Western Canada Regional Perspective on Mathematics Education
Prepared for the National Forum about Mathematics Education
for the Canadian Mathematical Society

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There were many people who contributed to this compilation. In January 2003 I invited elementary and secondary teachers, government personnel, mathematics education faculty, and mathematics faculty from each of the four western provinces and the Northwest Territories to offer their perspectives on the four categories. I attempted to make contact with people in the Yukon, but received no response. The response from the four provinces and the NWT was overwhelming. Clearly mathematics education is a passion for all of these people.

I thank the following people for their contribution to this perspective:
Liliane Gauthier, NWT; Steve Daniel, NWT; Philip Loewen, BC; Malgorzata Dubiel, BC; Richard DeMerchant, BC; Chris Van Bergeyk, BC; Pamela Hagen, BC; George Bluman, BC; Keith Taylor, SK; Rick Seaman, SK; Karen Campbell, SK; Kathy Nolan, SK; Harley Weston, SK; Donna Chanasyk, AB; Elaine Simmt, AB; Ralph Mason, MB; Grant Woods, MB; Rob Craigen, MB; Carol Matsumoto, MB. In addition to the contributions made by these people, I searched the internet and used websites to collect further data.

Limitations to this Perspective
As this compilation started to take form, I also realized that Nunavut should have been included in the data. Unfortunately, I only realized a short time ago that Nunavut was still a part of the Western Canadian collaboration and hence, a perspective from Nunavut is not included in this perspective.

In this compilation, I've attempted to respectfully represent the perspectives that I received and apologize if I inadvertently misrepresented any individual's comments.

This compilation consists of three parts; the first part being an overview of Western Canada; the second part providing individual province and territory perspectives; the third part is a closing statement.

Part One
Overview
Beginning in 1994, the four western provinces and two territories (at the time Nunavut was still a part of the Northwest Territories) began to work together to develop an elementary and secondary school mathematics curriculum framework. Once the framework was developed, each province and territory worked within their own context to implement it. This was an exciting time in Western Canada as it meant that textbooks that aligned with the framework were being published because the total student population in Western Canada was large enough for publishing companies to address the specific needs of the framework.

One of the concerns that was attempted to be addressed in the development of the Western Canadian framework was to reduce the amount of repetitiveness in both curricula documents and resources. This was pointing towards standards and expectations. For example, in the resources that were used prior to the framework development, you could not see any difference in student expectations for work with fractions between the Grades 7, 8, and 9 textbooks. What this meant was that students could possibly study fractions in Grade 7, and rather than having the material become more challenging in Grades 8 and 9, the same material was printed in the Grades 8 and 9 resources. This meant that a student could possibly experience the same material, at the same level of difficulty, for three years.

In the development of the Western framework, a focus on expectations was placed. The development of this framework essentially meant that children across Western Canada should be studying similar mathematics content throughout their school careers. In the implementation of this framework, the K – Grade 9 curricula in each of the provinces essentially matches the framework. In high school, the provinces and territories also attempted to describe courses (e.g. Pure/Precalculus/Principles of Mathematics and Applied/Applications of Mathematics); the degree to which the relationship between the high school framework and curriculum is implemented in each province is more varied (please see the provincial/territorial perspectives for a description of this).

Working together in the West was a huge change for all provincial and territorial ministries of education. Up to this point, each province/territory worked in isolation to develop its own curriculum. This was granted to the province/territory in the BNA Act. Curriculum development ultimately is a provincial mandate, and therefore is often affected by the politics and policies of a particular political party. (Please note that throughout this compilation I will refer to the WCP framework; however there has recently been a change to the initials. This collaboration is now referred to as the WNCP, Western and Northern Canadian Protocol.)

At the post secondary level, most elementary teacher education programs in Western Canada require that students have at least a one-semester mathematics course and at least a one-semester mathematics education course. In some universities, there is a mathematics course offered specifically for education students. The content covered in this course varies from university to university. Some universities very clearly specify the mathematics course(s) that are required to enter an education program. If a student has already completed a degree and then applies to education in an after-degree program, a mathematics course may not be required but a mathematics education course is.

