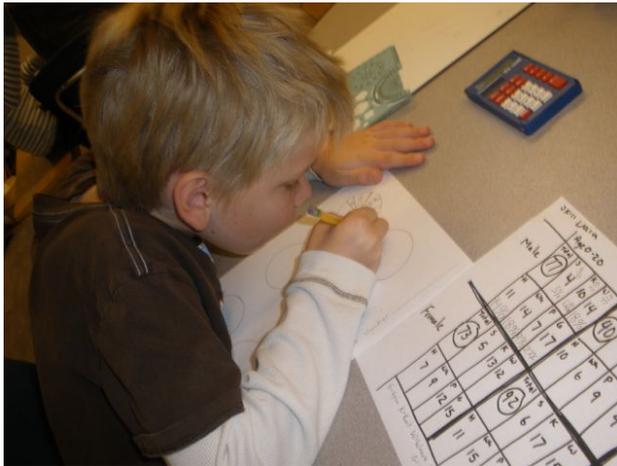


Math at Prairie Creek Community School



Revised 2/13

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This document is intended to be a living document that changes to meet the changing needs of the school and students.

Mathematics at Prairie Creek

At Prairie Creek, mathematics is deliberately incorporated into themes and the daily life of the classroom. It is also taught independently. It is important to balance our exploration of different math “strands” such as geometry and algebra with foundational arithmetic skills. In this way, students become capable mathematicians who are excited by the wonder of numbers. Communication in math is key to students’ conceptual understanding, and students learn to develop their ability to explain their math thinking both orally and in writing.

Math instruction at each grade level looks different, but if you walked into a classroom you would see children working toward solving problems efficiently, using math in real-world settings, talking about math and developing their understanding through the use of appropriate manipulatives (physical items designed to model mathematical concepts).

Prairie Creek teachers draw from an array of sources to craft math education that addresses student needs and interests. Math professional development is an ongoing focus for the staff since it is much more challenging (and rewarding) to deeply understand children’s numeracy than to simply deliver a prepared curriculum.

Kindergarten and First Grade Curriculum

In K-1, math is taught in a variety of ways. Depending on the topic and the needs of the children, lessons may be taught to kindergartners and first graders separately, or they may be taught to the class as a whole with different levels of practice offered depending on the skill levels of the students. Math stations are used to give children practice with new skills or to offer more challenge to children who are ready for it. During Math stations, teachers are free to work with small groups of children who need more help or more challenge. Many math concepts are presented throughout the day in the form of games, songs, and movement activities.

Kindergarten Topics

Topic	Strand(s)	Setting(s)	Resources/Notes
Know number names and the count sequence.	Counting & Cardinality	Math lesson and practice time, morning meeting activities including morning message, calendar work, math games, math stations, daily activities such as lining up, attendance, counting milks.	Everyday Math curriculum, games from Investigations curriculum, manipulatives for counting, Math Stations activities.
Count to tell the number of objects.	Counting & Cardinality	All of the above	Everyday Math, teacher-created activities, math stations activities.
Compare numbers	Counting & Cardinality	Math lesson and practice time, calendar work, math stations	Everyday Math, games from Investigations, other teacher-created games and activities, math stations activities.
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	Number and Operation Algebraic Thinking	All of the above, plus songs and gym games that involve adding one more person or taking away one (i.e. "Three little ducks went out to play.... Two little ducks came running back.")	Everyday Math, Marilyn Burns activities, teacher-created games and activities.
Work with numbers 11-19 to gain foundations for place value.	Number & Operations	Math lesson and practice time, math games, morning meeting games and activities (i.e. "count around the circle"), math stations	Everyday Math, teacher-created materials, math stations activities.
Describe and compare	Measurement	Often takes place during a theme. For	Everyday Math, teacher-created

measurable attributes	Data	example, during a dinosaur theme we taped together 90 1-ft long strips of paper to see how long an Apatosaurus was. May also be taught during a regular math lesson.	materials.
Classify objects and count the number of objects in each category.	Measurement Data	Math lesson and practice time, morning meeting including morning message, weather tallies, math stations.	Everyday Math, Marilyn Burns books, games and activities created by the teacher, math stations activities.
Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes cones, cylinders, and spheres).	Geometry	Math lesson and practice time, art activities involving shapes, tie in to Science by looking at shapes in nature.	Everyday Math, teacher-created activities.
Analyze, compare, create, and compose shapes	Geometry	Same as above, and also taught during Art activities.	Everyday Math, teacher-created activities, games from Investigations.

