

CMS 2019_Saturday_Indiginization

Keith Taylor: What can the CMS do about reconciliation?

- Brief history of Mi'kmaw Nation in Halifax
- The 8-pointed star
- Call to action to eliminate educational gaps
- Math is in 6 of the top 10 jobs (JobsRated 2019), math education must be a part of reconciliation
- Many individuals in the math community are working towards these goals
- We have a sort of “math privilege”, but not everyone does
- There is a connection between language and receptiveness to math
- The CMS should establish a Committee on Reconciliation
- Imhotep's Legacy Academy (since 2003) offers after grades 7, 8, and 9 science enrichment for schools with significant African enrollment in NS
- Students can gain points through the program and earn TD scholarships
- This model is being developed with the Mi'kmaw community
- Super Saturdays with the Sask Tribal Council (Saturdays on campus, summer camps in communities)
- Building patterns with nails around a circle and coloured cords attached (n=36, 40, 48..., k=4, 10, 15...)** (USE FOR MATH MANIA)
- *Suggestion:* come up with terms of reference for a CMS Reconciliation Committee

Brian Forrest: Expanding Mathematics Educational Opportunities for Indigenous Teachers

- Waterloo has very little experience with outreach in the Indigenous communities, despite larger outreach success
- 5 scholarships to the MMT for Indigenous Teachers (\$15,000), with the goal of building a national community of Indigenous math ed leaders
- The MMT focuses on secondary math content, rather than pedagogy. Fully online, part time, professional master's degree, highly inclusive
- Over 200 participants per year, largest Master's program at Waterloo (and likely in Canada)** (FOR TRANSITION SESSIONS)
- Proposal to include two courses on Indigenous Knowledge in Mathematics, but looking for leaders to help build these courses, will make them open to all
- These scholarship students would be assigned a mentor from the math community (WHO FROM WINNIPEG??)
- Ideally, multiple teachers from a school or within a close distance
- Challenges are identifying suitable candidates, addressing background issues, connectivity in remote areas, developing meaningful Indigenous content
- *Comment:* Doing it TO rather than doing it WITH, and connecting it all down to elementary school teachers

Veselin Jungic: Changing lives or scratching the surface: five years of the SFU academic summer camp for aboriginal students

- Working with a Cree coordinator, reaching out to the talent that is out there
- 21-26 grade 8-11 students in the day camp, from the GVA

- Strengthening academic engagement (participation, retention, high school graduation) and cultural awareness, both with remediation and enrichment
- Working with partners both on and off campus
- Building a strong community of learners and cooperative learners
- Staff of 11 people to organize and run the camp
- Recruiting through outreach programs and connections with communities, as well as Aboriginal resource teachers in the public schools, students apply with info and essay** (WHO ARE MY INDIG RESOURCE TEACHERS?)
- Looking for gender and school grade balance, and senior campers from the previous year

Darja Barr: The impact of working together.

- There is a gap between indigenous and non-indigenous educational achievement, especially in science and even more so in math
- Path2Math camp for incoming students
- ANCI Math Academy for indigenous nursing hopefuls
- Math Mania as a way to build confidence and give back
- How to get started by looking for partners, funding, and participants
- Looking for volunteers and participants can be the most difficult part, tap whatever resources you can as a middle man

Melania Alvarez:

- Culture, stories, conceptualization, what shapes our relationships with math
- Indigenous knowledge reflects the way that they have come to understand themselves, their culture is not reflected in our curriculum, they do not see themselves there
- Don't change the math, change the culture!
- 7 principles related to using First Nations stories: respect, responsibility, reciprocity, reverence, holism, interrelatedness, synergy
- We are all one, we should embrace everyone's stories and ways of life
- First People's Principles of Learning (from FNESC)
- Guiding principle is high expectations (leaving behind the philosophy or reduced expectations)
- Rigorous mathematics, success in math supports success in school and in life
- Variety of internships, mentorships, scholarships, and programs for students, teachers,, parents etc at UBC/PIMS** (PARENT CARE PACKAGES)
- Transition workshops/camps for students transitioning from elementary to high school using a cohort heading to one specific high school
- Can inspire and push students to get better and reach higher
- BIRS Workshops , teachers and elders

Edward Doolittle: Indigenous mathematics and word puzzles in Cree

- Mathematics and Indigenous culture may be at odds
- Perhaps applied mathematics could be a pipeline, applied to areas of interest to Indigenous peoples (vs. Ethnomathematics)

- We need to move past the past
- Language is a big issue for Indigenous communities, becoming extinct
- Building software to build Cree word puzzles using graph theory
- Pangrammatic autograms (word puzzles) in Cree and other languages
- The geometry of Cree syllabics, using Unicode
- There is currently no complete dictionary of Cree (about one trillion words vs one million in English), Cree is polysynthetic
- Word ladders using graph theory
- Word cycles with digraphs
- Crosswords, difficult to do in Cree, word search easier in Cree

Kathleen Nolan: A reframing of mathematics through critical and culturally responsive pedagogies

