

## **CMS Forum Toronto, ON, May 6-8, 2005**

### **Working Group: Mathematics Education in the Aboriginal community**

**Facilitators:** Louise Poirier, Université de Montréal and Kanwal Neel, Simon Fraser University

#### **Introduction**

This working group consisted of twenty four participants with diverse backgrounds from sea to sea to sea. The following questions formed a framework to start the discussion on finding ways in which the mathematics education community in Canada can respond to the identified need within the aboriginal community.

- In what ways do the aboriginal sense of knowing effect the teaching of mathematics in aboriginal communities?
- Is it possible to separate the challenges of learning and teaching mathematics in the aboriginal community from those encountered for other disciplines?
- What type of education about aboriginal communities should teachers of mathematics receive?
- What types of programs might universities offer to help aboriginal students to make the transition into mathematics and science programs?
- How is mathematics viewed within the aboriginal community?
- In what way or ways might the mathematics education community in Canada contribute to the development of culturally relevant curricula, pedagogy, and resources?

#### **Discussion**

As we went around the circle introducing ourselves and why we were participating in this working group it became clear that there were more questions than answers. Some additional questions that were raised are as follows:

- How can we support teacher with a program for more indigenous knowledge?
- What kind of support do teachers need?
- What should be part of the teacher training program for aboriginal teachers?
- How can we assist aboriginal students to succeed in mathematics?
- How can we integrate more aboriginal ideas into the outreach activities?
- How do we produce mathematics curriculum that enables the aboriginal students?
- How can we teach the mathematics curriculum in context?
- How should we involve aboriginal leaders, elders and scholars on developing aboriginal mathematics programs?
- What needs to change so that aboriginal students graduate and get jobs that are meaningful and worthwhile?
- How can aboriginal people be in position of decision making?
- How can we integrate culture into high school math classes?
- How are we defining the priority for aboriginal students and what are the steps of action?

## **Sharing Initiatives**

Across Canada, there were a number of initiatives and projects that were being implemented to address the issue of mathematics education in aboriginal communities. Some initiatives were national in scope, while others were provincial, district or school based. Implementation models varied, but in most cases the intent was to address the plight of aboriginal students in mathematics through the development of culturally relevant curricula, pedagogy, and resources. Below are the summaries of eleven initiatives that were shared in the working group.

### **Native Access to Engineering Programme**

Corinne Mount Pleasant Jette and Dawn Wiseman,  
Concordia University

<http://www.nativeaccess.com/>

NAEP looks at ways to address the low participation rate of Aboriginal people within the applied sciences in Canada. It works with the engineering profession and academic institutions, as well as government and business to develop programming which will encourage Aboriginal youth to stay in school and pursue post-secondary studies in the pure and applied sciences. Most importantly, it works with First Nations communities - students, teachers, parents, elders and leaders - from across Canada to ensure that the programming they produce is relevant and meets the needs and expectations of the community.

NAEP has a national mandate to deliver culturally relevant programming to Aboriginal youth and their teachers in remote, rural, urban and semi-urban areas. The NAEP has run summer camps, participated in career days and developed materials for use in schools. Aimed at the high school level, NAEP also produces curriculum that focuses on a different topic, and makes connections to math and science that are relevant to First Nations students.

### **Mathematics, Science and Aboriginal Students**

David Cowan and Holly Fraser  
University of Saskatchewan

<http://students.usask.ca/aboriginal/programs/>

This project is a “work in progress” about changing attitudes at the university and relationship building with Aboriginal communities. Since 80% of the people living in the North are aboriginal, the focus of this initiative is to create intellectual homes for the aboriginal students. 10% of the student body at the university is Aboriginal. Since there is a growing need to have trained Aboriginal professionals, for infra structure, engineers, and healthcare; the university has slowly started to respond by having a dialogue with aboriginal communities. They are hiring aboriginal consultants to talk to aboriginal communities and outline the priorities. There are some existing programs such as: ITEP, SUNTEP, NORTEP; these programs are effective for elementary teachers, but not for secondary programs, especially in Math and Science. The new programs are also focusing on indigenous knowledge with the assistance of elders.

