Mathematics
for the Elementary Level

An Information Bulletin for Administrators

January 1992

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Purpose of this Information Bulletin

Effective implementation of any new course of study requires administrative commitment and support. This document is designed to provide information and assistance to administrators so that you may play an active role in curriculum implementation.

The Elementary Mathematics Information Bulletin for Administrators has been designed to enable administrators to support teachers in implementing a quality mathematics program. In particular, this document:

- sets mathematics into the context of Core Curriculum;
- outlines the aim and goals of the new curriculum;
- provides a course overview of Mathematics, Grades 1-5, making suggestions for integration with other subjects at the Elementary Level; and,
- describes considerations for curriculum implementation such as time, resources and the suggested role administrators can play to support the implementation.

Background

Core Curriculum Plans for Implementation (Sask Ed, 1987) laid the foundation for the changes outlined by Saskatchewan Education in response to the emerging needs of the K-12 system. *Charting the Course: A Guide for Revising the Mathematics Program in the Province of Saskatchewan (Sask Ed, 1990)* addressed the general goals of mathematics education, some of the key issues that must be considered in reviewing the mathematics program, as well as changes that need to be made in the elementary program in Saskatchewan.

Rationale for Course Change

The Elementary Mathematics Curriculum is centered around the philosophy of real-life problem solving, the active involvement of students, and the use of a variety of appropriate resources. Previously, computation and other traditional student skills and classroom practices have had extensive focus. This has limited the amount of time teachers devoted to the applications of mathematics and to developing the skills and understandings necessary for students' future success. Therefore, the curriculum is designed to promote the following key changes:

- problem solving drives the curriculum and is incorporated in every strand of mathematics;
- the use of multiple resources;
- the application of mathematics to real life;
- the active involvement of students in their learning, including the extensive use of manipulatives;

- the application of estimation and mental arithmetic strategies;
- the use of calculators as tools for learning and doing mathematics; and,
- an integrated approach to the teaching of mathematics.

Aim and Goals

The main aim of the mathematics program K-12 is to prepare numerate individuals who value mathematics and appreciate its role in society. The intent is that students will be confident and competent with everyday situations that demand the use of mathematical concepts; specifically, this means interpreting quantitative information, estimating, performing calculations mentally, and developing an intuitive knowledge of measurement and spatial relationships. The mathematics program is intended to stimulate the spirit of inquiry by developing a variety of problem-solving skills and abilities. Lastly, there is a need to make effective use of technology where it is most appropriate.

The general curriculum goals are intended to provide students with the mathematical preparation essential to:

- function as consumers and workers, that is to develop the skills and knowledge of concepts necessary to meet the needs of the average worker and consumer;
- function as informed, responsible citizens, that is to develop the ability to analyze and interpret quantitative information;
- obtain a liberal education, that is to develop logical thinking skills, effective work habits and an appreciation of mathematics;
- become capable problem solvers, that is to develop the desire, confidence, and ability to solve problems;
- communicate mathematically; and,
- pursue further study in mathematics and mathematically related areas.

Emphasis is placed on how to compute, measure, estimate, and interpret mathematical data, when to apply these same skills and techniques, and understanding why these processes apply. The intent is to develop self-reliant, self-motivated, confident, life-long learners.

Course Overview

Student learning objectives in Elementary Mathematics are divided into five strands. Each strand is divided into topics and subtopics with emphasis placed on the objectives appropriate for each of Grades 1-5. Some learning objectives have also been included for Kindergarten.

Problem Solving

- Understanding
- Planning and Executing
- Reflecting

Data Management and Analysis

- Collecting
- Organizing and Displaying
- Summarizing and Interpreting

Numbers and Operations

- Whole Numbers
  - Foundations
  - Counting
  - Place Value
  - Addition
  - Subtraction
  - Multiplication
  - Division
- Rational Numbers
  - Common Fractions
  - Decimal Fractions

Geometry

- Space (three-dimensional)
- Plane (two-dimensional)

Measurement

- Length
- Area
- Capacity
- Volume
- Mass
- Time
- Temperature
- Money
- Angles

Implementation Considerations

• Policy and Time Allocations

Mathematics is a Required Area of Study at the Elementary Level. Time requirements for this course at each of Grades 1-5 is 210 minutes per week.

• Documents

- Curriculum Guide - one per teacher
- Bibliography - one per school - spring 1992
- Information Bulletin for Administrators - one per school - winter 1992

- **Key Resources**

  See Appendix A.