First Grade Math Topics

Topic	Strand(s)	Setting(s)	Resources/Notes
Represent and solve problems involving addition and subtraction.	Number and Operation Algebraic Thinking	Math lesson and practice time, morning meeting, math stations,	Everyday Math, Marilyn Burns activities, teacher-created games and activities
Understand and apply properties of operations and the relationship between addition and subtraction.	Number and Operation Algebraic Thinking	Math lesson and practice time,	
Add and subtract within 20.	Number and Operations Algebraic Thinking	Math lesson and practice, morning meeting, real world problems during a theme.	Everyday Math, Marilyn Burns activities, teacher-created games and activities.
Work with addition and subtraction equations.	Number and Operations Algebraic Thinking	Math lesson and practice, real world problems during a theme.	Everyday Math, Marilyn Burns activities, teacher-created materials.
Extend the counting	Number & Operations	Math lesson and practice, morning	Everyday Math, teacher created

sequence		meeting, calendar time, theme work.	materials
Understand place value.	Number & Operation	Math lesson and practice, calendar time (counting days in school)	Everyday Math, teacher-created activities
Use place value understanding and properties of operations to add and subtract.	Number & Operation	Math lesson and practice, calendar time	Everyday Math, teacher-created activities
Measure length indirectly and by iterating length units.	Measurement Data	Math lesson and practice, theme work, solving authentic problems that come up during the year.	Everyday Math, teacher-created activities
Tell and write time.	Measurement Data	Math lesson and practice, may come up within a theme.	Everyday Math, teacher created materials.
Represent and interpret data.	Measurement Data	Morning Message, theme work, Math lesson and practice.	Everyday Math, teacher-created materials, Marilyn Burns activities.
Reason with shapes and their attributes.	Geometry	Math lesson and practice, art	Everyday Math, Marilyn Burns, teacher-created activities

Second and Third Grade Curriculum

These topics are common units at the 2/3 level. They are not in a chronological order, nor are they in a hierarchical order. When planning the flow of math instruction for the year, we choose from among these units according to student need as identified in formative assessments. We also see student interest to help determine the course of instruction.

During the 2012-2013 school year, we piloted a more comprehensive use of Everyday Mathematics. Because of this, we group the children based on grade level. The children then weave in and out of hetero- and homogeneous groupings within their grade level based on interest, understanding, and proficiency. These groups are called Math Flocks. Math flocks are balanced with math instruction within mixed-age classroom groups.

The focus and scope of these units has been determined by the NCTM focal points, the Common Core, the Minnesota state standards and our own observation of developmentally interesting and appropriate math concepts.

The strands are those used by the Minnesota Comprehensive Assessment. That assessment does not include topics in discrete mathematics such as knot theory, network theory, or sorting algorithms. Nor does it assess math communication.

Where the setting indicates “Heterogeneous Group,” appropriate differentiation is always used so that students are learning and applying skills in their zone of proximal development.

Topic/Activity	Setting	Strand(s)	Resources/Notes
3-Dimensional and 2-Dimensional shapes	Heterogeneous Group Math Message	Geometry/Meanurement Communication	Everyday Math, Teacher Created Materials
Adding and Subtracting Whole Numbers	Homogenous Group Integrated into math units Math Flock Morning Message Games	Number and Operation	Everyday Math, Teacher Created Materials
Angles, polygons, and lines	Heterogeneous Group Math Messages	Geometry/Meanurement Communication	Everyday Math, Marilyn Burns, Teacher created materials

	Theme integration Integration into math units		
Area/perimeter/Linear Measures	Heterogeneous Group, Foundation Math, Math messages,	Number Geometry/measurement Algebra Communication	Marilyn Burns, Everyday Math, Teacher created materials
Bases	Heterogenous Group Homogenous Group Stand alone lessons Extension Integrated into math units	Number and Operation Communication	Teacher created lessons
Decimals	Math Flock Math messages	Number and Operation Geometry/Measurement Communication	Everyday Math, Teacher Created Materials
Division	Homogenous Groups Foundation Math Integrated into math units Math Message	Number and Operation Algebra Communication	Everyday Math, Marilyn Burns, At second grade, the children are focusing on the basic principle of division: breaking groups apart. In third grade, division algorithms are introduced.
Data Collection	Homogenous Group, Theme integration, Math Flock, Heterogeneous Group	Data	Everyday Math, Marilyn Burns, Teacher created lessons
Estimation	Homogeneous Group Math Flock Math Messages Theme integration Integration into math units	Number and Operation Data Communication	Everyday Math, Marilyn Burns
Fractions	Homogenous Group Math Flock Math messages Theme integration	Number and Operation Geometry/Measurement Communication	Marilyn Burns, Everyday Math

