** so that students' understanding and knowledge deepens and their ability to apply mathematics expands.
- **Assigning authentic mathematical tasks** to introduce important mathematical ideas and to engage and challenge students intellectually.

Students develop problem solving and critical thinking capabilities by:

- **Constructing** solutions using authentic problems that go beyond computation.
- **Communicating** using mathematical language to describe the problem solving process and to develop metacognitive thinking.
- **Investigating** open-ended, complex mathematical problems with confidence.
- **Reflecting**, refining and exploring conjecture on the basis of evidence and using a variety of reasoning and proof to confirm or disprove those conjectures.
- **Improving** from evaluation that represents a comprehensive picture of their understanding through performance on projects, tests, class work and homework, as well as from reflecting on their own processes and understanding.

- **Developing** confidence and perseverance when tackling difficult problems, demonstrating flexibility in exploring mathematical ideas, and embracing alternative solution paths.

Pre-Kindergarten/Kindergarten Number and Operations:

Concepts

Skills and Processes

Counting

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems
- Recognize sight sets (1-10)
- Count by ones, twos, fives and tens
- Group quantities into number sets and recognize “how many” in sets of objects
- Recognize numbers (0-20)
- Connect number words and numerals to the quantities they represent, using various physical models and representations
- Correspond objects to number quantity
- Develop understanding of the relative positions and magnitude of whole numbers and of ordinal and cardinal numbers and their connections

Place Value

- Recognize and write numbers (0-20)
- Group like quantities into 2's and 5's
- Understand meanings of operations and how they relate to one another
- Compute fluently and make reasonable estimates

Whole Number Operations

- Connect number sentences to operation sets (objects, pictures, and symbols)

Quantitative Analysis

- Group quantities of objects into sets
- Compare quantities of sets of objects and give their relationships
- Investigate correspondence of number to quantities of objects
- Estimate number of objects to a given set
- Order sets of objects to 20
- Represent quantities using concrete materials
- Name orally a quantity of objects by number

Pre-Kindergarten/Kindergarten Geometry:

Concepts

Spatial Visualization

Skills and Processes

- Investigate characteristics and properties of two and three dimensional geometric shapes
- Explore types of symmetry
- Explore ways of making shapes with other shapes
- Explore fractions by partitioning a whole shape into equal parts
- Explore patterns of fractions; more equal parts result in smaller portions
- Explore symmetry with music and art
- Construct common two-dimensional shapes
- Draw common two-dimensional shapes
- Explore common three-dimensional shapes in environment
- Explore vocabulary of shapes and designs
- Explore size correspondence from drawing to real objects
- Recognition of common two-dimensional shapes

Pre-Kindergarten/Kindergarten Measurement:

Concepts

Measurement

Skills and Processes

- Recognize attributes of length, volume, weight, area, and time
- Solve problems by comparing and ordering objects according to these attributes
- Explore surfaces in terms of geometric shapes
- Use non-standard units to compare lengths
- Estimate number of non-standard units required to measure a given length
- Understand Conservation of length
- Explore standard unit measurements with conventional measurement instruments
- Estimate standard measurement units required and check by measuring
- Explore concept of weight
- Compare of weight (heavier, lighter)
- Understand, discuss, and create simple navigational directions
- Apply appropriate techniques, tools, and formulas to determine measurements
- Understand measurable attributes of objects and the units, systems, and processes of measurement

Pre-Kindergarten/Kindergarten Data Analysis/Probability:

Concepts

Gathering Data

Skills and Processes

- Exposure to process of collecting data
- Gather data and information

Organizing Data

- Explore ways of ordering data
- Sort by attributes
- Tally
- Count

Representing Data
Display

- Explore ways of representing data
- Choose appropriate statistical methods to analyze data

Concepts

Analyzing Data

Skills and Processes

- Exposure to process of asking questions about the collection of data
- Connect to number sense and patterns
- Verbalize ideas and conclusions about information

Chance

- Make predications
- Explore situation involving chance
- Explore outcomes of situations involving chance
- Examine possibilities
- Explore simple forms of deductive reasoning

Pre-Kindergarten/Kindergarten Algebra:**Concepts**Whole Number
Patterns**Skills and Processes**

- Explore sight sets of 2, 3, 4, and 5 objects
- Group quantities into sets of 2, 3, 4, 5 and 10
- Recognize sight sets of various objects
- Explore patterns of odd and even
- Investigate skip counting
- Use and analyze patterns to make predictions
- Reproduce patterns with concrete materials
- Create patterns with concrete materials
- Explore and describe patterns in real life
- Establish procedures where routines occur (sequencing)
- Explore fractional number patterns with concrete materials

Algebraic Reasoning

- Use objects to determine number sentences for problem solving situations involving addition and subtraction
- Verbally use objects to determine number sentences for problem solving situations

Pre-Kindergarten/Kindergarten Communication of Mathematical Ideas:**Concepts**Mathematical
Expressions**Skills and Processes**