- Based on calls to action for developing culturally appropriate curricula, building student capacity for intercultural understanding, and having teacher ed that relates to building this student capacity
- Teaching Elementary School Mathematics certificate (like MMT), mixes math content and pedagogy courses
- CRP (Culturally Responsive Pedagogy) in the mathematics classroom
- How are teachers interpreting the challenges of teaching through CRP
- Stories of growth and success, but also of resistance
- ‘Rationalizing discourses’ for not doing anything
- “The math we know so well”, math as euro-centric and as a weapon of imposition of Western culture
- Reframing school and school math through disruptive pedagogies, CRdP
- [CRP], [EM], [CM], [IE], [LD], [E-b]
- Discourse analysis in math ed research articles
- *Comment:* What would this actually look like on the ground?

Gale Russel: Truth before reconciliation in mathematics and mathematics education: an invitation to action

- Mathematics through the “Westernized” and “Indigenous” lenses
- One belief is that mathematics does not exist outside of us, waiting to be discovered
- Too often we dive into reconciliation before looking for the truth
- Canada has two number systems, the Inuit number system (base 20 vs base 10, non-abstracted different contexts for numbers, completely oral)
- ‘Our’ mathematics emphasizes numbers, versus alternatives such as spatial reasoning
- There are alternate ‘mathematicies’, that can take us to different and new places
- “mathematics” vs “Mathematics” vs “Near Universal Conventional (NUC) math” vs “mathematx”
- *Comment:* can we teach mathematics in such a way that it reveals its multi-dimensionality naturally, and so that students realize that what we teach is not THE mathematics, but A mathematics.

Open Discussion:

- Is mathematics multi-lingual, or a universal language?
- Mathematics is packaged as one thing, but mathematicians of different fields think in very different ways. Perhaps we were mistaken in packaging it this way.
- The “new math” may be about recognizing different ways that students understand mathematical problems. It’s difficult for teachers, but in Japan they are doing it

Overall Thoughts:

- 2 main themes: Indiginizing Mathematics, and Engaging Indigenous Students in Mathematics. Can these two themes come together through reconciliation?
- Inspirational
- So many Indigenous students are being reached!!
- And so many teachers now too
- What mistakes have been made (like no elders)
- Finding participants and volunteers is difficult
- Reaching a critical mass of math educators working together for Reconciliation
- How to “Indigenize” the math classroom in an authentic way

(missing Sunday session)

CMS 2019_Sunday_Assessment

Darja Barr: Taking math students from ‘blah’ to ‘aha’: how can assessment help?

- Assessment can be a learning tool (assessment for and as learning vs assessment of)
- Outcome based assessment from K-12
- MBQ’s at the U of M
- Creative ways to assess with mock exams/questions, hunting for errors, applying processes

Rebecca Milley: Reading, writing, arithmetic: assessment strategies for readings and written work in mathematics

- Using math readings to flip the classroom, improve math reading/writing skills
- Get the students to buy in by making it worth marks, and selling it as essential, slip it in between ‘normal’ homework questions
- Choose a text that is readable, free, and online, design a worksheet that is tied to the readings (practice, read, check your understanding), peer graded
- Figuring out which learning objectives students can grasp on their own outside of class (define, state, identify, compute) and which you should do in class (explain, create, apply, compute)
- Technical writing course that is project oriented, teaching latex, report writing, programming
- Marked based on mechanics, style, organization, and content

- Mathematical writing comes from mathematical reading
- Assessing written work with comments and feedback but hiding the actual grade, can edit and resubmit for up to 5% increase
- Can computational skills benefit from better understanding of the vocabulary?
- Asking “what is this course about?”
- *Comment:* the language challenge for EAL students
- *Comment:* using these readings methods in courses for K-12 teachers
- *Comment:* which strategies would be usable for large classes

Laren DeDieu: Using assessments to boost motivation in a second-year linear algebra course

- Students are asked to state definitions and theorems, construct proofs, and verify statements, as well as orally communicate with peers
- Motivation has a strong impact on students’ success in math
- Students can be frustrated by the rigour that mathematical writing demands
- Students had to write an essay about the applications of linear algebra, and do a group poster presentation** (USE THIS IN MATH FOR TEACHERS CLASS)
- Students had positive feedback, they learned about applications even though it was not specifically taught in class. They showcased their own interests
- *Comment:* Sometimes ‘good’ math students rebel against writing

Christopher Eagle: In-class formative assessment in proof-heavy courses

- Formative assessments have low grade value and early feedback
- In class means active learning, practicing mathematical communication, encourage attendance (in classes where attendance is an issue)
- Written feedback gives practice in writing math and is lower stress than verbal answers
- The challenge is that digesting abstract ideas, solving challenging problems, and good writing, require time
- Learning lessons from missteps with assessment, sometimes it takes a few failures before a success
- Concrete examples can give students an appreciation for the abstract
- Giving students advanced notice can generate more success with in-class formative written assessments
- *Comment:* how do accommodate SAS students