	Integrated into math units		
Logic	Heterogeneous Group, Stand alone lesson Extension	Discrete Mathematics Communication	Everyday Math, Teacher created materials
Metric	Heterogeneous Group Theme integration Foundation Math Math Message Integrated into math units	Number and Operation Geometry/Measurement Algebra Communication	Everyday Math
Models for Word Problems	Heterogeneous Group, Theme integration	Number and Operation Algebra, Data Communication	Singapore Math, Everyday Math, Teacher created materials
Money	Math Flock, Theme integration	Number and Operation Geometry/Measurement Algebra Data Communication	Everyday Math, Teacher created materials
Multiplication	Homogenous Groups Foundation Math Integrated into math units Math Message	Number and Operation Algebra Geometry/Measurement Communication	Everyday Math, Marilyn Burns, Math Recovery Currently, the scope for development in multiplication in the second and third grades is very broad. Students move from a basic understanding of equal groups to repeated addition. Some children begin using different algorithms such as lattice method and column multiplication.
Negative numbers	Heterogeneous Group Foundation Math Math Messages Theme integration Integration into math units	Number and Operation Data Communication	Everyday Math This concept is only explored at 3 rd grade in relation to the number line and addition/subtraction.

Place Value in Whole Numbers	Homogenous Group, Foundation Math, Theme integration, Integrated into math units Math Messages	Number and operation	Everyday Math, Teacher Created Activities, Marilyn Burns
Probability	Heterogeneous Group, Theme integration	Number and Operation Data Communication	Marilyn Burns, Everyday Math, Teacher created lessons
Reflection/Symmetry	Heterogeneous Group Math Message Stand alone lesson Theme integration Integration into math units	Geometry/Measurement Communication	Everyday Math
Rounding	Homogeneous Group Math Flock Math Messages Theme integration Integration into math units	Number and Operation Communication	Everyday Math, Teacher Created Materials
Time	Foundation Math Theme integration Math messages	Number and Operation Measurement Communication	Everyday Math, Teacher created lessons
Volume	Homogenous Group Foundation Math Integrated into math units	Geometry/Measurement Algebra	Everyday Math

Fourth and Fifth Grade Curriculum

These topics are not in a chronological order, nor are they in a hierarchical order. When planning the flow of math instruction for the year, we choose from among these units according to student need as identified in formative assessments. We also use student interest to help determine the course of instruction. For example, when learning about probability, some students become very interested in the relationship between percentages, decimals and fractions. That becomes the logical next math focus. For ease of use, this table is arranged alphabetically. While many of these units are done every year, some are done more occasionally.

The focus and scope of these units has been determined by the NCTM focal points, the Common Core, the Minnesota state standards and our own observation of developmentally interesting and appropriate math concepts.

The strands are those used by the Minnesota Comprehensive Assessment. That assessment does not include topics in discrete mathematics such as knot theory, network theory, sorting algorithms. Nor does it assess math communication.

Where the setting indicates “Heterogeneous Group” appropriate differentiation is always used so that students are learning and applying skills in their zone of proximal development.

Topic/Activity	Setting	Strand(s)	Resources/Notes
3-D shapes	Heterogeneous Group Extension Stand alone lesson Math Message	Geometry/Measurement Communication	Everyday Math, Teacher Created Materials
Angles and polygons	Heterogeneous Group Math Messages Theme integration Integration into math units	Geometry/Measurement Algebra Communication	Everyday Math, Marilyn Burns, Teacher created materials
Area/perimeter	Heterogeneous Group, Foundation Math, Math messages, Village	Number Geometry/measurement Algebra Communication	Marilyn Burns, Everyday Math, Village, Teacher created materials

Bases	Heterogeneous Group Homogenous Group Stand alone lessons Extension Integrated into math units	Number and Operation Communication	Teacher created lessons Bases can provide an “aha!” moment in which students begin to understand how the Base 10 system works. There are also art connections if children code Pascal’s Triangle in different bases.
Big Numbers	Homogenous Group, Foundation Math, Theme integration, Integrated into math units Math Messages	Number and operation	Everyday Math, Teacher Created Activities, Fermi Math League, Teacher created activities
Co-ordinate planes	Heterogeneous Group	Number and Operation Algebra Geometry/Measurement Data Communication	Everyday Math, <u>Lessons for Algebraic Thinking</u> , Marilyn Burns, Teacher created materials
Combinatorics	Homogenous Groups Stand alone lesson	Number and Operation Algebra Data Communication	Teacher created materials
Computer Science	Heterogeneous Group Stand Alone Lesson Integrated into math units	Geometry/Measurement Communication	Teacher created lessons, Logo, Scratch, Squeak Logo is a great language with which to explore geometry. Scratch was developed by MIT to encourage young people to program and learn the basic logic of coding.
Decimals	Foundation Math Integrated into most units, Math messages	Number and Operation Geometry/Measurement Communication	Everyday Math, Marilyn Burns, Teacher Created Materials
Division	Homogenous Groups Foundation Math	Number and Operation Algebra	Everyday Math, Marilyn Burns, <u>Young Mathematicians at Work</u> :