The mathematics content requirement for prospective secondary mathematics teachers is much higher. Generally students are required to have some university calculus, geometry, linear algebra, and statistics courses. Once in education, they are required to take at least a one-semester mathematics education course.

In some universities across Western Canada, there is a high failure rate in first year mathematics courses, particularly in first year calculus. This causes and raises many issues about the standards and expectations in high school and within university classes.

Overall Strengths
There are strong provincial mathematics teacher professional organizations that are taking leadership roles in mathematics education in their provinces.

There exist quality resources that match the Western curriculum framework.

Teacher education programs are offering good quality programs, teaching prospective teachers about a variety of instructional and assessment strategies for school mathematics.

There is an attempt in some provinces to clearly define performance standards and expectations for curriculum outcomes.

Students in each province participate in mathematics competitions, although the numbers are small at the senior level in Manitoba, Saskatchewan and Alberta.

Overall Concerns
Most programs in elementary education require a mathematics course and a mathematics education course; however, the content of the mathematics course does not appear to address the needs of an elementary teacher. The mathematics content courses that are required by many education programs do not appear to help education students better understand the mathematics content that they will teach.

There are few mathematics education specialists graduating from teacher education programs across Western Canada.

Acceptance of high school mathematics courses other than high school pure/principles mathematics as entry requirements for post-secondary programs:

- Universities in Manitoba accept one of pre-calculus, applied, or consumer mathematics as general entry requirements.
- Universities in Alberta and BC only accept pure mathematics or principles of mathematics as general entry requirements.

Students who are entering university mathematics classes appear to be ‘less prepared’ than in the past.

There appears to be a lack of support of ongoing professional development opportunities for teachers.

Our society appears to have low expectations for mathematics, the perception that mathematics is a series of rules, and that mathematics can be used as a ‘gate.’

The development, implementation, and assessment of curricula is political.

The very small percentage of aboriginal student who complete high school mathematics courses and pursue mathematics-intensive programs in post-secondary institutions.

The percentage of students from certain regions in Western Canada who are invited to participate in national camps for mathematics contests.

Many mathematics teachers lack profound understanding of mathematical concepts.

In many schools across Western Canada, a teacher whose first or second teaching area is mathematics does not teach secondary mathematics courses. There is a common belief among administrators that 'anyone' can teach mathematics, all you need is a chalkboard and a textbook. "You only need to stay one lesson in front of the kids" is commonly heard when administrators ask teachers who are not educated as mathematics teachers to teach mathematics.

At the same time, even those teachers who have been educated as mathematics teachers may not have had opportunities to think about the nature of mathematics and instructional strategies for teaching mathematics.

Part II
Alberta
Elementary and Secondary Curriculum
Alberta was actively involved, and took a lead role, in developing the Western Canada Protocol for Mathematics. To qualify for a high school graduation diploma in Alberta students must take a Grade 11 mathematics course. Alberta offers three different routes to completing that requirement, through a pure mathematics course, an applied course, or a general mathematics course. Alberta also has a provincially developed high school calculus course that students may take. All students who enroll in a Grade 12 mathematics course, either in the pure or applied approaches, write a provincial final examination, which contributes 50% to their final course mark. Many of the larger high schools in Alberta offer Advanced Placement and International Baccalaureate Programs.

Students in Grades 3, 6, and 9 also write provincial mathematics Achievement Tests. A student's individual performance on this exam may or may not be included in their final mark.

Alberta students have recently performed well in various national and international testing programs in comparison with those from other provinces. [Please refer to http://www.cmec.ca/saip/indexe.stm for results of students in all provinces and territories on the School Achievement Indicators assessment.]

Implementing the applied mathematics component of the Western framework has caused the most confusion and has been more difficult than the implementation of the pure mathematics component. The applied mathematics program is quite distinct from the previous program designed for students who found academic mathematics difficult and/or inappropriate for them. There have been many numerous debates among teachers, administrators, and representatives from the ministry and post-secondary institutions as to the appropriateness of the content of the applied mathematics courses and as to whether or not the applied mathematics courses are appropriate for entrance into post-secondary programs. In 2002 there was a 2:9 ratio of students writing the Applied Mathematics 30 exam compared to the Pure Mathematics 30 exam. There is some indication from the

ministry that they expected the Applied Mathematics approach would be suitable for more than just 20% of the students.