## **Math in the Inuit communities with the Inuktitut Language**

Louise Poirier,  
Université de Montréal

This project was started to overcome the difficulties that Inuit children were having in learning mathematics. The students at home learned mathematics in Inuktitut, which is a number system based on twenty, rather than the number system, based on ten. The students excelled in spatial relationship and geometry. The word for mathematics in Inuktitut literally means “what we count with” so, there is a lot of emphasis on practical arithmetic. Some numbers might also have many meanings depending on the context. The project involves Inuit teachers, and is developing curriculum and teaching methods within the Inuit context. This collaborative research project involves students K-3 and also has a teacher training component. They are also developing Inuit games which children can bring home to connect the Inuit mathematics, the language and Western mathematics.

## **Super Saturday**

Darren McKee

Saskatchewan Learning, Aboriginal unit

[http://www.sasked.gov.sk.ca/branches/partner\\_aboriginal/aboriginal\\_ed/abindex.shtml](http://www.sasked.gov.sk.ca/branches/partner_aboriginal/aboriginal_ed/abindex.shtml)

A number of the First Nations students from around Saskatoon were not experiencing success in school, as they were experiencing culture shock. A program called “Super Saturday” was introduced in the late nineties to build relationship with the First Nations communities. Students would be brought from a variety of communities to the university at a very early age on Saturdays. The students would do a variety of activities in a variety of faculties, designed around First Nations value system, so each month, there would a value attached to it. For example it could be respect. Each event would start with the blessing by an elder.

The main goal was to get the students to see what a university was and also get them interested in math and science. The secondary goal was to get students thinking about activities and ideas that they would not get an opportunity to do in their own schools. Another goal was to build relationships between the students. The older students became chaperones for the younger ones. After graduation, a number of the students who participated in the program enrolled at the university, because they now knew the professors or graduate students.

## **Kivalliq Regional Science Fair Committee (KRSFC).**

Jim Kreuger

Nunavut Department of Education

For the past two years, KRSFC has delivered a land-based camp involving elders, science teachers, and youth from across the Kivalliq Region. This camp promotes scientific and cultural knowledge as important tools for today's young people. The science fairs have a cultural component integrating science with relevance to the careers up North. The students are brought together to a central place and the elders lead the activities in collaboration with the science

teachers. The topics must have an appeal to the students and the elders. The students get to see their elders as best examples of lifelong learning, since the elders participate in all the activities.

### **Yukon Experience**

Lee Kubica

Yukon Education

<http://www.gov.yk.ca>

Yukon is the smallest jurisdiction in Canada. It has the largest per capita expenditure per student in Canada, about \$11 000. Yukon can be divided into 9 different regions; each region has negotiated their own jurisdiction. Self governing bodies negotiate directly with the Canadian government and not the Yukon government. There are no band schools, as the government looks after the education of all learners. Eight of the First Nations are fully self-governing, hence they have the authority to govern their education. There is very little turn-over, and there is no problem recruiting qualified math and science teachers.

Yukon uses the WNCP curriculum, with the BC IRP resources and the Alberta achievement tests at the grade 3, 6, and 9. There is no such thing as an urban community. 26% of the population is First Nations. Statistically, the First Nations students in the high school, miss anywhere from 30 to 50 days per school year. The intermediate students in grades 4 to 7, are absent for about 10 to 12 days per year. However, in the primary grades, the students miss anywhere from 50 to 74 days per year. So, a lot of resources are being put into the Early Intervention programs, but it seems that the only students benefiting from this program are those that don't need the Early Intervention. A Reading Recovery program has also been implemented in the kindergarten. Two of our pressing issues are: How can we get primary students to school? How do we enable elementary teachers to teach math?