	Integrated into math units Math Message	Communication	<u>Developing Concepts of Multiplication and Division</u> , Math Recovery The scope for development in division in the fourth and fifth grades is very broad. Students move from a nascent understanding of splitting a number into equal parts all the way to long division, divisibility rules, factors, least common denominators
Estimation	Homogeneous Group Foundation Math Math Messages Theme integration Integration into math units	Number and Operation Data Communication	Everyday Math, Marilyn Burns, Math Recovery This needs to be consciously woven into all computation work.
Exponents and Scientific Notation	Foundation Math Math Message Theme Integration Integration into math units	Number and Operations Geometry/Measurement Communication	Everyday Math, Teacher created materials
Fermi math (complex, open-ended problems in which the process and communication are key)	Heterogeneous Group, Extension	Number and operation Geometry/Measurement Communication	Fermi Math League, Teacher created activities These problems often require research. Students sometimes identify math they are not yet able to do and seek out instruction.
Fractals	Heterogeneous Group, Stand alone lesson	Discrete Mathematics, Geometry	Vi Hart, <u>Cutting Fractals</u> , Teacher created lessons 4th and 5 th graders have what Montessori would deem a “sensitive period” for concepts of infinity. They like to continue

			patterns forever.
Fractions	Homogenous Group Foundation Math Math messages Theme integration Integrated into math units	Number and Operation Geometry/Measurement Communication	Marilyn Burns, Everyday Math
Functions	Heterogenous Group Math Messages Integration into math units Foundation math	Number and Operations Algebra Geometry/Measurement Communication	Everyday Math, , <u>Lessons for Algebraic Thinking</u> , Teacher created materials
Logic	Heterogeneous Group, Stand alone lesson Extension	Discrete Mathematics Communication	Everyday Math, Teacher created materials
Measurement	Heterogeneous Group Theme integration Foundation Math Math Message Integrated into math units	Number and Operation Geometry/Measurement Algebra Communication	Everyday Math
Models for Word Problems	Heterogeneous Group, Theme integration	Number and Operation Algebra, Data Communication	Singapore Math, Everyday Math, Teacher created materials
Money	Foundation Math, Theme integration	Number and Operation Geometry/Measurement Algebra Data Communication	Everyday Math, Teacher created materials
Multiplication	Homogenous Groups Foundation Math Integrated into math units Math Message	Number and Operation Algebra Geometry/Measurement Communication	Everyday Math, Marilyn Burns, <u>Young Mathematicians at Work: Developing Concepts of Multiplication and Division</u> , Math Recovery Currently, the scope for development in multiplication in

			the fourth and fifth grades is very broad. Students move from a basic understanding of equal groups and multiple addition all the way to multi-digit multiplication, properties of multiplication, multiples and rates.
Negative numbers	Heterogeneous Group Foundation Math Math Messages Theme integration Integration into math units	Number and Operation Data Communication	Everyday Math Inequalities, computation with negative numbers.
Olympiad Math	Foundation Math Extension	Number and Operation Geometry/Measurement Algebra Data Communication	<u>Olympiad Contest Problems for Elementary and Middle School Students</u> These are math problems which can be approached using brute force or more creatively. Students try to complete problems in a set time, incentivizing them to seek efficient, elegant solutions
Order of Operations	Homogenous Group Foundation Math Math Messages	Number and Operation Algebra	Everyday Math, Teacher created materials
Pan Balance	Heterogeneous Group, Extension	Algebra Communication	Everyday Math, Visualizing Algebra, Marilyn Burns, Teacher created materials
Pentominoes	Heterogeneous Group	Number and Operation Geometry Communication	Teacher created materials, <u>Chasing Vermeer</u>
Pi	Heterogeneous Group Stand alone lesson	Number and Operation Geometry/Measurement	Pi Day Websites, Teacher created activities We often celebrate “Pi Day” on