Comments about Teacher Education and Development
Within Alberta there is a structure to offer professional development experiences for practicing teachers through the Regional Professional Development Consortia. The Professional Development Consortia have been in existence for approximately six years and have been offering workshops specifically to help high school teachers implement the new curricula. The professional teachers association, the Mathematics Council of the Alberta Teachers' Association also offers an annual professional development experience in its annual conference. The registrations for these workshops and conferences continue to be strong, which indicates a strong desire for professional development among teachers.

Currently, two education researchers at the University of Alberta, Brent Davis and Elaine Simmt, are researching a model of professional development with a group of teachers from Western Alberta. The model is based on current research on human learning and collective understanding.

In terms of pre-service education, there were some comments, raised by practicing teachers, as to whether or not the student teachers are prepared to teach the variety of high school mathematics courses. There is a sense that the student teachers are well prepared to teach the pure mathematics courses, but are not well prepared to teach the applied mathematics courses.

Strengths Identified
Resources that are being used in Alberta have included more support material for teachers than the resources used in the past. The new resource packages include teacher resource manuals, test banks, solution manuals, and black line masters.

The mathematics curriculum expectations in Alberta are seen as relevant and interesting. Students are being asked to engage in a great deal of problem solving activities and conduct many investigations. Students are responding positively to the new programs.

Schools and school districts across Alberta are intent on making mathematics education a focus in their various initiatives.

Concerns Identified
There is a concern about the alignment of the curriculum topics, the resources used, and the items on the provincial exams. There is some concern that the depth to which a mathematical concept is studied varies among these three dimensions.

Students enrolled in all high school mathematics courses in Alberta are developing their mathematics skills within a technology-enabled environment. When these students reach university mathematics, they are told that they cannot use the current technological resources. Hence, there is a concern about the lack of technology in university mathematics classes.

There is also a concern that the university mathematics classes that prospective teachers take may not be meeting their needs as teachers. Teachers need a mathematics education that empowers them as problem solvers and mathematical thinkers. Traditional university mathematics courses are often taught didactically and may not be adequately preparing our beginning teachers.

Over and over again, there was the concern that the post-secondary institutions in Alberta were not accepting completion of the applied mathematics program as an entrance requirement into their programs.

There is minimal participation by Alberta students in Centre for Education in Mathematics and Computing contests, especially at the Grade 12 level, e.g., the Euclid Contest.

Saskatchewan

Elementary and Secondary Curriculum

Although the province of Saskatchewan was actively involved in developing the Western Canada Protocol for Mathematics, they chose not to implement the framework. Much of the K – Grade 6 curriculum in Saskatchewan is a close match to the Western framework. However, the secondary portion of the curriculum, in terms of the expectations on a year-to-year basis, is different. To qualify for a high school graduation diploma in Saskatchewan students must take a Grade 11 mathematics course. Saskatchewan offers two different routes to completing that requirement, through a pure mathematics course or a modified mathematics course. Saskatchewan is currently developing a curriculum for a high school calculus course.

In Saskatchewan, some students who are enrolled in a Grade 12 mathematics course write provincial examinations. If a student has a teacher who is accredited then the student does not have to write the provincial examination. If a teacher is accredited in mathematics in Saskatchewan it means that they have taught at least two years, hold a permanent Saskatchewan teacher's certificate and have at least 4 university mathematics courses and 1 mathematics education course, and have attended an accreditation seminar offered by the Saskatchewan Teachers' Federation. When a teacher is accredited, it means that they have been granted the 'responsibility of determining the final mark or standing of the students in a specified Grade 12 subject or subjects." (p. 1, Saskatchewan Accreditation Policies and Procedures, June 2002). Teachers must apply to have their accreditation renewed every five years. The departmental exam accounts for 40% of a students' final mark.

