The Variable

Presented by the Saskatchewan Mathematics Teachers' Society

Volume 1 | Issue 1 | April 2016

Introducing *The Variable*

This one's for you, Saskatchewan math teachers!

The Variable is a new monthly periodical by the Saskatchewan Mathematics Teachers' Society featuring articles, interviews, information about professional development opportunities, mathematical challenges, and other writings of interest to elementary and secondary teachers of mathematics (and all who are passionate, or even simply curious about mathematics education). We welcome a variety of contributions by mathematics educators at all levels – elementary, secondary, and higher – as well as by students.

Many of the articles you see here will have been posted on our website, www.smts.ca - in particular, those from our monthly columns: Problems to Ponder, Spotlight on the Profession, Reflections, and Intersections. If you missed them when they were posted, this is a great way to catch up. However, you will also find new articles, such as Jessica Morstad's "Math class, from the eyes of a student," a thoughtful reflection on teaching and learning mathematics by a Grade 9 student (see p. 15).

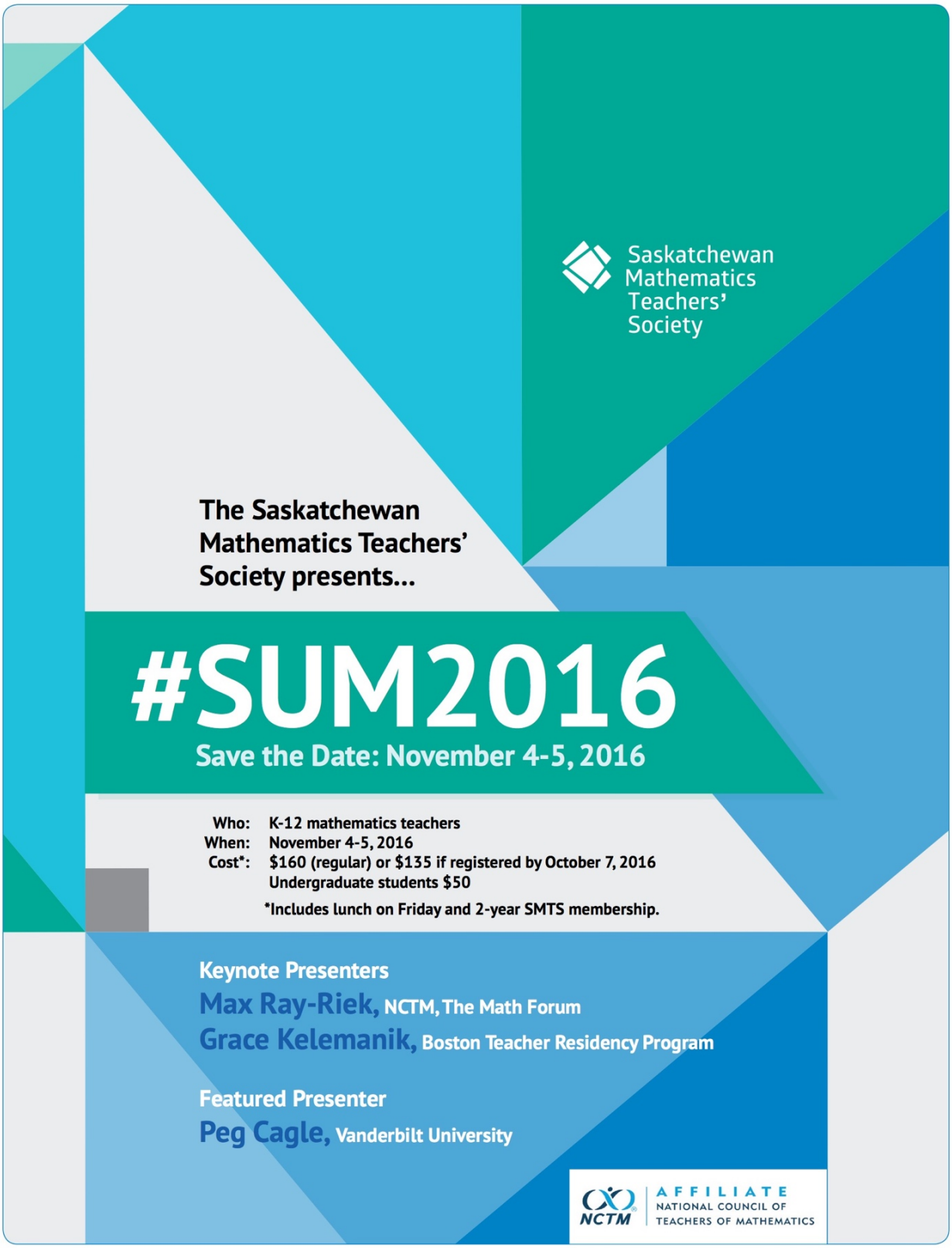
We hope that you find this periodical interesting and valuable for your teaching or personal interest. If you have any questions or comments about what you read, don't hesitate to get in touch by emailing us at thevariable@smts.ca. We also welcome you to contact us if you are interested in contributing to *The Variable* by sharing a lesson plan, a reflection on teaching, a book review, or any other piece; we are also looking for student contributions, including articles and artwork. See p. 19 for more information.