			March 14.
Probability	Heterogeneous Group, Theme integration	Number and Operation Data Communication	Marilyn Burns, Everyday Math, Teacher created lessons
Rates	Homogenous group, Integrated into other units	Number and Operation Algebra Geometry/measurement Data Communication	Everyday Math, <u>Lessons for Algebraic Thinking</u> , Marilyn Burns, Teacher created materials
Reflection/Symmetry	Heterogeneous Group Math Message Stand alone lesson Theme integration Integration into math units	Geometry/Measurement Communication	Everyday Math An obvious connection with art
Rounding	Homogeneous Group Foundation Math Math Messages Theme integration Integration into math units	Number and Operation Communication	Everyday Math, Teacher Created Materials We could use more resources in this area. Currently we have few lessons.
Time	Foundation Math Theme integration Math messages	Number and Operation Measurement Communication	
Volume	Homogenous Group Foundation Math Integrated into math units	Geometry/Measurement Algebra	Everyday Math

Title 1 – Math Program

Title I, Part A of the Elementary and Secondary Act (ESEA), provides financial assistance to local education agencies (LEAs) and schools with high numbers or percentages of children from low income families in order to assist schools in ensuring that all children meet challenging academic standards. Prairie Creek qualified for Title 1 funding in 2012/13 and uses these funds to support children at risk of not meeting math standards in the early years.

Identification

Students are identified and recommended for Title 1 support using formative assessments administered in the fall by the K/1 team of teachers. Students already identified with Individual Education Plan (IEP) math goals are not eligible for Title 1 support.

Parent Involvement

Parents are informed of this intervention opportunity at the fall parent/teacher conferences. Parents sign a “compact” agreement and are encouraged to attend a parent information session in the fall. Information and ways to support their child with math are sent home for those who cannot attend.

Instruction and Assessment

Instructional support is provided in the afternoons, supplementing the classroom math teaching. This additional support, based on math standards for each age group, is provided in class and as a pull out model depending on scheduling and student needs. Instruction is provided by a highly-qualified paraprofessional who works closely with the classroom teachers.

After initial identification, children are given a baseline assessment using the Math Recovery program. Frequent assessment is repeated throughout the year to monitor progress, with reports to parents provided at the mid-year and spring conferences.

Special Education and Math

Special education is instruction, specific to the child, at no cost to parents, to meet the unique needs of a child with a disability. It is important to note that students with disabilities are general education students first. They receive special education support services in conjunction with Prairie Creek's general curriculum. Special education is an instructional service, *not* a place. Specialized instruction and supports are provided as specified in an Individualized Education Plan (IEP), which addresses a student's unique needs as an aspect of their disability.

Students qualify for special education by meeting specific eligibility criteria as defined by the Minnesota Department of Education. A comprehensive special education evaluation is completed by a team of professionals to determine if they qualify in one or more of the following disability areas:

- Autism Spectrum Disorder (ASD)
- Deaf and Hard of Hearing (DHH)
- Deaf-Blindness (DB)
- Developmental Cognitive Disability (DCD)
- Emotional/Behavioral Disorders (EBD)
- Other Health Disabilities (OHD)
- Physically Impaired (PI)
- Severely Multiply Impaired (SMI)
- Specific Learning Disability (SLD)
- Speech or Language Impairments (S/L)
- Traumatic Brain Injury (TBI)
- Visually Impaired (VI)

It is possible to meet the eligibility requirements of a disability and not need special education services. For example, a child with a hearing loss who is succeeding within the general curriculum may not require "specialized instruction." In such instances, the district may still be required to make reasonable adjustments or accommodations to enable that student to access general education services under a Section 504 plan.

Special Education and Technology

Technology has been infused into the curriculum to assist teaching children with learning differences. The Special Education Program has purchased a variety of technological tools to assist students with learning. Ipads, SMARTboards, and laptops are being used to assist students with learning differences to access math in a variety of ways. The technology allows students to work on individualized instruction and have greater access to the general education curriculum.

Resources

Strategies to Achieve Mathematic Success

Strategies to Achieve Mathematic Success (STAMS) provides scaffolded lessons to assist students with learning math concepts. The lessons are broken down and build upon skills learned in prior lessons. There is a focus on building student independence with the concept being taught. The program supports general education curriculum. The program provides interactive whiteboard lessons to provide visual support to students.

Strategic Math Series

Strategic Math Series comes from the University of Kansas. It is a specialized program to assist students in learning math facts and place value. The program is designed to assist students in gaining fluency with math facts and learning to solve basic word problems. It starts with using concrete materials to solve problems and progressing to using numbers alone.

SMART Board

Combining a whiteboard with the power of a computer, the SMART Board interactive whiteboard enables teachers to create interactive lessons, write notes in digital ink and save their work. It allows notes to be saved and printed.

Ipad

Ipads provide a kinesthetic, visual and auditory math experience. New applications are now being developed to harness this powerful learning platform.