- Listen to stories incorporating mathematical concepts
- Listen to explanations given by others
- Communicate mathematical thinking coherently and clearly to peers, teachers, and others
- Begins to use the language of mathematics to express mathematical ideas precisely
- Describe and explains mathematical thinking through drawings and words
- Create and uses representations to organize, record, and communicate mathematical ideas
- Select and uses various types of reasoning and methods of proof
- Organize and consolidates mathematical thinking through communication

Pre-Kindergarten/Kindergarten Integrating Mathematics Play and Imagination:

Concepts

Problem Solving and
Abstract Thought

Skills and Processes

- Imagine alternative strategies to problem solving
- Imagine situations in which mathematical concepts can be applied
- Recognize and applies mathematics in contexts outside of mathematics
- Develop increasing ability to use abstract thought and symbols
- Solve problems that arise in mathematics and in other contexts

1st Grade Numbers:

Concepts

Counting

Skills and Processes

- Recognize sight sets
- Count by ones
- Group quantities into sets
- Recognize numbers (0-100)
- Correspond objects to number quantity

Place Value

- Recognize and write numbers to (0-100)
- Group like quantities into 2's, 5's, and 10's

Whole Number
Operations

- Connect number sentences to operation sets (objects, pictures, and symbols)
- Understands addition and subtraction in context of story problems
- Demonstrate automatically with addition and subtraction

Quantitative Analysis

- Group quantities of objects into sets
- Compare quantities of sets of objects and give their relationships
- Investigate correspondence of number to quantities of objects
- Estimate number of objects in a given set
- Order sets of objects to 20
- Represent quantities using concrete materials
- Explore and investigate with manipulatives
- Name orally a quantity of objects by number
- Identify currency
- Count money and make change

1st Grade Measurement:

Concepts

Measurement

Skills and Processes

- Explore concept of length
- Explore surfaces in terms of geometric shapes
- Use non-standard units to compare lengths
- Estimate number of non-standard units required to measure a given length
- Understand conservation of length
- Explore standard unit measurements with conventional measurement instruments
- Estimate standard measurement units required and check by measuring
- Explore concept of weight
- Compare of weight (heavier, lighter)

1st Grade Geometry:

Concepts

Spatial Visualization

Skills and Processes

- Investigate basic spatial relationships with objects
- Explore types of symmetry
- Explore ways of making shapes with other shapes
- Explore fractions by partitioning a whole shape into equal parts
- Explore patterns of fractions; more equal parts result in smaller portions
- Explore symmetry with music and art
- Recognition of common two-dimensional shapes
- Construct common two-dimensional shapes
- Draw common two-dimensional shapes
- Explore common three-dimensional shapes in environment
- Explore properties of two-dimensional shapes
- Explore properties of three-dimensional shapes
- Explore vocabulary of shapes and designs
- Explore size correspondence from drawing to real objects
- Recognition of common two-dimensional shapes
- Explore and investigate with manipulatives

1st Grade Statistics/Probability:

Concepts

Gathering Data

Skills and Processes

- Exposure to process of collecting data
- Gather data and information

Organizing Data

- Exposure to ways of ordering data
- Sort by attributes
- Tally
- Count

Representing Data

- Exposure to ways of representing data
- Simple graphs using objects
- Simple graphs using symbols

Analyzing Data

- Exposure to process of asking questions about the collection of data
- Connect to number sense and patterns
- Verbalize ideas and conclusions about information

Chance

- Make predications
- Explore with situation involving chance
- Explore outcomes of situations involving chance
- Examine possibilities
- Explore deductive reasoning
- Connect probability to whole/part, part/whole

1st Grade Patterns and Algebra:

Concepts

Whole Number
Patterns

Skills and Processes

- Explore sight sets of 2,3,4, and 5 objects
- Group quantities into sets of 2 and 5
- Recognize sight sets of various objects
- Explore patterns in fact families up to 12
- Explore patterns of odd and even
- Investigate skip counting
- Use and analyze patterns to make predictions
- Reproduce patterns with concrete materials
- Explore and describe patterns in real life
- Establish procedures where routines occur (sequencing)
- Explore fractional number patterns with concrete materials

Algebraic Reasoning

- Use objects to determine number sentences for problem solving situations involving addition and subtraction
- Verbally use objects to determine number sentences for problem solving situations

1st Grade Communication of Mathematical Ideas:

Concepts

Mathematical
Expressions

Skills and Processes

- Listen to stories incorporating mathematical concepts
- Listen to explanations given by others
- Describe and explain own strategies
- Develop some form of symbolic representation of mathematical concepts
- Describe and explain mathematical thinking through drawings and words

1st Grade Integrating Mathematics Play and Imagination:

Concepts

Problem
Solving/Abstract
Thought

Skills and Processes

- Imagine alternative strategies to problem solving
- Develop increasing ability to use abstract thought and symbols
- Imagine situations in which mathematical concepts can be applied