Happy reading!

Saskatchewan Mathematics Teachers' Society

In this issue

Saskatchewan Mathematics Teachers' Society


Saskatchewan Mathematics Teachers' Society
The Saskatchewan Mathematics Teachers' Society presents...
#SUM2016
Save the Date: November 4-5, 2016
Who: K-12 mathematics teachers
When: November 4-5, 2016
Cost*: $160 (regular) or $135 if registered by October 7, 2016
Undergraduate students $50
*Includes lunch on Friday and 2-year SMTS membership.
Keynote Presenters
Max Ray-Riek, NCTM, The Math Forum
Grace Kelemanik, Boston Teacher Residency Program
Featured Presenter
Peg Cagle, Vanderbilt University
NCTM AFFILIATE NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Message from the President

Instead of New Years' resolutions, 2016 began with the trend of choosing a word to represent your goals for the year. While I didn't participate personally, if I had to choose a word for the SMTS, it would most certainly be "growth."

Our growth really began in 2015 when the STF released their 5-year vision and initiated the transition from Special Subject Councils to Professional Growth Networks. This transition gave us the impetus to do some very exciting long term visioning with the help of the Saskatchewan Professional Development Unit. In early 2016, the executive had the opportunity to step back, examine "what we always do", and reshape our thinking around how the SMTS can grow to be a leader for the support of teaching and learning of mathematics in Saskatchewan.

Reframing our vision for the SMTS has resulted in some exciting changes, one of them being this new publication, *The Variable*. To complement our new vision of teacher and learner support, the SMTS will be focusing on growing our communication with our members. Not only can you expect monthly communication in the form of this publication, but also increased posts on our website and social media.

Our growth is not limited to communication! The Math Challenge also underwent some very exciting growth this year, which is shared in this edition of *The Variable* (see p. 5). The SMTS is committed to "walking the walk" of best practices in mathematics education, both for students and teachers. It is in this spirit that our Math Challenge team created and administered a Math Challenge experience that showcased the increasing value being placed on *collaboration and problem solving*.

In closing, I would like to welcome our incoming board members and sincerely thank our outgoing board members for their leadership and hard work. The planning and visioning for the SMTS was enhanced by bringing these two groups together. A significant period of planning and preparation is essential for growth to begin. Our ability, as a new executive, to implement our growth plan is result of the hard work and commitment of those who came before. Much like in our schools and classrooms, we are always better when we work together. Growing and changing is hard work, and the SMTS is excited to face this challenge together with our membership!

Michelle Naidu

Problems to Ponder

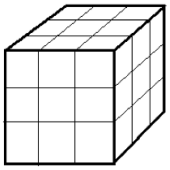
At the beginning of each month, we will be publishing two challenge problems on our website (www.smts.ca), one problem for Grades 7-8 and one for Grades 9-10. Some will be drawn from the Saskatchewan Math Challenge, the Saskatchewan Mathematics Teachers' Society annual team math challenge for students. The solutions will appear at the end of the month in this periodical.

The problems are meant to be discussed in teams – we encourage you to pose them as a challenge in your classroom or your math club!

Grade 7-8 Problem: Painted cube
Math Challenge 2016

A cube is made up of 27 smaller cubes. Suppose that all of the faces of the larger cube are painted red, and then it is taken apart. How many of the small cubes would have no faces painted red? One face painted red? Two faces painted red? Three faces painted red?

Grade 9-10 Problem: More cubes than meets the eye
Math Challenge 2016



a) How many cubes are there in a 3 x 3 cube?

b) How many rectangular prisms are there in a 3 x 3 cube?

c) How many cubes are there in a 9 x 9 cube after a 3 x 3 cube has been removed from the center?

See solutions on page 19.

Reflections on Math Challenge 2016

On Saturday, March 12, over 70 Grade 7-10 students from schools around the province arrived bright and early to the University of Saskatchewan to participate in this year's installment of the Saskatchewan Math Challenge, a provincial math challenge co-sponsored by the Saskatchewan Math Teachers' Society and the University of Saskatchewan. This year, the Math Challenge was also assisted by generous support from the University

of Saskatchewan Department of Mathematics and Statistics.

Participating students competed as teams of 3 to 5 in solving problems, enrolled in one of two levels: Grade 7-8 and Grade 9-10. In the morning, while the Grade 7-8 students worked at a variety of stations where they used hands-on materials to solve diverse mathematical problems with their teams, the Grade 9-10 students worked on two group exams. As the students worked together to solve the given problems, laughter, cheering, and friendly arguments were heard across the halls.

After refueling over lunch at Marquis Hall, the students were ready for some more mathematics. This time, the Grade 7-8 students wrote a group exam, followed by a high-energy, competitive, hands-on activity, while the Grade 9-10 students worked on a longer problem whose solution they presented to a panel of judges. The students' creativity, communication, and problem-solving skills shone! The panel presentation was a new aspect of the Math Challenge, intended to give participants the opportunity to communicate mathematically in a new way and to make their creative ideas public.

