Notes for Curriculum Panel

§1. Some mathematician-teacher-researcher collaboration in Canada

(a) The Fields Institute Mathematics Education Forum

Each month, there is meeting at the Fields Institute in Toronto that includes mathematicians, teachers of all levels, educational researchers and curriculum developers. Material is posted on the website [www.fields.utoronto.ca/programs/mathed](http://www.fields.utoronto.ca/programs/mathed).

About a decade ago, the Ontario government decided to redesign the curriculum and put the process for doing so out to tender. The Fields Institute won the contract and put together a committee that included a number of mathematicians. They submitted a proposal that was reviewed by the government bureaucracy, which in the end made some changes without adequate consultation with the committee.

(b) Canadian Mathematics Education Study Group/Groupe Canadien d’étude didactique des mathématiques.

Founded in the wake of the 1975 report (#37) for the Science Council of Canada on mathematics in Canada by John Coleman and K.P. Beltzner, the Canadian Mathematics Study Group is a loose association of various sorts of individuals involved in mathematics education that meets annually for five days every May in a different Canadian city. Its website is [www.cmesg.ca](http://www.cmesg.ca).

(c) Canadian Mathematics Education Forum.

In 2003, a group of individuals with the sponsorship of the Canadian Mathematical Society got government support to hold a conference in Montreal that brought together mathematicians, researchers, teachers and policy makers for an in-depth discussion of a number of issues. The success of this venture led to repeat conferences in 2005 (Toronto), 2009 (Vancouver) and, forthcoming, 2014 (Ottawa). The website for further information is [www.cms.math.ca/Events/CMEF2014](http://www.cms.math.ca/Events/CMEF2014).

(d) Centre for Education in Mathematics and Computing: University of Waterloo

This originally began as an organization for setting annual competitions after Ontario ceased having provincial Grade 13 examinations. It now runs a whole slate of competitions, operates workshops for teachers, publishes books and visits schools. Teachers and professors collaborate in the setting of contests and participate in their marking along with university students. The Centre is also the home of the Descartes Society which honours teachers and other individuals for their contributions to mathematics education. Its web address is [www.cemc.uwaterloo.ca](http://www.cemc.uwaterloo.ca).

§2. The curriculum

(a) *Mathematics for the citizen*. Basic arithmetic and algebra (computations, ratio and proportion, interest, percentages, rates, formulae), elementary probability and statistics (risk, lotteries, polls), data management (histograms, graphs), modelling (climate), decision theory (proportional representation, voting systems), reasoning and analysis. Role of mathematician: to find the proper level that conveys the essence without undue technicality.

(b) *Mathematics as preparation for employment or higher level education*. Core of primary syllabus is arithmetic, of secondary syllabus is algebra, the language of mathematics. Additional topics: proportionality, optimization and inequalities, geometry, trigonometry, probability and statistics, linearity, linear algebra, equations, geometry, appreciation of structure, mathematical reasoning. Role of mathematician: to seek out the competencies and fluencies necessary for later success (which is not merely technical), to prioritize what is of most significance for mathematical growth, to analyze possible topics for their attributes and to recommend what might achieve goals and what might be dispensed with.

(c) *Mathematics as a cultural artefact*. The place of mathematics in cultural history, how it developed in different cultures, its creativity. Important developments in mathematics and its applications, some of its personalities and stories, processes and traditional problems.
(d) Mathematics as recreation. The laying of a foundation for the immediate and lifelong appreciation of and interaction with mathematics. Longstanding puzzles and problems. Patterning and investigation.

§3. The curriculum-teacher model

An imperfect but suggestive model is inspired by Handel’s Messiah: the libretto as the basic syllabus; the musical score as the text; the teacher as the conductor; the students as the performers and the audience.

The syllabus should exhibit unity and coherence. It should have a flow that brings us to some sort of conclusion. At the end of a period of time, students should feel that something has been achieved, that there has been an evolution from the setting out of themes to their resolution.

The role of the teacher/conductor is to “know the score”. Her role is to help students think about and approach the subject in a productive way, help the students to sort out what is significant and seminal, organize the material in a way that meets the needs of the class, provide exercises, problems and other assignments that promote discipline and understanding.