The curriculum for high school students in Saskatchewan is designed such that all students should be able to succeed in Mathematics 10 and 20. After Mathematics 20, the curriculum was designed in such a manner that any student who wants to enter a university program should take Mathematics A30. If the student was successful in Mathematics A30 and wished to pursue a mathematics intensive program at the post secondary level, then they should also take Mathematics B30 and C30.

The philosophy of Saskatchewan Learning is one of resource-based learning. This means that teachers should implement curricula using a variety of resources. Hence, for

example, this means that there are no authorized resources for high school mathematics. Because Saskatchewan decided not to implement the high school portion of the Western Canada framework, the newly published resources do not match the Saskatchewan curriculum. Some of the larger school districts in the province have addressed the need for resources by asking teachers to write books that match the curriculum.

Comments about Teacher Education and Development
There are two different pre-service teacher education programs in Saskatchewan. A four-year program at the University of Regina and in the Aboriginal Teacher Education programs (situated at both universities).

The University of Saskatchewan offers a two-year 'post-academic' program. Students at the University of Saskatchewan study for 2 years in a university program and then apply to enter the education program. When they graduate from the education program, they are granted a Bachelor of Education.

Students at the University of Regina can also take a five-year program that results in a joint degree in Mathematics and Mathematics Education.

There is a good working relationship between faculty in the Department of Mathematics and Statistics and Education at both universities. For example, at the University of Regina, the faculties have worked together to develop the mathematics content course required by elementary education students and have worked together on an annual math camp, Math Central website, the Centre for Mathematics, Science and Technology Education (a recent initiative funded by the NSERC PromoScience program), and hosting the Math Counts competition. At the University of Saskatchewan, faculty in the Department of Mathematics and Statistics and in the College of Education has worked to develop the Mathematics Teacher Certificate Program (MTCP). The MTCP was designed to give teachers who are teaching mathematics at the secondary school level, but are not accredited, an opportunity to qualify for accreditation in mathematics. These courses are delivered in a variety of ways over a three-year period.

Strengths Identified
The collaboration between faculty, and between faculty and the provincial mathematics teacher organization, the Saskatchewan Mathematics Teachers Society, is definitely a strength in this province. Faculty at both universities have supported and co-hosted Saskatchewan's participation in the Math Counts competition for example. This has provided a good opportunity for those mathematically talented students to participate in an extracurricular program.

Saskatchewan Learning has a team of 'mentor teachers' who, if invited by a school, school district, or teacher, will work with teachers in coming to understand and implement the curriculum.

The Saskatchewan Teachers Federation has a teacher research program called the Dr. Stirling McDowell Fund for Research into Teaching. Recently a University of Saskatchewan researcher and high school teachers in the province completed a high school mathematics research project.

Concerns Identified
Although the high school curriculum appears to have some solid mathematics, the challenge is with the implementation of the curriculum. Part of the difficulty of this is that the province has not identified a set of textbooks that follows the curriculum. Hence, teachers at all grade levels select from a variety of resources or may choose to use a resource exclusively without the curriculum match. This has a direct impact on the standards and expectations in a math course. Teachers rely on the textbook to give them a sense of 'what is truly expected in the curriculum.' In Saskatchewan, there is very little sense of a provincial understanding of the standards in the curriculum.

Although beginning teachers are experiencing mathematics education courses in university that teach them about using a variety of instructional strategies and the intent of the mathematics curriculum, it appears that many of them have chosen to not implement these ideas when they have their own classes. This may be bombarded with so many 'new' things that they resort to the 'easiest approach for survival.' What this is suggesting is that we need to look at how we support teachers in their continual professional development in mathematics education.

Although some people that elementary preservice teachers are not exposed to enough mathematics to become good mathematics teachers, we are also facing the reality that many students have a negative attitude towards or fear mathematics. Should these teachers be required to take more mathematics courses or more mathematics education courses to help them begin to have positive and open-ended experiences in mathematics to create the desire in them to teach differently than they were taught? If we expect these students to take more mathematics courses, what should the content of these courses look like? These are critical questions as many students, in education, are missing basic understandings of concepts like place value.