Parent Involvement Summary

Curriculum Night

Each fall, a curriculum night is hosted to provide families with information about all aspects of the program. Each classroom hosts parents, and teachers provide an overview of the math curriculum

Parent Conferences

Conferences are held three times a year: goal-setting (fall); mid-year progress (winter) and summary (spring). Teachers use these conferences to provide feedback from formative assessments, establish math goals and provide information on progress. Parents are provided with a written narrative (winter and spring) that includes a section articulating the child's work and growth in math.

Additionally, parents of students in grades 3 – 5 receive an assessment report detailing their child's achievement score on the Minnesota Comprehensive Assessments (MCAs)

Newsletters and blogs

The director and the teachers use newsletters and blogs to provide regular updates and insights into our progressive curriculum. Math is routinely addressed by classroom teachers in weekly communication home. Parents are also encouraged to directly contact the teacher if they have questions or concerns regarding math.

Feedback opportunities

Overall satisfaction with the math program is elicited each year by the Parent Satisfaction survey. More informally, Prairie Creek hosts meetings for input on the program.

The Incorporation of Mathematics into Thematic Learning

Math is taught in “math class” at Prairie Creek but it also infuses other parts of the school day. Math is often part of the morning message that greets student in the morning. Teachers use math games and short math activities when they transition a class from one activity to another. Math is also woven into the theme work the children do. This math can be especially powerful because it is contextualized for the children. They see a very real need for the math work they are doing. It is authentic. It is real. We strive to connect math concepts to our theme work to help students feel the utility and beauty of math.

The following are just three examples of the math incorporated into theme learning in our classrooms.

Where in the World does our Food Grow? – A kindergarten and first grade theme

Where in the World does our Food Grow? was a thematic unit involving world geography, the seven continents, and our leading food-growing countries for common foods we eat every day.

Math concepts integrated:

- Fractions
- Tally marks
- Forward number counting sequence/by ones, fives, tens
- Place value of tens and ones
- Measurement: weight/temperature
- Qualitative comparison of weight/volume
- Sorting
- Estimation/actual count

Theme work at the K-1 level provides many opportunities for hands-on/ real life learning experiences for mathematical understanding.

In a geography study of our earth and the foods we produce, we focused on common foods we eat daily. While learning about bananas we introduced fractions of whole, half, and quarter. We cut our bananas into these

fractioned pieces and fried them up to eat. We learned a song about tallying bananas. Throughout our eight week study we practiced and used tally marks whenever possible. This tallying reinforces forward number sequence by ones, fives and tens.

During our study of pumpkins and where they grow, we made estimations of how many seeds there would be inside a pumpkin. After removing a great quantity of seeds, the children arranged the seeds into piles of ten and circled each set on a large paper on the floor. Messy math is wonderful math! We counted up piles by tens to reach a grand total of 300 seeds with seven left over: 307! We boiled that pumpkin down into mash and made pumpkin muffins using fractions in our baking. These muffins would be frozen and stored for a feast event later on in the month.

During our study we started a service project to collect food shelf items to be delivered to our local food shelf. The whole school was invited to donate items. We sorted items by packaging: boxes, cans, jars and bags. We counted each group, again recording our quantities using tally marks. The quantities were then written and added as whole numbers. We weighed bags and boxes comparing relative size of containers with actual weight. One small bag was far heavier than one enormous box. We learned to read the scale as well as our thermometer and calendar.

We studied other foods and continued to practice all of the basic math skills we had introduced along the way. The hands-on experiences during our theme work integrated very well with the daily math lessons and basic skill work in the classroom.



Full Circle Foods – A second and third grade theme.

In the fall of 2010, as part of a grant from the MPCA and as a service project, second and third grade classrooms tackled some difficult questions regarding the full circle of food – Where does our food come from? How do we use food to nourish our bodies? What happens to our food waste? How can we reduce our waste?

Along with science, math was heavily integrated into this theme. The children began by gathering background information about our food waste at school. Using scales and standard units of measurement, the children calculated weight and volume of waste generated through our school lunch program. They graphed this information

along with information gathered from an all-school survey about perceptions of waste at school. Our main goal was to reduce the amount of waste generated at school. Later, when purchasing recycling and garbage receptacles for the school, the children answered multi-step word problems with variable answers about just how many receptacles we would need.

As part of the theme, the children visited compost sites and small vegetable farms. The children used the vegetables collected from these farms to make soup for our culminating event, Empty Bowls, an international project to fight hunger. They weighed their ingredients and learned about fractions while following recipes. In the days leading to the event and at the event, the children sold handmade bowls and collected money for their local Food Shelf. Identifying, sorting, and adding coins was an integral step in determining the amount of money they raised (over \$1,000!)