- **Staff Development**

  Saskatchewan Education will provide regional or school-division-based inservice to school divisions implementing the program during the three-year "window" for implementation. School divisions are responsible for providing release time and expenses for teachers to attend implementation inservice.

- **Integrating Mathematics With Other Subjects**

  - Integration in mathematics entails:

    - teaching mathematics in a manner that is meaningful and applicable to all students;
    - combining many of the learning objectives from various strands and topics of mathematics within a unit of study; and,
    - demonstrating the applicability of mathematics by showing the interrelatedness with other Required Areas of Study.

  - Five integrated units, one at each grade level, are included in the curriculum guide and serve as models.

Role of Administrators

- To support the development of a strong collection of resources to encourage resource-based learning. Teachers should be encouraged to use community-based resources as well.
- To support teachers who wish to collaborate to plan units, to expand their repertoire of instructional methods, and to use appropriate evaluation strategies.
- To inform parents, boards and the community that the Elementary Mathematics Curriculum outlines specific concepts and skills that need to be developed. Instruction will be influenced by the previous experiences of teachers and students, community resources, and the cultural background of students.
- To inform parents, boards and the community that the course encourages teachers to use a variety of instructional strategies and methods that are appropriate to the teaching of the Mathematics Curriculum. These strategies and methods will in turn require a variety of evaluation procedures.

Maintenance

In part, Saskatchewan Education plans to maintain the curriculum for elementary mathematics through information provided in the Textbooks Circular (to be called Key Curriculum Resource Materials). Other support will come through Core Curriculum initiatives involving school divisions.

Curriculum Evaluation

The new elementary mathematics courses will be evaluated shortly after the implementation phase as part of the curriculum development cycle.

Appendix A: Key Resources

Manipulatives

The philosophy of the Elementary Mathematics Curriculum promotes the active participation of all students. Students learn best by forming mental pictures of numbers, number relations and mathematical concepts through manipulation of concrete material. Therefore, every elementary mathematics teacher should have basic manipulative materials as part of the classroom resources. Some manipulatives should be purchased, others can be constructed or collected. Most concrete materials can be used in a wide variety of ways in the classroom.

Commercially produced manipulatives, such as those listed below, are considered to be essential for developing the major concepts in elementary mathematics. Other important manipulatives that may be constructed or collected are described in the bibliography.
Ideally, each classroom would have the equivalent of the following materials:

Item	Order No.	Suggested Quantity			Price (Approx.)
Base Ten Material		Gr. 1	Gr. 2	Gr. 3-5	
unit cubes (pkg. of 100)	BB 1671	10	5	5	$3.50/pkg.
rods (pkg. of 10)	BB 1672	20	10	10	$3.00/pkg.
flats (pkg. of 10)	BB 1673		8	8	$10.00/pkg.
decimetre cubes	BB 1674			2	$7.00 ea.
stamps (set of 4)	BB 1675	1	1	1	$10.00/pkg.
Linking Cubes	BB 1676	1000			$8.00 per 100
Pattern Blocks (pkg. of 250)	BB 1680	5			$25.00/pkg
Overhead Blocks (set)	BB 1678	1			$10.00/set
Attribute/Logic Blocks (pkg. of 60)	BB 1682	Gr. 1 (large) - 1 Gr. 2-5 (small) - 2			$50.00/pkg. $20.00/pkg.
Geoboards					
5 x 5 (Gr. 1-2)	BB 1677	15			$5.00 ea.
11 x 11 (Gr. 3-5)	BB 1678	15			$7.00 ea.
Geo-bands (set)	BB 1679	1			$3.00/set
Money coins and bills (set)	BB 6390	2			$12.00/set
Calculators	1 class set per school, plus individually owned student calculators				

It is recommended that each classroom's inventory of concrete material be cross-referenced with items listed in the bibliography and that manipulatives be obtained based on the needs of the students, the teacher, and the curriculum. It is recommended that initially teachers focus on the multiple applications of a few major manipulatives and gradually expand the scope of manipulatives used. It is also recommended that less frequently used items be shared among teachers in the school.

When obtaining manipulatives it is advisable to purchase sufficient quantities of key manipulatives rather than a commercially prepared kit that may contain items less frequently used. Print material to support various manipulatives is available and recommended.