There is minimal participation by Saskatchewan students in Centre for Education in Mathematics and Computing contests, especially at the Grade 12 level, e.g., the Euclid Contest.

There is a high failure rate in first year university calculus courses.

Manitoba
Elementary and Secondary Curriculum
Manitoba, like Alberta and British Columbia, was actively involved in creating the Western framework for mathematics. Students have a choice of three different routes in high school mathematics, applied, consumer, or pre-calculus and can choose to take a 'regular high school program' or a 'vocational education program.' To qualify for a high school graduation diploma in Manitoba students must have a mathematics credit in each of their four years (Grades 9 – 12) of high school. The K – Grade 8 curriculum in Manitoba is closely aligned to the Western curriculum framework. Some of the larger secondary schools in Manitoba also offer Advanced Placement Calculus or the International Baccalaureate math program.

In Manitoba, some students who are enrolled in the Grade 9 mathematics course write provincial examinations. The Ministry of Education develops the examinations annually. The decision to participate in the tests is made by individual school divisions. The tests are locally marked and may count up to 25% of the student's final grade. The provincial exam is traditional in design, with selected-response, open-response, and constructed-response items.

If students are enrolled in a Grade 12 mathematics course (applied, consumer, or pre-calculus) then they must write a provincial exam. The exams are locally marked and account for 30% of the student's final grade. The design of the provincial exams differs in each of these mathematics courses. For example, the pre-calculus exam is a 3-hour sit down exam that consists of two parts: the first hour of the exam students are given a set of questions and in which students can use a scientific or graphing calculator; the last 2 hours students are given an additional booklet and the calculators are removed (students can use the last two hours of the exam to complete questions in either booklet). The applied test has two parts: the first part includes two inquiry tasks written on one day with a two hour limit; the second is a written test written the day after the first part. The consumer mathematics exam has been innovative from its inception. The examination consists of three parts: the first part is a project which students complete in a two-week period and are given three class periods; the second part is where each student prepares a portfolio of their work; the third part is a written test.

In Manitoba, teachers are expected to assess students at the beginning of Grade 3 in order to report to parents and to inform their teaching. In Mathematics, teachers check student performance for 8 Critical Competencies that have descriptors for the three levels of performance. There are no specific assessment tools developed for this task, teachers are to use classroom-based assessment strategies such as observation and over the shoulder interviews. Teachers find this assessment useful but time-consuming. A provincial report is released regarding the number of students in each of 3 categories: Needs On-going Help, Needs Some Help to Meet Expectations, Meets Expectations.

In January 2003, the Manitoba Ministry of Education announced the "Early Years Numeracy Grant." The grant is intended to assist school divisions/districts in implementing early intervention strategies that improve the mathematical skills, knowledge and attitudes of students in Kindergarten to Grade 4.

Comments about Teacher Education and Development

The Province of Manitoba requires five years of post-secondary education for teacher certification. The University of Manitoba offers a two-year post-degree program that involves only taking education courses. Brandon University and the University of Winnipeg offer a two-year after degree program as well as a combined BED/BA or BED/BSC program. For all of the after degree programs, students are assumed to have taken all of the academic courses that they required prior to entering an education program. Students enrolled in early years, middle years or senior years programs may choose mathematics as either their first or second teaching area.

Brandon University also offers a Northern Teacher Education Program and a Hutterite Teacher Education Program. Students in the Hutterian Education Program specialize in

either early or middle years while students in the Northern Teacher Education Program can complete a combined degree program or an education after-degree program.

Strengths Identified
The Ministry of Education in Manitoba has a Mathematics Steering Committee. The membership of the committee comes from a variety of stakeholders in mathematics education and has been the driving force in many worthwhile changes in mathematics education.

The three routes that students can take in high school mathematics are coming close to meeting the needs of a diverse student population.

The documents provided by the Manitoba Ministry of Education provide useful information such as the prescribed learning outcomes; suggest teaching and assessment strategies, as well as possible resources.