Connected with this theme, in the spring of 2011, the children created their own garden at school. Before constructing their garden, they needed to determine perimeter and area of the garden, use multiplication arrays to decide the layout of the vegetables, and calculate the cost of purchasing vegetable plants.

The Game of Village – a fourth and fifth grade theme

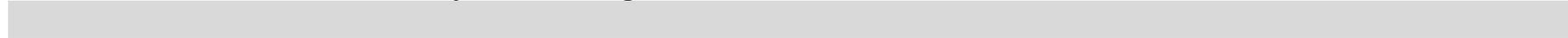
In the spring, fourth and fifth graders create a village to $1/24$ scale. They quickly gain an understanding of ratio as they translate the “real” world into twenty-fourths. A year becomes two weeks, a month becomes a day, and a day becomes an hour. Students design their houses to scale and determine the area of the siding and roofing they need. They also work with the Pythagorean theorem to design their roofs. They make decisions about the materials they will use based on their cost in the store.

To get the money to buy their materials, students must take out a loan based on the value of their land. Financial literacy is central to their learning in this part of the game as they open bank accounts, read contracts, take out loans with interest, write checks, keep checkbooks, deposit checks, submit timesheets and invoices and create budgets.

Many students open businesses and learn about material costs, labor and net profits. Students send goods through customs and learn about tariffs. While the federal government allows certain goods to pass through customs without a charge, it taxes others heavily in order to discourage certain kinds of trade. These personal lessons in economics expand outward as the citizens develop a monetary system, deal with possible counterfeiting and often learn too late about the causes of inflation (“Why don’t we just print more money for everyone?”) They also learn about the impact of currency exchange on trade. There are two villages and they don’t necessarily have the same currency or currency valuation (the value of currency is determined by how much private land the villages decide to allot.)

Finally, students prepare descriptions of their land for appraisers. Students average their appraisals and collect other information to create a final financial portfolio.

The math in village is just a part of what we’re doing on a daily basis. Words like “collateral,” “interest,” and “inflation” become natural parts of students’ vocabularies. At the end of a mini-lesson on how to figure out how much a product costs to produce and how to determine what a fair profit is, one student came up to a teacher and declared, “Thanks, I needed that!” The goal of all progressive education is to create in students a feeling of desire for the information and skills they are learning.



Annotated Bibliography of Resources

Key Practical Curriculum Sources (Lessons, Scope and Sequence, Assessments)

McGraw-Hill Everyday Mathematics – 2012 Common Core Edition

Everyday Math provides a scope and sequence for skills and concepts from kindergarten through fifth grade. Concepts are clearly laid out and students are appropriately scaffolded within a lesson. Multiple algorithms are taught with the goal of students developing a deep understanding of operation and an increasing ability to compute efficiently and accurately. Concepts “spiral,” meaning they are introduced long before mastery is expected. Each time a student encounters a concept a level of complexity is added. The language and layout is consistent with the way problems are presented on the MCA.

Marilyn Burns – various publications and series

Marilyn Burns units focus on developing a deep and flexible understanding of math concepts. Students engage in problems and games that challenge them to *use* the math concepts to which they are being introduced. Discussion of strategies is key, and the supporting curriculum materials take pains to help educators navigate and guide math discussions effectively in a way that leads to authentic discovery. Marilyn Burns believes that writing and talking are crucial elements in assessment as they enable the educator to understand much more deeply what a child understands about number. The educator can then effectively address misconceptions that can be masked if a child is only asked to show computational work.

Math Recovery

This program is intensive and primarily remedial, roughly analogous to the Reading Recovery model. However, it has many activities that can be used by the regular classroom teacher in whole group or small group settings. Developing a very strong base 10 number sense and a flexible approach to number are strengths of the program. The K/1 Title programs uses many elements of Math Recovery.

Scott Foresman Investigations

The focus of this curriculum is on process--children are encouraged to communicate the strategies they used to solve a problem, and to consider more than one way of solving a problem. At K-1 we use many of the games from this curriculum to give children practice on basic math skills and processes.

Strategies to Achieve Mathematic Success

Strategies to Achieve Mathematic Success (STAMS) provides scaffolded lessons to assist students with learning math concepts. The lessons are broken down and build upon skills learned in prior lessons. There is a focus on building student independence with the concept being taught. The program supports general education curriculum. It also provides interactive whiteboard lessons to provide visual support to students.

Strategic Math Series

Strategic Math Series comes from the University of Kansas. It is a specialized program to assist students in learning math facts and place value. The program is designed to assist students in gaining fluency with math facts and learning to solve basic word problems. It starts with using concrete materials to solve problems and progressing to using numbers alone.