The two Grade 7-8 teams with the lowest average times for completing the puzzles during the hands-on activity, as well as the two Grade 9-10 teams with the highest presentation scores (judged on mathematical accuracy, clarity, and creativity) had the opportunity to choose among some fantastic prizes donated by local businesses, including Amazing Stories, Puzzle Master, Dragon's Den, King Me Boardgamery, and Broadway Cafe.

Based on both student and coach feedback and the excellent work submitted and presented by participating students, the day was a rousing success. We wish to thank all participants for their energy and enthusiasm, as well as their coaches for their commitment to their students: We recognize and value the time you spend to enrich your students' mathematics learning. It is with sadness that we say goodbye to Math Challenge 2016 – but we're already looking forward to next year's installment!

We hope to see you there.

The Math Challenge Team

Spotlight on the Profession

In this monthly column, we speak with a notable member of the Western Canadian mathematics education community about their past, present, and future work, and about their perspectives on the teaching and learning of mathematics. This month, we had the pleasure of speaking with Dr. Kathleen Nolan.

Dr. Kathleen Nolan is an Associate Professor in the Faculty of Education at the University of Regina, where she teaches undergraduate and graduate courses in mathematics curriculum, qualitative research, and contemporary issues in education. Dr. Nolan's current research focuses on mathematics teacher education, exploring issues of teacher identity and the regulatory practices of schooling, learning and knowing. Bourdieu's social field theory and theories of critical mathematics education feature prominently in Dr. Nolan's work. She is the author and co-editor of two books, as well as author of more than 40 published articles, book chapters, and conference proceedings papers. In 2012, she was awarded a Social Science and Humanities Research Council (SSHRC) Insight Grant for her project entitled Reconceptualizing Secondary Mathematics Teacher Education: Critical and Reflexive Perspectives*. Within this qualitative research program, Dr. Nolan seeks to strengthen connections between teacher education, curriculum reform and mathematics education research by studying the interplay of different perspectives, or dimensions, of teacher education. One such perspective includes research into the design and facilitation of a professional learning community approach to teacher education internship.*

First things first, thank you for taking the time to have this conversation during this busy time of year!

According to your website (http://www2.uregina.ca/ktnolan/), you studied mathematics and physics as an undergraduate at Saint Mary's University, and obtained a Master's degree in physics from the University of Toronto. What drew you to education, and then to research in the field of mathematics education?

My own positive high school experiences drew me to study mathematics and physics at the university level. After completing my M.Sc. degree in physics, I almost accepted a position as a health physicist at a nuclear power plant! That seems like such a long time ago. However, at the same time, I had the opportunity to volunteer (with VICS) for two years as a high school mathematics and physics teacher in Grenada (located in the West Indies). The rewards of that experience were many, leading me to pursue my diploma in education at McGill University, followed by several years of teaching at both high school and college levels. A few years teaching at Nova Scotia Teacher's College in the 1990s convinced me that mathematics teacher education was my passion, and so I moved to Saskatchewan in 1998 to pursue my Ph.D. at the University of Regina, where I took up a Faculty position a few years later. Because my research and teaching both focus on secondary mathematics teacher education, I thoroughly enjoy the intersections and overlaps that my scholarship affords me.

Much of your current research focuses on (mathematics) teacher education, including the issue of theory-practice transitions. In your view, how wide is the disconnect between mathematics education research (the "theory") and the teaching of mathematics in our classrooms (the "practice")? What contributes to this disconnect, and how can the gap be narrowed?

I don't think it is so much that the gap between theory and practice is wide, but rather that these two very important aspects of teaching and learning are frequently isolated from each other without appreciating just how much they actually shape and inform each other on a daily basis. For example, I frequently hear prospective teachers discuss that the most valuable part of teacher education is the experience they have in 'real' classrooms, with 'real' students. However, in my view at least, a teacher education classroom is *very real*, and so are all of the pedagogical practices and theories that we discuss and work with there. Teacher education, I think, should be viewed as an opportunity to enrich and expand understandings of teaching and learning (and maybe even to unlearn a few things!), not as a place where new teachers are 'trained' in techniques and strategies that serve to maintain *status quo* practices in schools. I like to think that my own research attempts to narrow this perceived gap by proposing that teacher education faculty members become more invested in the field experiences, working closely with student teachers and cooperating teachers in schools.

"Teacher education, I think, should be viewed as an opportunity to enrich and expand understandings of teaching and learning, not as a place where new teachers are 'trained' in techniques and strategies that serve to maintain *status quo* practices in schools."

As such, I have been reconceptualizing my own role as a faculty advisor during internship, which has led to the design and facilitation of an enhanced version of our traditional internship model—one I refer to as a Teacher-Intern-Faculty Advisor (TIFA) professional learning community model. In this model, I collaborate with three cooperating teachers and three interns to create a learning community based in the professional development practices of lesson study and video analysis, a process I call an *Integrated Noticing Framework*. It's been very rewarding for me to have the opportunity to work with interns and cooperating teachers at this deeper level, and my research interviews with past participants in the community point to the many benefits for them as well.