The Early Years Numeracy Grant.

Concerns Identified
Many teachers, both practicing and those in teacher education programs, have a weak background in the mathematics that they are going to teach. Several of these teachers actually fear mathematics. This appears to manifest in the elementary education area.

Although there are the three routes that students can take in high school mathematics, there is a challenge of ensuring that students are being counseled to take the 'right' course' based on what they are interested in doing and the requirements of the programs that they would like to enter in post-secondary institutions.

The Grade 9 course is a senior years course, required for graduation, and provides the content for students who are entering into the academic streams in Grade 10. At the same time, the government in Manitoba has indicated that streaming will not happen in Grade 9. So, there is 'one course' for all in Grade 9. Some content was removed from the Grade 9 course, but there are still about 25% of the students failing.

Kindergarten is not mandatory in Manitoba. One of the consequences of this is that not all children in Grade 1 will have had the kindergarten experience and, in some cases, are not able to achieve the learning outcomes in Grade 1.

Little information about national mathematics competitions is available to schools in Manitoba. Consequently, few Manitoba students have ever received invitations to participate in a national camp. There is spotty participation by Manitoba schools in the math league and the Centre for Education in Mathematics and Computing contests.

British Columbia
Elementary and Secondary Curriculum
British Columbia, like Alberta and Manitoba, was actively involved in developing the Western framework for mathematics. Students have a choice of three different routes in high school mathematics, principles, applications, or essentials. To qualify for a high

school graduation diploma in British Columbia, students must have credit in a Grade 11 mathematics course. The K – Grade 8 curriculum in British Columbia is closely aligned to the Western curriculum framework. British Columbia has a provincial curriculum for high school calculus. Many large secondary schools in British Columbia also offer Advanced Placement and International Baccalaureate mathematics courses.

There were several comments about the amount of change that has occurred within the BC curriculum and the impact that these changes have had on students who are entering post-secondary programs. University and college mathematics professors claim that students who are entering mathematics classes at the university appear to have less logical thinking and multi-step proof skills and appear to not know enough about algebra, functions, and trigonometry. Elementary and secondary teachers in the province feel that there are too many learning outcomes in the curriculum to allow all students time to develop a deep understanding of the material. Furthermore, there is concern among teachers in the province that some of the topics in specific curricula are not part of a coherent package. One example to illustrate this is that students study some trigonometry in Grade 10 Principles and then again in Grade 12 Principles, but none in Grade 11 Principles.

Students enrolled in Applications of Mathematics 12 or Principles of Mathematics 12 write a provincial final examination. The exam score is worth 40% of a student's final course mark.

The Foundation Skills Assessment is administered every spring to students enrolled in Grades 4, 7, and 10 in both public schools and provincially funded independent schools in British Columbia. This assessment is connected to the provincial curriculum and performance standards. According to the BC Ministry of Education website, the purpose of the assessment is to "help the province, school districts, schools and school planning councils evaluate how well students are achieving basic skills, and make plans to improve student achievement." Results on the Foundation Skills Assessment have become a part of many school districts' "Accountability Contracts with the Ministry of Education."

Recently, the BC Ministry of Education has established an early numeracy project. The project will identify struggling students, offer some intervention strategies and will include a parent component.

Comments about Teacher Education and Development
Four universities in British Columbia offer a post-baccalaureate teacher education program: UBC, Simon Fraser, Victoria, and Malaspina. UBC also offers a five-year Native Indian Teacher Education Program.

The British Columbia Association of Mathematics Teachers provides many good professional development experiences in the province.

Strengths Identified
Many new resources are currently available to support teachers in implementing the BC mathematics curriculum.

The BCAMT is an active and vibrant organization that does a lot of good work for mathematics education in the province. The BCAMT is largest specialist association of teachers in the province and actively engages in discussions with the Ministry of Education about curriculum matters. The Association is currently working on making contacts in each school district in the province to supply information about mathematics education.

The development of the Early Numeracy Project.