<h2>Pedagogy, Philosophy and Psychology Books</h2>

Burns, Marilyn. About Teaching Mathematics: A K-8 Resource (3rd Edition). Sausalito, CA: Math Solutions Publications, 2007. Print.

A mix of pedagogy, philosophy and practicality. Burns describes mathematical teaching that strives to understand where children are in their mathematical thinking so that misconceptions can be addressed and conceptual understanding deepened.

Chapin, Lisa. Math Matters: Understanding the Math You Teach. Sausalito, CA: Math Solutions

Publications, 2006. Print.

Delves into how students understand math and how teachers can clarify their understanding of the math they teach.

Liping Ma. Knowing and Teaching Elementary Mathematics. Routledge, 2010. Print.

An excellent bi-cultural examination of understanding of mathematics in elementary and secondary teachers in China and the United States. Ma Finds that despite more formal training in teaching, U.S. teachers often do not deeply understand the concepts they are teaching, leading to superficial explanations and the continuation of poor mathematical understanding and application in our society.

Liburn, Pat, et. al. Good Questions for Math Teaching: Why Ask Them and What to Ask, K-6. Sausalito, CA: Math Solutions Publications, 2002. Print.

An exploration of the power of questions in a math classroom. Illustrates how to help students dig deeper into their understanding and highlights the importance of doing so.

Twomey Fosnot, Catherine. Young Mathematicians at Work: Constructing Number Sense, Addition and Subtraction. Heinnean, 2001. Print.

A practical guide infused with philosophy. Activities and discussions that lead to a flexible, fluent and deep ability to manipulate numbers. Additional books in the series include Multiplication and Division, and Fraction, Percents and Decimals.

Wright, Robert J., Jim Martland, and Ann K. Stafford. Early Numeracy: Assessment for Teaching and Intervention (Math Recovery). Thousand Oaks, CA: SAGE Publications, Inc., 2006. Print.

The first portion of this book looks at the development of mathematical concepts in children. The second portion provides a very detailed assessment to identify the needs of students who are struggling in math.

Other Resources (a partial list)

Bachman, Vicki. First-Grade Math: A Month-to-Month Guide. Sausalito, CA: Math Solutions Publications, 2003. Print.

Offers a year of rich math instruction for first graders based on the philosophy of Marilyn Burns. Helps teachers decide what to teach, when and how. The series includes other grades which are used by teachers at other levels.

Bresser, Rusty and Caren Holtzman. Minilessons for Math Practice, Grade K-2. Sausalito, CA: Math Solutions Publications, 2006. Print.

These are short lessons that have been created for use during transition times. They provide practice in math skills, concepts and processes and give children the opportunity to apply them in real problem-solving contexts.

Burns, Marilyn, Maryann Wickett and Katharine Kharas. Lessons for Algebraic Thinking: Grades 3-5. Sausalito, CA: Math Solutions Publications, 2007. Print.

A series of lessons designed to help students see how algebra works through visual representations. Students work with functions, patterns and graphs.

Conrad, Stephen and Daniel Flegler. Math Contests, Grade 4,5 & 6. Math League Press, 2006. Print.

A collection of short problems for upper elementary students. Focuses on quick computation and vocabulary recognition.

Diller, Debbie. Math Work Stations: Independent Learning You Can Count On, K-2. Portland, Maine: Stenhouse Publishers, 2011. Print.

A guide to organizing math materials and activities and teaching independent work habits, so that children can practice math skills independently while the teacher works with small groups.

Lechner, George. Olympiad Contest Problems for Elementary and Middle Schools. Glenwood Publications, 1997. Print.

A collection of problems and solutions for upper elementary and middle school students. Focus on efficient, creative approaches to problems. We also use Volume 2.

Wright, Robert J., Jim Martland, Ann K. Stafford and Garry Stanger. Teaching Number in the Classroom with 4-8 year olds (Math Recovery). Thousand Oaks, CA: SAGE Publications, Inc., 2012. Print.

Wright, Robert J., David Ellemor-Collins and Pamela D. Tabor. Developing Number Knowledge: Assessment, Teaching and Intervention with 7-11 year olds (Math Recovery). Thousand Oaks, CA: SAGE Publications, Inc., 2011. Print.

Wright, Robert J., Jim Martland, Ann K. Stafford and Garry Stanger. Teaching Number: Advancing Children's Skills and Strategies (2nd Edition). Thousand Oaks, CA: SAGE Publications, Inc., 2010. Print.

A series of books giving a step by step approach to helping children develop number sense, based on Math Recovery principles.