The Book Bureau (BB) stocks most of the key resources for elementary mathematics. Please note that prices quoted are approximate only. Wherever possible, the key resources identified should be examined before final ordering decisions are made. The Book Bureau may be able to arrange previewing privileges if materials are returned in saleable condition and a restocking fee is paid. Please contact the Book Bureau for details.

Videotapes

Many excellent student and teacher videotapes are available to support student learning of mathematics. Several titles can be obtained from Media House Productions (MHP)for a duplication charge of $1.00 per title plus postage and a blank videotape; other titles can be purchased at varying costs through suppliers. If the more costly videotapes are purchased, a school division may wish to house them in a division collection and loan them to schools.

Beginning Mathematics (Videotapes). Magic Lantern Films (MHP), 1987. 14 min. each, $1.00 per title plus blank tape.

Titles in this series include: Addition-Revised; Counting, Base and Place Values-Revised; Division-Revised; Multiplication-Revised; Numbers All Around Us-Revised; Subtraction-Revised; What are Fractions and How are they Used?-Revised. Each title is annotated separately in the bibliography.

Mathematics: Making the Connection (Videotape). National Council of Teachers of Mathematics (MHP), 1991. 12 min. $1.00 plus blank tape.

This promotional videotape from the National Council of Teachers of Mathematics stresses the importance of mathematics in real-world situations. Three prominent American figures who work in the areas of publishing, architecture and music are interviewed. Each of them emphasizes that mathematics is not merely computation, but reasoning, problem solving and communication. The two documents promoted in the

videotape are "Curriculum and Evaluation Standards for School Mathematics" and "Professional Standards for Teaching Mathematics."

Math: With Manipulatives (Videotapes). Marilyn Burns. Cuisenaire Company of America (Order from: Spectrum Educational Supplies Limited, 125 Mary Street, Aurora, ON, L4G 1G3, Phone: (416) 841-0600, Fax: (416) 727-6265), 1988. 20 min. each. $129.00 each or $695.00 for entire set.

This is a series of six videotapes that present lessons on the effective use of concrete materials in the elementary classroom. They are designed to be used for professional development or parent information sessions. Each of the six titles in the series features a twenty-minute videotape and a guidebook with step-by-step instructions for group leaders and blackline masters for classroom use. A further description of these videotapes appears in the bibliography.

Math Works (Videotapes). Agency for Instructional Technology (MHP), 1985. 14 min. each. $1.00 per title plus blank tape.

Titles in this series include: Adding and Subtracting Fractions and Mixed Numbers with Like Denominators; Adding and Subtracting Fractions and Mixed Numbers with Unlike Denominators; Comparing Decimals; Estimating by Rounding; Exploring Geometric Shapes; Exploring the Movement of Objects in Space; Forming Ratios; Identifying the Problem; Measurement: Dividing Regions Into Subregions For Finding Area; Measurement: Find the Areas Of Rectangles; Measurement: The Difference Between Perimeter And Area; Other Estimation Strategies; Place Value In Decimals; Place Value Of Large Numbers; Probability: Possible Outcomes; Problem Solving: Looking For A Pattern; Relating Fractions And Decimals; Simplifying The Problem; Statistics: Analyzing Data; Statistics: Collecting Data; Statistics: Sampling; Understanding The Placement Of The Decimal Point; Using Diagrams And Models; Using Graphs; Using Maps; Using Mental Computation For Subtraction; Using Mental Computations For Addition; Using Tables. Each title is annotated separately in the bibliography.

It Figures (Videotapes). Agency for Instructional Technology (MHP), 1986. 15 min. each. $1.00 per title plus blank tape.

Titles in this series include: Changing Scale On A Graph; Comparing Decimals; Deciding When To Use Multiplication; Deciding When To Use Subtraction; Estimating When Dividing; Finding Area By Covering; Finding Equivalent Fractions; Looking At Objects From Different Positions; Making Sense Of A Large Number; Measurement: Deciding How Close Is Close Enough; Predicting Your Change; Problem Solving: Acting It Out; Problem Solving: Drawing A Picture; Problem Solving: Keep On Trying; Problem Solving: Making A Table; Problem Solving: Many Ways To Go; Problem Solving: Recognizing Necessary Information; Problem Solving: Using A Guide; Relating Fractions and Decimals; Understanding Place Value; Understanding Remainders; Using Bar

Graphs; Using Division; Using Estimation; Using Fractions; Using Mental Computation; Using Multiplication and Addition; Using Probability. Each title is annotated separately in the bibliography.