Rebecca McKay: Active assessment

- ‘Active’ meaning students are doing something and then reflecting on what they did
- Based on the positive research about active learning
- Goal is to improve retention, reading comprehension, oral and written presentation
- Clickers, think-pair-share, one minute papers, muddiest point, team-based learning
- Using in-class quizzes where students can work together and get help, but are collected and evaluated/graded
- To be efficient with class time give problems that you normally would go through in class, or give partially worked out problems and ask what is missing
- This can build classroom morale and provide extra and timely practice

- Students submit assignments question by question for a participation mark, one student is a “homework convener” for each question, then that student presents a very rigorous written solution to that question and presents it on the board, evaluated
- Require reflection in a cover page
- Try representative problems: one everyone should solve, one that most could solve, one that would challenge most. Have students solve while documenting how they solve
- Submitting a proof portfolio, could do an integral or differential equations portfolio

Overall Thoughts:

- Full of practical and useable ideas
- Inspiring to see what creative things math educators across Canada are doing with assessment

(missing Sunday afternoon discussion and talks)

Highlights from the Education Sessions at the Summer 2019 Meeting of the Canadian Mathematical Society

By Darja Barr

At the 2019 Summer Meeting of the Canadian Mathematical Society in Regina, attendees had the opportunity to participate in two Mathematics Education Sessions. The first, organized by Douglas Farenick (University of Regina) and Keith Taylor (Dalhousie University), was called Indigenization and Reconciliation in Mathematics. This session focused on sharing perspectives from experts and individuals experienced with indigenization/reconciliation in the university contexts of teaching and research. The second education session, organized by Shannon Ezzat (University of Winnipeg) and Rebecca McKay (University of New Brunswick) was about Assessment in Mathematics. It covered all kinds of meaningful and innovative approaches to assessment, and the outcomes of some of these approaches. Each session contributed to current and relevant issues in mathematics education in its own unique way.

During the Indigenization session, speakers and topics fell into two themes: sharing about programs that provided outreach and support to Indigenous students and teachers across Canada, or the re-imagining of mathematics curricula with a specific focus on Indigenous ways of knowing. For those who attended the session and were running or hoping to start running outreach and support programs for Indigenous students, a lot of valuable information was discussed. Everything from possible partnering organizations, to funding opportunities, to details about budgets, and what kinds of mistakes were made along the way. Main challenges identified included finding reliable volunteers who could participate in programming consistently, and recruiting participants. It was incredibly inspirational to realize just how many (hundreds, and perhaps even thousands!) of students have been reached by the endeavours of our colleagues in mathematics departments across the country.

Other talks brought up issues of mathematics and its role in indigenizing education. Speakers tackled questions about how we may play a part in ‘decolonizing’ mathematics, for those who see the current mathematics curricula as a ‘Western’ pursuit. These talks brought on some heated debates about what the true nature of mathematics is, and the difficulties of applying abstract pedagogical theories in a practical way in mathematics classrooms. It was extremely interesting to hear from Dr. Ed Doolittle, who shared his experiments in developing word problems that used the Cree language to make mathematics more relevant to his Indigenous students.

A highlight of the Indigenization session for this participant was hearing about the success of the Masters of Mathematics for Teachers (MMT) professional program that is run out of Waterloo, largely due to the efforts of Dr. Brian Forrest. This program, which aims to build the mathematical knowledge of secondary mathematics teachers across the world, is now looking to offer scholarships to Indigenous teachers (or teachers working with Indigenous communities). This is a very positive and exciting development which has the potential to help achieve the aim of the Truth and Reconciliation Committee, who call for closing the gaps in education between Indigenous and non-Indigenous students. It is my hope that in the future, such sessions might include perspectives of Indigenous students and K-12 teachers, like the ones who have participated in the MMT.

The Assessment session offered the perspectives of post-secondary instructors who were looking for ways to use assessment as more than simply an evaluative tool. From flipped

classrooms, to outcome based assessment, to proof portfolios, the session was jam packed with extremely practical examples of creative and engaging assessment methods. For me, it was the first time that I really had the chance to think about how though reading mathematics, writing mathematics, and orally communicating mathematics play such a big role in our work as mathematicians, we may not be offering our students enough opportunities to develop these skills through the typical assessment methods that we use. Lauren DeDieu, as an example, found many ways to include mathematical writing in the courses that she was teaching. My favourite example was an assignment that she gave her students in a second year Linear Algebra course. Though she does not typically cover many application examples, students were asked to make posters about a linear algebra application that interested them, and present these to their peers in a speed-dating style poster session. It gave the opportunity for students to communicate about some mathematics that they had learned on their own, and it gave Lauren an inside view into the interests of the students in her class.

Both sessions included an open discussion portion, however I was not able to attend these discussions. I am sure that there were many more thought-provoking ideas shared in both. For this participant, the Education Sessions of the CMS in Regina were well worth attending, and I left with a long list of colleagues to connect with and new things to try.