Changing gears, I would like to touch on a more controversial issue. In recent years, interest in the state of mathematics education in Canadian schools has grown (read: exploded) in the public sphere, partly due to the efforts of movements such as WISE Math in Alberta. Typically, the media frames the issue in terms of a traditional/reform dichotomy (the conflict is sometimes referred to as the "math wars"). Could you offer your perspective on this debate and how you see it evolving in the future? Will teacher educators such as yourself have a greater role to play in resolving the conflict?

"Along with diversifying pedagogy (to include *both* traditional and reform-based practices), we need to become more creative in our 'measuring', that is, assessment practices."

This topic is a fiercely debated one, that's for sure, so my response could be a lengthy one. However, my views can probably be summed up quite simply: Disrupting well-established (and often unquestioned) pedagogical practices by trying 'new' reform-based approaches to student learning (such as inquiry) can be daunting and

discouraging because many still want to measure the results or outcomes (that is, student learning) in the same 'old' ways. In other words, it is not reasonable to think that one can draw conclusions regarding the successes of teaching and learning through inquiry using a measuring stick derived from direct forms of pedagogy. It just doesn't make good sense. Along with diversifying pedagogy (to include *both* traditional and reform-based practices), we need to become more creative in how and what we 'measure', that is, in our assessment practices. To me, *this* is where we need to become WISE.

Some of your work has explored issues of equity and social justice in mathematics education. In one of your articles (Nolan, 2009), you write:

> "I […] dream of a social justice-oriented mathematics classroom that begins by challenging the often invisible normative and regulatory aspects of schools and mathematics." (p. 214)

Could you elaborate on this for teachers who are interested in developing a social justice-oriented mathematics classroom? How does this vision differ from the more common "'statistics and figures' approach" to tackling issues of social justice in the mathematics classroom?

As I wrote in that article, a 'statistics and figures' approach to teaching about/through social justice is not to be dismissed; I think it needs to be part of the journey toward understanding and challenging dominant (and unjust) practices that generally serve in the interest of only a very few. A problem exists, however, when such a 'statistics and figures' approach becomes nothing more than an intermission in the regularly scheduled programming of teaching and learning mathematics. Let me give an example: with a 'statistics and figures' approach, one might introduce local poverty statistics or data on low graduation rates of Aboriginal students into a data management class for students to analyze, graph, come to conclusions, and maybe even mobilize toward action. However, if, at the same time, there are underlying messages being conveyed in the classroom regarding who can succeed at mathematics and who cannot, who is good at mathematics and who is not, then these discourses *also* need to be challenged—that's an example of what I mean by the often "invisible" and "regulatory" aspects of mathematics. It is tragic, I think, that our society readily accepts people announcing that they've "never been very good at math," but doesn't seek to unpack underlying messages about what it means to "know" in mathematics, and who says so.

"It is tragic that our society readily accepts people announcing that they've "never been very good at math," but doesn't seek to unpack underlying messages about what it means to 'know' in mathematics, and who says so."

Your work has been published in a variety of notable journals, books, and conference proceedings, including the Journal of Mathematics Teacher Education, Educational Studies in Mathematics, For the Learning of Mathematics, *and the* Canadian Journal of Science, Mathematics and Technology Education, *and in 2007, you published your own book* (How should I know? Preservice Teachers' Images of Knowing (by Heart) in Mathematics and Science; *Sense Publishers*). *Which of your publications would you recommend to Saskatchewan mathematics teachers (and beyond) who are looking to grow in their practice and their understanding of the teaching and learning of mathematics?*

I think that the article in the *Journal of Mathematics Teacher Education* (Nolan, 2009) that you mention above, which discusses social justice and mathematics education, would be valuable to read since it connects directly to my own classroom experiences, and so it may connect to other mathematics teachers' experiences as well. If teachers are drawn to learning more about social theory, in particular my use of Bourdieu's social field theory, then they might read my articles in *Educational Studies in Mathematics* (2012; 2016). In those articles I write about how, without a critical approach, education (schools, policies, teacher education, etc.) can function to reproduce *status quo* practices. Full citations and links for those articles can be found on my website. In fact, lately I've been working on my website, especially on the SSHRC Insight Grant page (http://www2.uregina.ca/ktnolan/sshrc-insight-grant/), to insert some media files and links to articles. So, for example, if someone wanted to learn more about my TIFA internship community, they could view a video of the presentation that I gave with two teacher colleagues at the Hawaii International Conference on Education (Nolan, K., Rogers, K., & Sundeen, January *2016*) or listen to the audio for a similar presentation that I gave at the International Technology, Education and Development (INTED) Conference (March 2016).

[*For even more information about Dr. Nolan's use of Bourdieu's social field theory, TIFA, and more, see her recent conversation with* Innovation International*:* http://www.internationalinnovation.com/considering-new-approaches-to-mathematics-teacher-education/ *– Ed.*]

Looking ahead, what do you have planned in terms of your research program?

