Western Canadian Protocol: The Common Curriculum Framework (K–12 Mathematics)

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What Is Protocol?

Curriculum development in western Canada has been done in the context of two protocol agreements that have been signed by the ministers of education in Canada. These agreements provide the authority and direction for the various projects to be undertaken.

Western Canadian Protocol

In December 1993, ministers of education from the four western provinces and two territories (Manitoba, Saskatchewan, Alberta, British Columbia, the Yukon Territory and the Northwest Territories) signed the Western Canadian Protocol for Collaboration in Basic Education, Kindergarten to Grade 12 (WCP). This agreement encourages and enables the participating jurisdictions to work more closely together because of the importance they place on

- common education goals,
- high standards in education,
- removing obstacles for student access to educational opportunities, which includes improving the ease of transfer from jurisdiction to jurisdiction, and
- optimum use of educational resources.

The WCP covers six major areas: curriculum, distance learning and technology, special education, student assessment and standards of student performance, aboriginal education, and teacher preparation and certification. There is also provision in the agreement for launching other types of cooperative projects in the future.

The WCP group has agreed to develop common curriculum frameworks of general and specific outcomes—what students will be expected to know and be able to do—for mathematics and English language arts. They will also be working together on the review of learning resources.

Alberta is playing a lead role in three of the projects: mathematics curriculum for Kindergarten to Grade 12, curriculum in languages other than English and French, and distance learning and technology. We are also participating in the language arts project for Kindergarten to Grade 12, which is being coordinated by Manitoba.

Pan-Canadian Protocol

After discussions in 1994, a general framework for collaboration, the Pan-Canadian Protocol for Collaboration on School Curriculum, was adopted in February 1995 by the Council of Ministers of Education, Canada.

Recently, ministers of education have initiated several joint projects to develop common frameworks for school programs. Work has begun on the development of the pan-Canadian science project, which will potentially involve all Canadian provinces and territories, except Quebec.

Framework Development for K–12 Mathematics

The development of the common curriculum framework for mathematics commenced with the first interprovincial writing in August 1994. Since then, 64 educators from six participating jurisdictions have developed the framework. It is important to note that the participants represented practising teachers (K–12, as well as some postsecondary instructors) and curriculum specialists from the various departments of education.

In Alberta, The Alberta Teachers' Association nominated teachers to the Alberta team, as did Alberta Education.

The development of the K–12 framework took place in two phases. The first phase ended in June

1995 with the distribution of the K–9 component. The second ended in June 1996 with the distribution of the 10--12 component.

The Framework

The Common Curriculum Framework for mathematics does several things:

- It has grade-level student outcomes organized as
  - general outcomes,
  - specific outcomes and
  - illustrative examples.
- It identifies four strands within which all student outcomes are organized.
- It has a K–12 focus.
- It identifies key mathematical processes that are critical elements affecting student learning.
- It discusses the nature of mathematics.

Student Expectations

The content of the common curriculum framework is stated in terms of outcomes. These outcomes are measurable and identify what students are required to know and do.

The outcomes are developed and based on the expectation that they are appropriate to a large majority of the students. Outcomes are stated at the level where they are expected to be "mastered." There may be some time delays between where students first encounter the learning and where they are expected to demonstrate knowledge of, or mastery in, that learning.

General Outcomes

General outcomes are general statements that identify what students are expected to know and be able to do on completion of a grade.

Specific Outcomes

Specific outcomes are statements identifying the component knowledge, skills and attitudes of a general outcome.

Illustrative Examples

Illustrative examples are sample tasks that demonstrate and elaborate on the general and specific outcomes. They are important in conveying the richness, breadth and depth intended in outcomes.

Four Strands

All student outcomes are organized into four strands. Regardless of grade level, there are student outcomes in each of the following strands:

- Number
- Patterns and Relations
- Shape and Space
- Statistics and Probability

K–12 Focus

The design of the common curriculum framework focuses on mathematics as a K–12 program rather than as a subset of this, which has been the practice historically.

There are two major sections of the document that show this focus. The general outcomes are presented on four two-page spreads, one for each strand. The specific outcomes in the K–9 component are also presented so that the reader can easily see the student outcomes across multiple grades.

Mathematical Processes

The seven mathematical processes that are identified are critical elements that students must encounter in a mathematics program to achieve the goals of mathematics. Students are expected to

- communicate mathematically;
- connect mathematical ideas to other concepts in mathematics, to everyday experiences and to other disciplines;
- use estimation and mental mathematics where appropriate;
- relate and apply new mathematical knowledge through problem solving;
- reason and justify their thinking;
- select and use appropriate technologies as tools to solve problems; and
- use visualization to assist in processing information, making connections and solving problems.

The common curriculum framework incorporates these seven related mathematical processes that are intended to permeate teaching and learning.

Nature of Mathematics

By enriching our view of mathematics and the learning environment, the outcomes of the common curriculum framework can be accomplished.

The brain is constantly looking for and making connections. "Because the learner is constantly searching for connections on many levels, educators need to orchestrate the experiences from when learners extract understanding. . . . Brain research establishes and confirms that multiple complex and concrete experiences are essential for meaningful learning and teaching" (Caine and Caine 1991, 5).