In order to increase attendance in the primary schools a pilot project has been tried in our First Nations communities. As there is a belief that real stuff doesn't start in the math classes till grade 4, the attendance of the primary students is a parental issue. It is a cultural thing, specific to Yukon, where most parents want to keep their children home, or migrate to the South for a holiday when their children are young. First Nations assistants have had to go to the homes and bring the children to school. Funding is also offered to establish tutoring programs in most of the communities, in an effort to support all the students. Some tutors go to the homes and travel to different communities.

### **Walt's Game of Chance**

Newell Johnson, and Darren Googoo

Eskasoni High School, Nova Scotia

<http://collections.ic.gc.ca/objects/mi'kmaqgames.htm>

Many facets of Mi'kmaq culture required great skill in speed and hand dexterity. To hone these skills, games of chance were invented. Some of these games required great concentration and

memory. Others were similar to chess and checkers. For instance, the game of *waltes*, a dice and bowl game played with counting sticks, involved concentration, intellectual skill, and endurance of time. Usually these games were played into the night and some even lasted until sunrise.

*Waltes* is one of the games that survived 513 years of contact for the Mi'kmaq people. In the last few years this game has been reintroduced in the schools because of its rich cultural value and connection to probability. At one time the game was banned, and confiscated if people played it. This game can be played in Math 10, 11, or 12 to teach the units on data management or probability. The connections can be made between theoretical and experimental probability.



### **Aboriginal Connections**

Edward Doolittle

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<http://www.firstnationsuniversity.ca/>

Our premise is Indian Control of Indian Education, based on a document written in 1973. Teaching First Nations' students mathematics, we try to cultivate a personal connection with our students, it is one thing we find to be an essential foundation in working with First nations students. I have been fortunate to teach small classes. As I am improving as an instructor, I am trying to identify some the key difficulties. When I started twenty years ago, I would teach straight from the book. As I have become more experienced I have used other ideas. The bottom line is relationships. I try to follow the examples set by elders in being spontaneous, and try to connect.

In first term almost all our First Nations students were successful. In the second term, we have had opposite results, we are not sure why. For these courses we used a textbook written by the University of Regina, it has some great ideas. I think it has a little too much content, but minimal First Nations connection. I don't think it is the content that is a problem, but the delivery or the teaching methodology. One thing I spend a lot of time is on different calendars. Another thing I spend time on is Mayan numeration. I don't have the extra time to teach different cultural connections, as we write a common exam with the University of Regina.

### **Math Careers**

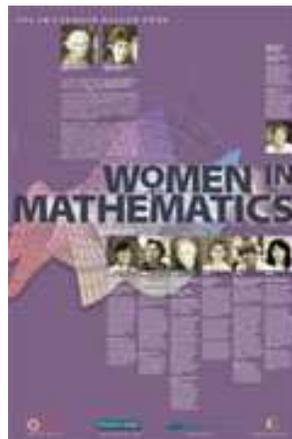
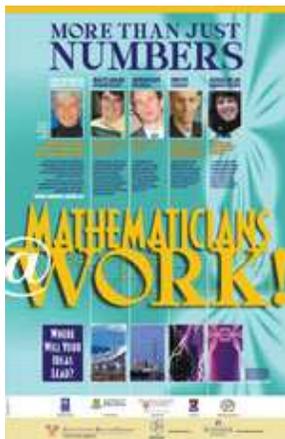
Harley Weston

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[www.mathcentral.ca](http://www.mathcentral.ca) is a collection of resources which gets about a million hits per month. If you go to the Resource Room and type aboriginal and you will get a link to a collection of games

titled: [\*Games from the Aboriginal People of North America\*](#). These games have some mathematical content. Through the use of these games, people would be developing hunting, problem solving and strategy skills. However, by taking a closer look at a few of these activities you can see that the educational value extends beyond the obvious skills they were meant to teach. Players were learning many basic mathematical concepts while enjoying these games. The idea of patterns, relationships of patterns, numbers and operations were developed in many of the dice games. Also, the strategy games brought in ideas of problem solving and critical thinking. Practically all of these games rely on the concepts of data management and probability.