Even though my SSHRC grant has recently come to the end of its term, I still have quite a bit of data to analyze, papers to write, and results to share from this research program. The good news is that I will be able to run another TIFA internship learning community in Fall 2016, having received funding from the Saskatchewan Instructional Development and Research Unit (SIDRU). I'd like to continue that project because I enjoy enacting my role as a faculty advisor through a collaborative community approach, but it does require funding for resources and substitution days for teachers. I may look into involving school divisions more closely, because I think that the community professional development model benefits both interns *and* cooperating teachers—that is, it is beneficial in both the processes of *being* and *becoming* mathematics teachers.

Another area of interest that I will continue to pursue in the next couple of years is in connection to my study on perceptions of middle years mathematics teaching specialists. Research reports from that study are also available on my website. So far, the study points to the benefits of developing and offering a certificate program in the teaching of elementary school mathematics, so stay tuned for that exciting possibility!

Thank you, Dr. Nolan, for taking the time to share your research and perspectives with our readers. We'll be following your future work with interest!

If you would like more information about Dr. Nolan's work, you can find a list of her publications, grants, service work, contact information, and more at her website:
http://www2.uregina.ca/ktnolan/

Ilona Vashchyshyn

References

Nolan, K. (2007). *How Should I Know? Preservice Teachers' Images of Knowing (by Heart) in Mathematics and Science*. The Netherlands: Sense Publishers.

Nolan, K. (2009). Mathematics in and through social justice: Another misunderstood marriage? *Journal of Mathematics Teacher Education*, *12*(3), 205-216.

Nolan, K. (2012). Dispositions in the field: viewing mathematics teacher education through the lens of Bourdieu's social field theory. *Educational Studies in Mathematics*, *80*(1), 201-215.

Nolan, K. (2016). Schooling novice mathematics teachers on structures and strategies: A Bourdieuian perspective on the role of "others" in classroom practices. Special Issue on Contemporary Theory II, *Educational Studies in Mathematics.*

Reflections

Reflections *is a monthly column for teachers, by teachers on topics of interest to mathematics educators: lesson plans, book/resource reviews, reflections on classroom experiences, and more. If you are interested in sharing your own ideas with mathematics educators in the province (and beyond), consider contributing to this column! Contact us at thevariable@smts.ca.*

Can I do more than totem poles in math?

Sharon Harvey

"A totem pole casts a shadow that is 15 m long. The angle of depression of the sun is 43°. How tall is the totem pole?" Or perhaps this one: "The following beading pattern has a ratio of black to red beads of 4:7. If there are 35 black beads, how many red beads are there?" FNIM content – check.

> "I've always struggled with incorporating FNIM content in math. It shows up in my Professional Growth Plan year after year, because I am never okay with what I am doing."

This was me. This is me. This has been me for 8 years. Is it better than nothing? Maybe. Is it good enough? Definitely not.

I've always struggled with incorporating FNIM (First Nations, Inuit, and Métis) content in math. It's something that shows up in my Professional Growth Plan year after year, because I am never okay with what I am doing. I know I need to do something more. Something that makes students think, question, and respond to FNIM content while still focusing on mathematical concepts. But I'm a full time teacher, and with all the time commitments that this involves, I don't have time to develop something fabulous – so instead, I totem pole and bead pattern.

In November, I attended the SUM conference in Saskatoon. A group of teachers and consultants for Saskatoon Catholic Schools presented a statistics unit for grade 9s that was rooted in FNIM material. This was exactly what I had been looking for. They had collected the statistics and the ideas, and they put them in one place where I could take what I needed. And I did. I took parts of their plan and molded it into the unit that I share below. Does it still have room for improvement? Of course it does, but I'm excited enough by what I saw and did with my students to want to share it, even in its rawest form.

> "It was new. It was exciting. I can't wait to do it again."

I broke the unit into two big topics: Games of Chance and Interpreting Statistics.

Games of Chance

The FNIM Games of Chance unit began as a group lesson. We watched the PowerPoint from the SUM unit around chance and why certain FNIM communities played games of chance. We all made and played the game "Stick Dice". In this version of the game, players alternate tossing four decorated sticks (see Figure 1 below). The goal of the game is to collect 10 counters (choose your favorite manipulative), which players earn when certain events occur (see below). (Counters are taken away from the other player when none are left unclaimed. For example, suppose each player has 5 counters. If Player 2 earns 2 points on his or her turn, he/she takes two counters from Player 1, so that Player 2 now has seven counters and Player 1 has three.)