Solve It (Videotapes). Agency for Instructional Technology (MHP), 1987. 15 min. each. $1.00 per title plus blank tape.

Titles in this series include: Drawing and Interpreting Tables and Diagrams; Estimation Strategies for Division; Estimation Strategies for Multiplication; Guess, Check and Revise; The Meaning of Percent; Measuring Angles; Measuring Volume; Multiplication with Fractions and Mixed Numbers; Ordering Decimals; Precision and Estimation; Reasonableness of Answers; Sampling, Scale Drawings and Models; Solving A Simpler Problem; Subtracting Mixed Numbers; Understanding Mean, Median, and Mode; Using Logical Reasoning; Using Mental Computation for Multiplication. Each title is annotated separately in the bibliography.

Student and Teacher Resources

If teachers are to instruct students using methods which support optimal student learning, they must have available a wide range of various kinds of materials. In the case of elementary mathematics, it is recommended initially that allocated funds would be most effectively used for the purchase of manipulatives and key teacher references.

If class sets of textbooks have been purchased recently, they may certainly be used as one of many resources. Textbook materials considered suitable are listed in the Bibliography and in the Textbooks Circular. However, all textbooks must be examined carefully. Only those parts that support the objectives of the curriculum and the recommended instruction and evaluation practices should be used. The purchase of a class set of textbooks is expensive and they can become quickly outdated. No one textbook meets all the requirements of the curriculum. **The purchase of a class set of textbooks is not recommended.** New print resources which more fully support the curriculum may be available from publishers in the future.

The following Student and Teacher Resources reflect the philosophy of the Elementary Mathematics Curriculum and provide appropriate resources for the elementary classroom. These resources are selected from materials that have been submitted by publishers and evaluated by pilot teachers and curriculum writers.

Print-Teacher-References recommended are:

Active Learning Series (Print-Teacher-Reference). Exclusive Educational Products (BB), 1989. 80 p. each (approx.) $30.00 each (approx.).

Titles in the series:	Complete Book of Cube-A-Link (K - Gr. 4)	BB 1665
	Complete Book of Cube-A-Link (Gr. 5-8)	BB 1667

101 Winning Ways with Base Ten (Gr. 1-3)	BB	814
101 Winning Ways with Base Ten (Gr. 4-6)	BB	6024
Pattern Blocks (Gr. 4-6)	BB	1668
What do you do with Attribute Blocks? (Gr.K-8)	BB	829
The Geoboard Collection (Gr. 4-6)	BB	826

The Active Learning Series is a collection of print-teacher-references in blackline master format. The resources are self-contained in three-ring binders. Materials are grouped into early primary, upper elementary and middle years. All of the materials offer sequential activities grouped by topic. More complete information is provided in the bibliography for each title in the series.

Cooperative Learning in Mathematics: A Handbook for Teachers (Print-Teacher-Reference). Neil Davidson (Editor). Addison-Wesley (BB), 1990. 409 p. BB 825 $44.88.

This print resource contains original essays by educational leaders describing practical strategies for using cooperative learning in small group situations. The procedures described are realistic, practical strategies for using small groups in mathematics teaching and learning. These methods can be applied from kindergarten to grade 12 and all major topic areas in mathematics are covered. The book features a variety of cooperative learning strategies to address differing academic objectives. Suggestions are provided for implementing cooperative learning in heterogeneous classrooms. Sample activities and strategies for using computers with mathematics are described. This reference will appeal to all teachers wishing to expand their repertoire of available instructional strategies in mathematics.

Explorations (Print-Non-Fiction). Betty Coombs, et al. Addison-Wesley (BB), 1985.

Explorations for Early Childhood	BB 824	$ 89.70
Explorations 1	BB 5472	$106.95
Explorations 2	BB 5473	$106.95

Explorations is a mathematics program based on a commitment to learning through the manipulation of concrete materials and interaction with the environment. The three books in the series have been designed for Kindergarten, Grade 1 and Grade 2 students. Activities have been spiralled to provide repeated exposure to various strands of mathematics: problem solving, number, geometry, measurement and operations. All of the Explorations resources are richly illustrated and include numerous photographs. Each section of the teacher's resource manuals contains background information, planning and preparation guides, observation and evaluation suggestions, and practical activity strategies.

Hands On Manipulative Activities for Primary Children (Print-Teacher-Reference). Creative Publications (BB). 1986. 120 p. each ($28.40 each).