There are additional critical components that must be addressed in a mathematical program beyond those listed as mathematical processes. The components discussed are Pattern, Number, Shape, Change, Constancy, Dimension (size and scale), Relationships,

Quantity and Uncertainty. They are used to describe mathematics in a broad way to establish the variety of connections that can be made among the various strands.

Framework Summary

The components of the conceptual framework for K–12 mathematics, as described, dictate what should be happening in mathematics education. The components are not meant to stand alone but are to be related to enhance one another. Activities that take place in the classroom should stem from a problem-solving approach built on the *mathematical processes* and lead students to an understanding of the *nature of mathematics* through specific knowledge, skills and attitudes related to each strand.

1996 Annotated Bibliography of K–9 Mathematics Resources

The annotated bibliography of the K9 mathematics resources identifies the English language resources endorsed by and common to all WCP jurisdictions implementing the common curriculum framework. The bibliography also identifies authorized Alberta resources that are not listed in earlier annotated bibliographies.

The WCP resources in the annotated bibliography were selected through a collaborative review process, based on their high level of fidelity with the rationale, philosophy, mathematical processes and outcomes of the common curriculum framework for K–9 mathematics. These resources have undergone an intensive review and were found to be the most suitable of those submitted.

In addition, the annotated bibliography includes authorized K–9 resources in Alberta. These resources have been evaluated in Alberta and not by WCP evaluation process.

Learning resources for Kindergarten to Grade 6 that were listed in the 1995 elementary mathematics authorized resources annotated list have not been repeated in the 1996 bibliography. Listings of elementary learning resources authorized since publication of the 1995 list and all resources authorized for Grades 7–9 are included in the 1996 bibliography. Both the 1995 list and the 1996 bibliography are required for a complete listing of authorized resources for Kindergarten to Grade 9.

A complete list all authorized learning resources is also available on the Education in Alberta Web site at http://ednet.edc.gov.ab.ca in the Students and Learning section.

Alberta Mathematics K–9 Program of Studies

Alberta Education has incorporated the common curriculum framework for K–9 mathematics into the program of studies for K–9 mathematics. The relationship between the common curriculum framework and the program of studies can best be described as "copy and paste." A grey background has been inserted to illustrate the required components. This amendment to the program of studies was sent to schools in June 1996.

1995 Kindergarten Program Statement

The 1995 Kindergarten Program Statement [was] revised in June 1997 to include the Kindergarten components of the common curriculum framework for mathematics and language arts.

Implementation Timeline for K–12 Mathematics

In September 1996, the mathematics programs for Grades 7 and 9 were implemented, while the programs for Kindergarten to Grade 6 were available for optional implementation.

In September 1997, the Kindergarten through Grade 6 and Grade 8 programs [were] implemented.

Differences Between Alberta's 1994 Interim K–6 and the 1996 K–9 Program of Studies

For the purposes of this article in *Early Childhood Education*, the focus will be on the differences in the K–3 portions of 1994 Interim K–6 and the 1996 K–9 programs of studies.

The organization and presentation of the documents vary. The common curriculum framework presents a multiple-grade focus. This type of presentation enhances the horizontal version of the 1994 interim program of studies. There are fewer outcomes that indicate teaching strategies; however, the illustrative examples are used to get at teaching methodology. There is more reference to technology in the 1996 program of studies as well.

In the Number strand, competency with higher numerical values is expected, and there are links between the process of estimation and mental mathematics.

In the Patterns and Relations strand, the emphasis on patterns is maintained.

In the Shape and Space strand, there is an increased emphasis on the use of language related to the concepts of *parallel, intersection, perpendicular* and *congruent*, which are introduced in Grade 3. Position language to document motion is also expected. The concept of area has its beginning in Kindergarten. There is an increased focus on standard units of measure.

Document Acquisition

The following documents can be obtained by contacting the Learning Resources Distributing Center at 427-2767, fax 422-9750:

- *The Common Curriculum Framework for K–12 Mathematics: Western Canadian Protocol for Collaboration in Basic Education*, Alberta Education, 1995; product code 302183-01, $11.60
- *Alberta Program of Studies for K–12 Mathematics*, Alberta Education, 1996; product code 317653-01, $6.90
- *Kindergarten to Grade 9 Mathematics Resources: Annotated Bibliography*, Alberta Education, 1996; product code 319154-01, $8.40

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Armstrong, T. *Seven Kinds of Smart: Identifying and Developing Your Many Intelligences*. New York: NAL-Dutton, 1993.

Caine, R. N., and G. Caine. *Making Connections: Teaching and the Human Brain*. Menlo Park, Calif.: Addison-Wesley, 1991.

Hope, J. *Charting the Course, A Guide for Revising the Mathematics Program in the Province of Saskatchewan*. Regina: Saskatoon Instructional Development and Research Unit (SIDRU), Faculty of Education, University of Regina, 1990.

National Council of Teachers of Mathematics (NCTM). *Curriculum and Evaluation Standards for School Mathematics*. Reston, Va.: NCTM, 1989.

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Two Quadrilaterals

Connect the midpoints of adjacent sides of a convex quadrilateral. The result is again a quadrilateral. Prove that the resulting quadrilateral is a parallelogram with area one half the size of the original convex quadrilateral. Is this true for concave quadrilaterals as well?