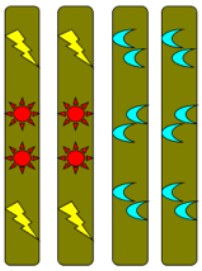


Figure 1

The points are allocated as follows:

Only one design facing up (4 identical designs): 2 points
Two of one design facing up, two of the other design facing up (see left): 1 point
Any other combination - 0 points

We discussed the frequency of scoring tosses to blank tosses that we had observed in the game. Then, I asked what the chance of scoring was each time that I tossed the sticks. Depending on how your students approach this question, it leads to a variety of probability conversations. Some of my students quickly resorted to theoretical probability (though they couldn't have labelled it that) and started writing down all the possibilities, and which among these would win. Other students tossed sticks and recorded what happened. Of course, they came up with different probabilities of scoring, so I asked who was correct. This was likely the most brilliant question I've ever asked in my math class (give me a break – I'm still new…ish). I have never had students so invested or defensive of their answer. It took way longer than I expected for students to come to realization that what *should* (theoretically) happen doesn't always happen – oh, to be young again! After discussion, we decided that, at some point in time, the theory and the experiment must match – otherwise, according to my grade 9's, "what's the point of the theory – why even have it?" So I asked them to figure it out. Was 20 tosses enough? 40? 60? *So. Much. Fun*. We

> "This was likely the most brilliant question I've ever asked in my math class."

did other math stuff too, like determining the formula for theoretical probability, talking about subjective judgment and good old hunches.

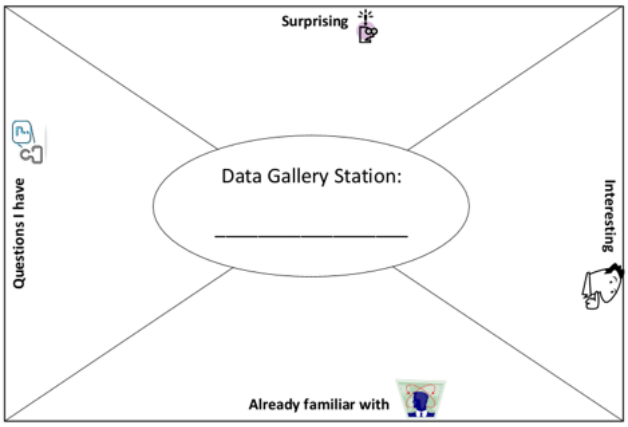
Following our experiments, I asked students to research a FNIM game of chance and present their findings to the class. We collectively made a list of requirements (see below), and I gave them 3 days to complete a presentation. I also made a sign-up list with the games from the SUM unit so that there weren't more than two people signed up for a game. (Nobody wants to learn the same game 7 times, no matter how awesome it is.) There was also an 'other' category for those who wanted to explore a game of chance that wasn't on the list.

Project requirements:

- Game origin (Which nation? Where?)
- Why it was played (entertainment, wagers, dexterity, etc.)
- How to play
- Sample of the game with a chance for others to play later
- Original materials and adapted materials (What was originally used to play the game, and what can we use today? e.g., popsicle sticks instead of bones)
- The "math," including the experimental and theoretical probabilities if possible, and an explanation if not possible (the explanation came later, when they were sure there was absolutely no purely theoretical probability about, for example, getting a piece of bark with a hole in it or not)

Interpreting Statistics

Following the presentations each day (I limited it to 5 presentations per day), the students participated in a Gallery Walk, which are similar to "stations" in that they involve students walking around the classroom to visit different activity centers, but involve statistics found in newspapers or websites. I presented them through PowerPoint. The GSCS unit plan included 6 "walks" to choose from, and I chose four among these: Top 10 Stats (a YouTube video), Educational Funding, Credit Completion at Oskayak, and Traditional Languages. During each walk, students were required to fill out a graphic organizer that asked them to identify what in the data they found surprising and interesting, what they already knew, and if they had any questions. It looked like this:



We did the first Gallery Walk as a class, during which I had students watch the video "10 Extraordinary Statistics," which you can find here: https://www.youtube.com/watch?v=BE54mDs6St4. We watched it twice, and only during the second time did they record anything on their graphic organizers. We discussed what in the video surprised them, what was interesting, and things they already knew. Then we discussed the questions that they had, such as: Is it outlandish to state that coconuts are 15 times more dangerous than sharks? Why or why not? What does "conceive" mean? Are zoo animals considered privately owned?

This led to a great discussion on the use of statistics: Why do we use them? How can they be misrepresented? How do we know where the statistics are from? This initial conversation about coconuts and IKEA made it easier to illicit a similar discussion when looking at data about course completion for First Nations students, the loss of traditional languages, or the difference between educational funding for public and on-reserve schools.

After each gallery walk, we had a whole-group discussion. We talked about the validity of the statistics, as well as the history that led to the statistics. As much as we talk about FNIM history and culture in schools, there is so much more to discuss. About 30% of my class is made up of EAL students who don't know the history of First Nations in Canada. They asked amazing questions, such as: (Regarding traditional languages:) "Why did people force First Nations people to not speak their own language?" (With respect to educational funding:) "Why do we get more money than them?" (Regarding history:) "Were they the first people in Canada?" The students posed questions, discussed, and learned together. Finally, we finished up our unit by looking at sampling and collection methods.

It was new. It was exciting. I can't wait to do it again.