Hands On Attribute Blocks (K - Gr. 3)	BB 6363
Hands On Base Ten Blocks (K - Gr. 3)	BB 6364
Hands On Geoboards (K - Gr. 3)	BB 6365
Hands On Pattern Blocks (K - Gr. 3)	BB 6366

Several topics are included in this series of carefully sequenced mathematics activities. Each topic is addressed in a single 3-ring binder which consists of more than 100 pages of reproducible blackline masters. The main focus of each of the books is the development of critical thinking skills such as sorting, classifying, logical thinking, identifying patterns, testing, and recording.

MathWorks (Print-Non-Fiction). Heather J. Kelleher. Houghton Mifflin (BB), 1992. $96.00 each.

MathWorks A	BB 6065
MathWorks B	BB 6066

MathWorks is an activity-oriented, materials-based program. Real-world themes that use everyday materials are divided into three distinct strands: number content, spatial content, and data analysis and problem solving. Assessment is on-going and uses a diagnostic teaching approach with formal and informal methods of testing and observation. Flexible groups are encouraged and suggestions are provided for adaptations and class management. There are two MathWorks programs at this time: MathWorks A is for use with early primary and MathWorks B is for use with late primary, each corresponding with grades one and two. Both books are coilbound, oversize and feature colourful photographs and colour-coded sections. A bibliography of children's literature titles grouped by mathematical concepts is provided. Each theme lists language arts connections.

Mental Math in the Middle Grades: Blackline Masters - Grades 4-6 (Print-Teacher-Reference). Jack A. Hope, et al. (Mental Math). Dale Seymour Publications (BB), 1987. 121 p. BB 6023 ($12.75).

Second in a series of three books on the topic of mental math, this resource extends the skills developed in the primary edition by providing more challenging calculations. Perforated pages include teacher pages, power builder selections and review pages. The resource focuses on simple calculations with whole numbers using the basic operations of addition, subtraction, multiplication and division.

Mental Math in the Primary Grades: Blackline Masters - Grades 1-3 (Print-Teacher-Reference). Jack A. Hope, et al. (Mental Math). Dale Seymour Publications (BB). 1988. 117 p. BB 6022. ($12.75).

This resource provides practical mental math activities in 36 sequential lessons. Teacher background information and step-by-step instructions are given. Complete teacher notes, bulletin board ideas, practice sets, unit tests, and illustrated blackline masters are included. This resource focuses on simple calculations with whole numbers using the basic operations of addition, subtraction, multiplication and division.

Pattern Blocks Activities K-6 (Print-Teacher-Reference). Barbara Bayha and Katherine Burt. Dale Seymour Publications (BB), 1985. 82 p. BB 6021. ($13.35).

Activities related to patterns, number operations, geometry and measurement are included in this book of blackline masters. Thirty-six lessons in three levels of difficulty encourage hands-on exploration of math concepts. Topics covered are: Explorations, Patterns, Strategies, Fractions, Symmetry, and Perimeter and Area.

The Problem Solver: Activities for Learning (Print-Teacher-Reference). Judy Goodnow, et al. Creative Publications (BB), 1987. 142 p. each. ($32.90 each).

The Problem Solver 1	BB 6016
The Problem Solver 2	BB 6017
The Problem Solver 3	BB 6018
The Problem Solver 4	BB 6019
The Problem Solver 5	BB 6020

Available individually for each grade, these teacher resources contain annotated teaching plans, pages of reproducible problems for each particular grade, ready-to-use discussion questions, and detailed problem solutions in a 3-ring binder format. Each Problem Solver has charts that reference related problems in adjacent grade level binders. Some problems have imperial measures which can easily be converted to metric.

Windows on Mathematics: Worktime Activities for Young Children (Print-Teacher-Reference). Joan Westley, et al. Creative Publications (BB), 1987. 64 p. each. BB 6369. ($125.00 complete set or individually as listed in the Bibliography).

Windows on Mathematics consists of 12 coilbound books plus a teacher's guide suitable for the early primary grades. Each book contains 28 investigations or windows. Topics covered include: measurement, shapes, counting, numbers, comparing, matching and graphing. All lessons use familiar, commonly-available materials and may be used with small groups, individual students or at learning centres.

Distributor Directory

BB Book Bureau
1308 Winnipeg Street
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Phone: (306) 787-5993
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