Concerns Identified
Some teachers are using resources that do not match the BC mathematics curriculum. This may be occurring because teachers perceive that the new resources do not support them in delivering a program. At the same time, there is no targeted funding for resources and this seems to mean that there is less money for mathematics resources in some areas.

Post-secondary acceptance of high school mathematics courses is a major issue in BC. For example, UBC currently only accepts Principles of Mathematics for entry into its programs.

There is a sense that the Ministry of Education does not adequately consult with teachers or university faculty about the development of secondary mathematics curricula.

Our society accepts low expectations for mathematical competence. There is reluctance in our society to accept, understand and value mathematics.

Some secondary teachers who are teaching mathematics in the province have not had adequate education in some of the new mathematics topics in the curriculum. This can also be said about elementary teachers. Some elementary teachers have very limited experiences in mathematics education.

Outside of urban areas, there appears to be a lack of support for professional development opportunities for teachers.

There are huge cuts in provincial funding to schools in BC.

There are few mathematics-specialized teachers leaving the teacher education programs in BC.

Northwest Territories
Elementary and Secondary Curriculum
The Northwest Territories, like Alberta, British Columbia and Manitoba, were actively involved in creating the Western framework for mathematics. Students have a choice of three different routes in high school mathematics: pure, applied, or essentials. To qualify for a high school graduation diploma in the NWT, students must have credit in a Grade 11 mathematics course. The NWT follows the Alberta curriculum for the pure and applied mathematics courses and worked with British Columbia and Manitoba to develop the essentials courses. The K – Grade 9 curriculum in the NWT is closely aligned to the Western curriculum framework and specifically the Alberta curriculum.

As in other jurisdictions, there are concerns about the amount of material in the K – Grade 12 curriculum. A number of teachers indicate that they are not able to cover all of the curricular outcomes and have to make decisions about what to teach and what to 'leave out.'

Students enrolled in Applied Mathematics 30 or Pure Mathematics 30 write the Alberta provincial diploma examination. The exam score is worth 50% of the student's final course mark.

There is no territorial assessment program for K – Grade 9. One school district in the NWT recently decided that their students in Grade 3, 6, and 9 would write the Alberta Achievement Tests.

Mathematics in the NWT is becoming more and more important because many students will enter trades areas when they leave the K – Grade 12 system. The mining community within the NWT is desperate for skilled workers from the NWT and mathematics is a part of becoming that 'skilled worker.' The Territorial Department of Education is currently working with the trade's organizations to identify ways that students can meet the mathematics requirements to enter into the trade's areas.

Comments about Teacher Education and Development
There is a teacher education program offered collaboratively through Aurora College and the University of Saskatchewan. This four-year program was originally created to help residents from the NWT become qualified teachers. Students in the program must spend their last year in Saskatoon.

Strengths Identified
Early numeracy and literacy projects have been initiated in many districts. These projects have had a positive impact on student success.

The NWT has benefited by being involved in development of the WCP framework.

The WCP framework is based on the NCTM Standards.

Concerns Identified
At the secondary level, the largest issued identified was the lack of acceptance of the Applied Mathematics program by post-secondary institutions in Alberta and BC.

There is a high rate of teacher turn over in the NWT. In some communities new teachers arrive each year. Although in-service is conducted during the implementation phase of new curricula, new teachers who are arriving in the NWT may not have received the professional development experiences about the topics and resources. Additionally, there is no targeted funding or process for ongoing implementation/professional development for new teachers.

There is little leadership in mathematics education in schools or school districts. Part of this is a result of few educators having a strong foundation in mathematics and current pedagogical approaches.

There is no real incentive for teachers to participate in additional educational opportunities once they have been hired as a teacher or when their teaching assignment has changed.

Many students in the Aurora College/University of Saskatchewan teacher education program face math anxiety.

Part III

In Closing

This is an exciting time for mathematics education in Canada. As we come together to talk and learn about each other's perspectives in Canada, I hope that we come to realize that we all have a role in helping to enhance mathematics education in our country. We need to work together as a mathematics education community to help our society come to value and appreciate mathematics. Are we willing to do this as a community?