For the full unit plan, or for questions or comments, you can contact:

Sharon Harvey at harveys@spsd.sk.ca or
Diana Sproat (GSCS Math Consultant) at dsproat@gscs.sk.ca

Sharon Harvey has been a teacher within the Saskatoon Public School Division for eight years. She has taught all secondary levels of mathematics, as well as within the resource program. She strives to create an inclusive and safe environment for her students.

Do you have a lesson plan, reflection, book review, or other thoughts or ideas that you'd like to share with the Saskatchewan mathematics education community – and beyond? Consider contributing to *The Variable*! See page 19 for more information.

Student Voice

In this column, we let our students speak—about their experience as mathematics learners, about an interesting problem and/or solution, or about anything else that they would like to share with the wider mathematics education community. If one of your own students would like to contribute to this column, or if you would like to share (with their permission) some of your students' work, please contact us at thevariable@smts.ca.

Math class, from the eyes of a student

Jessica Morstad, Grade 9

During the past year, I have been working on video projects in math class that have challenged me in many ways that our math text book has not. When you solve an equation, you can skip a few steps and do some of the math in your head, and still get to the right answer. This happens very often when we use our math text book. However, when you make a video, you don't know who will be watching it. You have no idea what their learning style is or if they understand what you are saying. As a result, you have to explain everything that you are doing in detail and emphasize the important things to ensure the viewer's understanding.

After making each video, I feel that I have a better understanding than I had when I started. When making these videos, you learn how to teach others, get your point across, and be more confident in your own understanding. These videos can also make you more comfortable in front of a camera. I enjoy written assignments when they challenge me, but making these videos has sparked a new interest in mathematics.

Unfortunately, textbooks can be very repetitive, and have many of the same types of questions over and over again. I learn best when I am taught a variety of things in a short period of time, rather than a different variation of the same questions again and again. Another method of teaching that I do not enjoy is large-group lessons. I find it hard to ask questions and I feel embarrassed when I do not understand a concept. In large-group lessons, I feel obligated to listen and participate, even when I understand and feel the need to move on and work on the assignment.

> "I enjoy being challenged, and working in groups is definitely a challenge. But working with a variety of people is a challenge that we will all experience in the real world."

Non-text assignments are often more hands-on and engaging. They can have real life aspects that you are able to use in the future. I think it is important to incorporate real-life scenarios in math class, as math is such a big part of our daily lives. I enjoy being challenged, and working in groups is definitely a challenge. The most important part is finding everyone a job to help solve the problem. Working with a variety of people is a challenge that we will all experience in the real world, and I think it is important to teach these kinds of skills, especially at a young age. Getting to do something that you will do in the future makes you feel accomplished, and will give you confidence in the coming years. Higher-level thinking assignments are also challenges that I enjoy.

A strong math student would tell teachers to get creative, and not just teach from the textbook. Higher-level learning challenges that are hands-on, and ones that teach students about real-life situations are a lot more fun than some students might expect. They allow students to get engaged in math class. It is important to understand that every student has a different learning style; they may not understand something right away, but don't give up. As long as you are patient and energetic, you should do just fine. Just remember to not get too frustrated when the students aren't listening, and get creative once in a while. Teaching from the textbook might be your main priority, but if you switch it up a little, it won't hurt.

The best teachers recognize a student's strengths and weaknesses. They encourage questions from the students and understand their capabilities. They create hands-on problems to do along with textbook work, and they encourage group work. They challenge the students without pushing them too hard. The ideal math teacher would ask questions to help the student get to the answer him or herself, instead of just giving the student the answer. The ideal teacher goes the extra mile to help students grow, for example by having students create learning videos or through other creative challenges.

"The best teachers recognize a student's strengths and weaknesses. They encourage questions from the students and understand their capabilities."

The worst teachers do not make a connection with the students, and are not interested in seeing students grow (and we can tell right away!). They seem disinterested with the lesson and use a monotone voice. They put no effort into the lessons or the answers that they are giving the students. They seem preoccupied and rush the lessons. In my opinion, teachers should be energetic and never teach a lesson from their desk. It takes a lot of effort to be a great teacher, and little effort to be the worst.

The most engaging math lessons are taught in small groups, where everyone has a chance to answer and ask questions without the fear of being wrong. In larger groups, students feel unsure about their answers. It takes a lot of courage to talk in front of a class, especially in classes full of people that you don't know. When working in smaller groups, there is more one-on-one time with the teacher, and if necessary, you can stay after class to ask more questions. In larger groups, it is easier to sneak by without answering any questions, whereas when students work in small groups, the teacher is able to hear everybody's ideas. A truly engaging lesson is one where everyone participates, but the teacher should make sure that everyone is comfortable with their group so that they can speak openly about their opinions.

"A truly engaging lesson is one where everyone participates, but the teacher should make sure that everyone is comfortable with their group so that they can speak openly about their opinions."

I enjoy guided math very much because the groups are based on levels of comprehension, and I feel comfortable with my group. I can share my ideas without fear of being wrong, because I know that they understand everyone makes mistakes.