Another project that is being done in conjunction with the Canadian Mathematical Society is to promote mathematics through posters titled “Careers in Mathematics.” The focus is on mathematicians who do interesting jobs. For the next poster, the theme is “The Mathematics of the Indigenous People of the Americas”. This poster will feature Indigenous People and how they are connected with mathematics. This is a work in progress.



### **Transition Year Program: A Bridge to Success**

Patricia Doyle-Bedwell

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[www.dal.ca/cce](http://www.dal.ca/cce)

The Transition Year Program (TYP) has served the post-secondary educational needs of the Mi'kmaq and Black Nova Scotian communities for over 30 years. It is a one-year program designed for African-Canadian and First Nations students who wish to enter university but who do not yet meet standard entrance requirements. The TYP was established to redress historical and current educational disadvantages to members of the Mi'kmaq and Black Nova Scotian communities.

The TYP prepares its students for full admission to regular Dalhousie BA degree programs at the beginning of their second year on campus. The program introduces students to the university in a wide variety of ways. Its curriculum, which includes a variable number of non-credit classes, can

be adapted to individual needs and objectives. The TYP core curriculum includes classes in Black and Native Studies, Strategies for University Learning, English and Mathematics. Students may also choose a regular first-year elective.

### **Indigenous/ Modern Worldviews**

Kanwal Neel

Simon Fraser University

There is a mismatch between cultural perspectives that results in many young Indigenous students becoming alienated from mathematics. Indigenous peoples have historically applied the creative thought process within cultural contexts, taking a holistic approach. In most schools, math is taught from a Western cultural perspective that is preoccupied with abstract formalizations. The complexities that come into play when two fundamentally different worldviews converge present a great challenge. Many elders feel that Indigenous students should seek knowledge from both worldviews recognizing their interconnectedness. The dialogue needs to be a two-way street rather than viewing the problem as a one-way challenge to get Indigenous people to buy into the Modern system. Indigenous people may need to understand mainstream mathematics, but not at the expense of what they already know. Non-Indigenous people, too, need to recognize the existence of multiple worldviews and knowledge systems, and to find ways to understand and relate to the world in its multiple dimensions and varied perspectives.

### **Key Issues**

Participants agreed that there were a number of issues and challenges. One of the first things that need to be done is to gather the data on aboriginal students, so that there is data to substantiate the claims. Though the Council of First Ministers identified education of First Nations students to be a priority in 2004, little has been done. The working group decided to base their summary and recommendations on four key issues:

#### **Teacher Training (either pre service and in service)**

For pre service teachers, emphasis should be put on cultural aspects of mathematics contents and also on teaching methods.

For in service, school boards should join the curriculum development bureau with the professional development. If one wants mathematics to grow, facilitators are much needed. These counselors should be aware of the development being done and implemented in the schools. There should also be incentives for teachers to pursue their maths training, these incentives can be money but not necessarily. They could take the form of grants or taking part in professional learning communities or working with a facilitator.

## Early Intervention

Help should be offered to parents of kindergarten children. A booklet on “How can I help my child in mathematics” could be handed out to parents. In early school years, teachers should be aware of the importance of developing the children’s attitudes toward mathematics and their learning. Parents and teachers should never underestimate young children and their capacities.

For all students from kindergarten up to the end of High School, we should have tools to help better diagnose the mathematics difficulties and develop Maths recovery programs accordingly to these difficulties.

For parents at all levels, homework helpers should be made available. This could take the form of programs showing parents what their children are doing in school.

Junior high students could participate in mathematics projects on every day maths.

## Outreach/ Relationships

Outreach in the family, in the community. We could work around the 6 areas of A. Bishop and have students ask someone in their family or in the community about what that person does in each of these fields. Youths can grasp knowledge outside of the school immediate environment. In order to help, we have to acknowledge the traditional knowledge especially the knowledge of elders. This brings us to our last point.

## Cultural and Traditional Knowledge

We should provide a framework to teachers to help them understand the culture, the traditional learning process and values. For example, the importance of the environment (either natural or social), the learning by doing, of being resourceful, of consensus and of collaboration.

## Participants

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