Math is a required class, but it doesn't have to be boring, and there are certain teaching styles that can assist student learning. As a Grade 9 math student, I would highly recommend small-group lessons, creative math challenges, and showing energy and passion towards the subject. If we can see you're engaged, chances are, we will be too.

Intersections

In this monthly column, you'll find a list of upcoming math (education)-related workshops, conferences, and other events that will take place in Saskatchewan and beyond. Some events fill up fast, so don't delay signing up!

Within Saskatchewan

Conferences

IT Summit
May 2nd – 3rd, Saskatoon, SK
Presented by the Saskatchewan Professional Development Unit

This two-day event will explore exemplary practices for teaching and learning with technology to support the actualization of Saskatchewan curricula. It promotes professional dialogue that fosters effective teaching and learning with technology, and is designed to share best practices in network infrastructures and centralized technologies that support student learning through technology use in schools and school divisions.

See https://www.stf.sk.ca/professional-resources/events-calendar

SUM Conference
November 4th – 5th, Saskatoon, SK
Presented by the SMTS

Our own annual conference! Join us for two days packed with learning opportunities, featuring keynotes Max Ray-Riek and Grace Kelemanik and featured presenter Peg Cagle. This conference is for math educators teaching in K- 12. See the poster on page 3 for more information, and keep checking the SMTS website (www.smts.ca) in the coming months for registration details.

Workshops

Structures for Differentiating Middle Years Mathematics
May 10th, Saskatoon, SK
Presented by the Saskatchewan Professional Development Unit

We know that assessing where students are at in mathematics is essential, but what do we do when we know what they don't know? What do we do when they DO know? This

workshop will have participants explore the use of responsive stations as structures that allow for individualized learning of mathematics without individualized planning.

See https://www.stf.sk.ca/professional-resources/professional-growth/events-calendar/structures-differentiating-middle-years

Comprehension Strategies in All Subject Areas
July 27th, Saskatoon, SK
Presented by the Saskatchewan Professional Development Unit

Students are faced with increasingly complex texts in every subject area. Research literature confirms the importance of explicitly teaching comprehension strategies to students to support their understanding. By explicitly teaching comprehension strategies in subject areas such as science and math, teachers can help students develop deeper understanding of these and other subject areas. This workshop will have participants experience a number of practical strategies that they can connect back to the subjects that they teach.

See https://www.stf.sk.ca/professional-resources/professional-growth/events-calendar/comprehension-strategies-all-subject

Structures for Differentiating Elementary Mathematics
July 28th, Saskatoon, SK
Presented by the Saskatchewan Professional Development Unit

We know through formative assessments that our elementary students are at different places in their understanding of mathematics, but how do we structure our classrooms to meet their individual needs? This workshop will provide the opportunity for participants to design their classroom structure so that it allows children to move flexibly among large groups, small groups and individual instruction. By having a structure in place, teachers can create a differentiated learning experience without creating individualized learning programs for every child.

See https://www.stf.sk.ca/professional-resources/professional-growth/events-calendar/structures-differentiating-elementary

Beyond Saskatchewan

Waterloo Math Teachers' Conference
August 23rd – 25th, Waterloo, ON
Presented by the Centre for Education in Mathematics and Computing

A conference for teachers of grade 7-12. While the Grade 9-12 sessions are directed towards university preparation and mainly Ontario teachers, teachers from any province or country will benefit as well. Registration is now open and spots fill up fast, so sign up early! Participation is restricted to two teachers per school until the **May 31st deadline**.

See http://www.cemc.uwaterloo.ca/events/mathteachers.html

Call for Contributions

Did you just deliver a great lesson? Or maybe it didn't go as planned, but you learned something new about the complexities of teaching mathematics. Perhaps you just read a book, or attended a conference or workshop that gave you great ideas for presenting a topic your students have always found difficult, or that changed your perspective about some aspect of teaching. **Why not share your ideas with other teachers in the province – and beyond?**

The Variable is looking for a variety of contributions from elementary and secondary teachers, researchers, and others who are interested in the teaching and learning of mathematics. Consider sharing a favorite lesson plan, a reflection, an opinion piece, a book review, an interesting problem solution, or any other article or other work of interest to mathematics teachers. If accepted for publication, your piece will be shared, as part of this periodical, with a wide audience of mathematics teachers, consultants, and researchers across the province, as well as posted on our website (www.smts.ca).

We are also looking for student contributions, whether in the form of artwork, short articles or stories, or interesting problem solutions. This is a great opportunity for students to share their work with an audience beyond that of their classroom and their school!

All work will be published under a Creative Commons license. If you are interested in contributing your own or (with permission) your students' work, please contact us at thevariable@smts.ca.

We look forward to hearing from you!

Problem Solutions

Grade 7-8 Problem: Painted cube
Math Challenge 2016

No faces painted red: 1
One face painted red: 6
Two faces painted red: 12
Three faces painted red: 8

Grade 9-10 Problem: More cubes than meets the eye
Math Challenge 2016

a) 36 b) 216 c) 1368
